Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

EARLY DIAGNOSIS OF POSTURE DISORDERS IN ADOLESCENT ATHLETES USING COMPUTER OPTICAL TOPOGRAPHY

Aziza Biykuzieva
Assistant of the Department of Medical Rehabilitation,
Sports Medicine, Traditional Medicine and Physical Education,
Tashkent State Medical University

Abstract

The article describes an objective method of optical analysis of the human spine and posture, which allows for an expanded range of examinations for scoliotic and kyphotic postural disorders and pelvic tilts. It also enables early diagnosis and detection of postural abnormalities in athletes. Based on the examination results of 89 athletes from two different sports, a comparative analysis of two examination methods (calculation of the shoulder index and optical analysis of the spine and posture) was conducted.

Keywords: Athletes, shoulder index, optical analysis of the spine, posture disorders.

РАННЯЯ ДИАГНОСТИКА НАРУШЕНИЙ ОСАНКИ У СПОРТСМЕНОВ ПОДРОСТКОВОГО ВОЗРАСТА МЕТОДОМ КОМПЬЮТЕРНОЙ ОПТИЧЕСКОЙ ТОПОГРАФИИ

Бийкузиева Азиза Абдунабиевна
ассистент кафедры Медицинской реабилитации, спортивной медицины, народной медицины и физкультуры, Ташкентский государственный медицинский университет

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

Аннотация

В статье описан объективный метод оптического анализа человеческой позвоночника и осанки, который позволяет увеличить спектр применения обследований при сколиотических и кифотических нарушениях осанки, перекосах таза, а также дает возможность ранней диагностики и выявления нарушений осанки у спортсменов. По результатам обследования 89 спортсменов, представителей 2 видов спорта, проведен сравнительный анализ двух методов обследования (расчет плечевого индекса и оптический анализ позвоночника и осанки).

Ключевые слова. Спортсмены, плечевой индекс, оптический анализ позвоночника, нарушения осанки.

Introduction

According to global statistics, musculoskeletal disorders are the most common health abnormalities among athletes [1]. Today, approximately 82% of adolescents exhibit some degree of spinal curvature. Musculoskeletal pathologies account for 43% of total morbidity in athletes (Mironova Z. S., Chermit K. D.). Within this structure among young athletes, postural disorders in the frontal and sagittal planes occur in 70% of cases, connective tissue dysplasia syndrome in 47%, scoliosis in 7%, flat feet in 45%, and juvenile osteochondrosis and cervical spine instability in 35–40% [4].

For athletes with scoliotic and other spinal deformities, evaluating the shape of the back is a crucial component of clinical examination [2]. While X-ray imaging provides direct information on the shape and deviations of various skeletal parts in a two-dimensional projection, a three-dimensional form can be obtained through stereo X-rays or computed tomography. To reduce radiation exposure, German scientists developed the "Formetric" system—a radiation-free, safe, light-optical method for measuring the back surface followed by a reconstruction

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

of the spinal shape. This technology allows for functional testing, postural analysis, and the assessment of body statics, posture, and scoliotic or other spinal deformities in less than a minute [3]. Given that postural disorders negatively affect various body systems and overall physical function, the relevance of this study is beyond question.

Research Objective:

To investigate the potential for early diagnosis of various musculoskeletal disorders in adolescent athletes using the "Formetric" optical system for spine and posture analysis.

Materials and Methods:

Based on the results of an in-depth medical examination conducted during the winter period by the Tashkent Adolescent Dispensary, 100 athletes were initially screened. From this group, 89 young male and female athletes were selected. These participants belonged to Health Group I and showed no external signs of scoliotic postural abnormalities according to orthopedic examinations (assessed via the shoulder index method). The participants were involved in track and field (running, jumping, javelin and discus throw) and tennis. Their average age was 13.6 ± 2.4 years, with a sports experience of 4.23 ± 2.45 years (Figure 1). All young athletes underwent functional tests and additional examinations using the method of optical spine and posture analysis. For this purpose, the "Formetric" system was utilized, which allows for investigations to be conducted with maximum speed and accuracy.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

