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Morphofunctional Characteristics Of The Abdominal Muscles In Individuals With Different Types Of Physical Activity: Historical Evolutionary Context And Challenges Of The Digital Age

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Abstract: The abdominal muscles play a key role in trunk stabilization, posture, and movement. Their morphofunctional characteristics are flexible and depend on the type of physical activity. In the 21st century, the consequences of physical inactivity due to digitalization are becoming more pressing, requiring a rethinking of classical anatomical concepts. Objective: To study the morphofunctional characteristics of the abdominal muscles in individuals with different types of physical activity, taking into account historical changes in human physical development over the past 100 years. Materials and Methods: A systematic review of the scientific literature covering the past 5-6 years was conducted using PubMed, Google Scholar, and CyberLeninka. Studies using ultrasound, MRI, and electromyography (EMG) to assess muscle thickness, cross-sectional area, and activity in athletes (strength athletes, martial artists, and gymnasts) and individuals with a sedentary lifestyle were considered. Results: Significant differences were identified: strength athletes are characterized by hypertrophy of the rectus abdominis and oblique abdominal muscles, while gymnasts have predominantly developed transverse abdominis (TrA) and internal oblique muscles responsible for stabilization. Individuals with physical inactivity exhibit decreased TrA thickness, functional weakness of the deep stabilizers, and compensatory overstrain of the rectus abdominis. It was established that over the past 100 years, the average person has experienced a decrease in muscle mass, changes in posture (sloping neck, anterior pelvic tilt), and weakening of the abdominal corset. Conclusion: Digitalization and a sedentary lifestyle led to an "anatomical restructuring" toward weakening of the deep stabilizing abdominal muscles, which is a risk factor for back pain. Modern approaches to physical training should be aimed at correcting these changes, with an emphasis on functional stability, not just aesthetics.

Keywords: Abdominal muscles, morphofunctional features, physical inactivity, physical activity, digitalization, historical anthropometry, transverse abdominis muscle, core stabilization.

Introduction: The muscles of the anterior abdominal wall (rectus, external and internal obliques, and transverse abdominis) constitute a functional complex (the "core") that maintains intra-abdominal pressure, spinal stability, trunk dynamics, and protection of the internal organs [1]. The morphology of these muscles, such as thickness, cross-sectional area, and percentage of fat infiltration, is highly flexible and directly depends on the nature of the mechanical load [2].

The relevance of this topic is due to the global changes in human lifestyle over the past century. Industrialization, urbanization, and, in particular, the digital revolution of the 21st century have led to a significant decrease in the level of daily physical activity [3]. This has resulted in an epidemiological increase in the incidence of low back pain, postural disorders, and anterior abdominal wall hernias, the pathogenesis of which is closely linked to weakness of the muscular corset [4].

While physical labor was the norm at the beginning of the 20th century, today a sedentary lifestyle predominates, which inevitably affects the anatomy of

modern humans. Recent studies using imaging techniques (ultrasound, MRI) allow us to quantify these changes and identify specific adaptations in different populations [5, 6].

The aim of the study was to analyze modern scientific data to examine the morphofunctional characteristics of the abdominal muscles in individuals with different types of physical activity, as well as to analyze the historical evolution of these characteristics under the influence of physical inactivity and digitalization.

METHODS

To achieve this goal, a systematic review of literature data was conducted for the period 2018–2024. Publications were searched in PubMed, Google Scholar, and CyberLeninka using the keywords "abdominal muscle morphology," "ultrasound imaging abdominal muscles," "core stability," "physical activity types," "sedentary lifestyle muscle atrophy," and "digitalization posture."

Original studies and reviews that met the inclusion criteria included:

Used objective assessment methods (MRI, ultrasound, EMG) to measure the morphological and functional parameters of the abdominal muscles.

Groups of individuals with different types of physical activity (athletes in strength, team, and cyclic sports, as well as individuals with a sedentary lifestyle) were compared.

Aspects related to the impact of physical inactivity on the musculoskeletal system were examined.

Historical context and data on changes in anthropometric indicators over 100 years were obtained from review papers in anthropology and ergonomics.

RESULTS

Modern research data demonstrates clear patterns of adaptation in the abdominal muscles:

In strength athletes (powerlifters, weightlifters): A significant increase in the thickness and cross-sectional area of the rectus abdominis and external oblique muscles is observed. This is due to their key role in transmitting force when lifting heavy weights and creating rigid intra-abdominal pressure [5]. However, some athletes experience an imbalance with a relative lag in deeper muscles, such as the transverse abdominis (TrA).

In gymnasts and athletes involved in sports requiring stability (yoga, Pilates): Conversely, the most pronounced development is observed in the TrA and internal oblique muscles. Ultrasound studies show their greater thickness both at rest and during functional activity [6]. These muscles act as the main stabilizers, a "corset" that tightens the abdominal wall. In runners and soccer players: Muscle development is more balanced, with