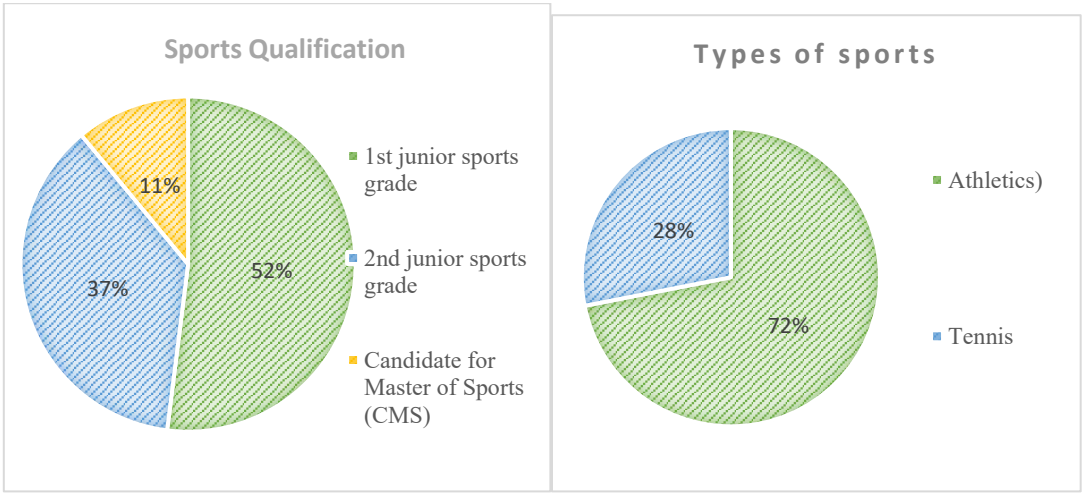

Figure 1. Analysis of the Study Cohort

During the examination, the athletes stood in a natural upright position at a distance of two meters in front of the scanning device. They were stripped to the waist, with trunks lowered to expose the lower back, and hair tied up. All extraneous items (chains, bracelets, kinesiology tapes) were removed. Light and sound insulation were maintained throughout the procedure. Each measurement lasted approximately 40 seconds.

Research Results:

According to the examination findings and the orthopedic reports from the in-depth medical screening, the majority of male and female athletes specializing in tennis and track and field exhibited good posture. However, certain postural disorders were identified, specifically the presence of a slumped-normal (kyphotic-normal) posture (Table 1).

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

Table 1. Posture Assessment Based on Shoulder Index Values in Male and Female Athletes (%)

Type of sport	Number of participants, n		Postural distribution (%)	
			Normal posture	Kyphotic-normal
Athletics	females	23	62	38
	males	41	54	46
Tennis	females	14	68	32
	males	11	51	49

The prevalence of slumped-normal posture among male track and field athletes is 46%, while in females it is 38%. A similar postural pattern was also identified in male tennis players (49%) and female tennis players (32%). This is likely associated with the intensified unilateral development of the neck and back muscles. The formation of slumped-normal posture in track and field athletes can be explained by the significant development of muscles supporting shoulder joint movement.

Table 2. Results of Optical Spine and Posture Analysis of the Study Subjects (%)

Indicator		Athletics		Tennis	
		males	females	males	females
Frontal plane, trunk imbalance (tilt)	2°	62	68	57	62
	2-4°	38	32	43	38
Lateral deviation (up to) Spinal midline deviation (up to)	5мм	59	72	28	36
	5-7мм	41	28	72	54
Pelvic obliquity, up to	4 мм	69	67	52	53
	4-10 мм	31	33	48	47
Spinal rotation (to the right, to the left), up to	4°	72	74	65	63
	4-6°	28	26	35	37
Kyphotic angle	47-50 %	56	58	48	50
	51-55%	44	42	52	50
Lordotic angle	38-42 %	64	62	60	61
	43-47%	36	38	40	39
Lateral spinal deviation (right/left)	5 мм	67	64	48	51
	5-10 мм	33	34	52	49

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

Analysis of the study cohort across the two sports using optical spine and posture analysis revealed significant differences (Table 2) in all parameters for athletes of both sexes. Specifically, 62 athletes (69.5%) were identified with postural disorders, with the majority being tennis players. To confirm the high prevalence of pre-pathological spinal conditions among the examined athletes, a comparative analysis of the two examination methods was conducted (Figure 2).

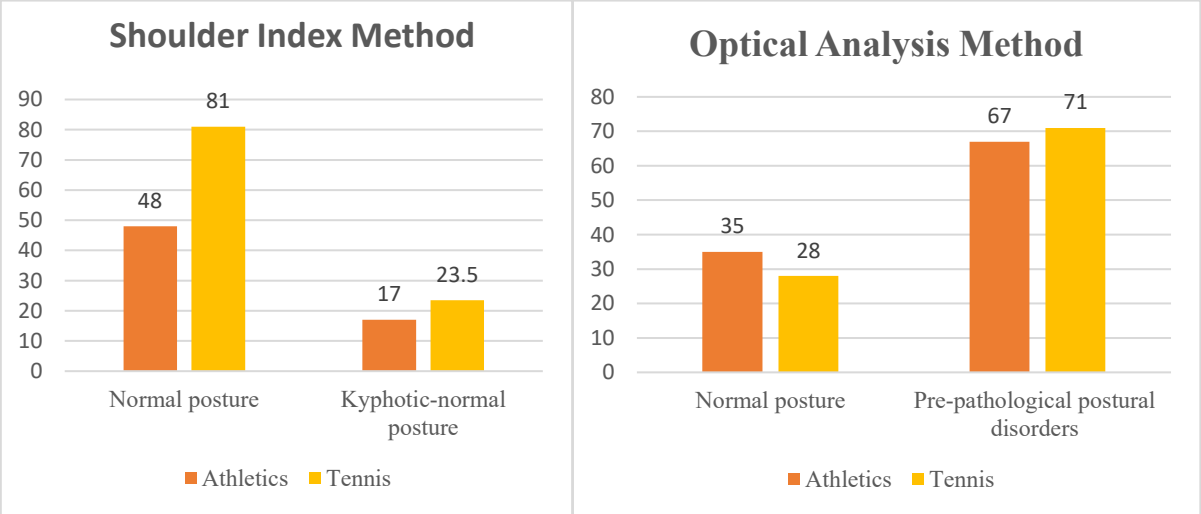

Figure 2. Comparative analysis of the shoulder index and optical analysis methods for spine and posture examination data of the athletes studied, %.

Thus, when evaluating primary examination data using the shoulder index method, normal posture was observed in 64.5% of athletes on average, compared to 31.5% using the optical analysis method. While 20% of athletes were identified as having "normal-stooped" posture according to the shoulder index, the "Formetric" optical analysis system revealed pre-pathological spine and posture irregularities in 69% of subjects across a range of indicators. The results of the study indicate that heavy, uneven physical loads lead to the predominant development of specific muscle groups or muscles on one side of the body, thereby resulting in various postural impairments.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026

https://eurekaoa.com/index.php/5

Conclusions

Examinations of athletes using the Formetric optical topography system make it possible to identify functional and structural changes at an early stage, even in the absence of musculoskeletal symptoms, which is a vital element in diagnosing pre-pathological conditions. One of the key conditions for preventing pre-pathological spinal changes (scoliotic and kyphotic postural impairments, pelvic tilt) is the refinement of training process management. This can be achieved by expanding the use of alternative methodologies and implementing dynamic monitoring to correct functional and structural musculoskeletal disorders.

References:

1. Тиханович Ж. В., Афанасьева Т. Ю. Современные подходы к изучению состояния детей с нарушениями осанки на физкультурно-оздоровительных занятиях //Физиологическое сопровождение тренировочного процесса и занятий физической культурой. – 2020. – С. 211-215.
2. Свен Хюбнерг. Инструкция DIERS myoline professional / Свен Хюбнерг. – 2010. – 12 с.
3. Bańkosz Z, Hawrylak A, Kołodziej M, Murinova L, Barczyk-Pawelec K. Interlimb and trunk asymmetry in the frontal plane of table tennis female players. PeerJ. 2024 Jun 21;12:e17526.
4. Alfred T., Ben-Shlomo Y., Cooper R. et al. ACTN3 Genotype, Athletic Status, and Life Course Physical Capability: Meta-Analysis of the Published Literature and Findings from Nine Studies. Hum Mutat., 2011 Sep; 32(9): 1008–1018.
5. Sport-Related Concussion: Evaluation, Treatment, and Future Directions / L. McKeithan [et al.] // Medical Science. – 2019 – № 7 (44). – P. 1–19.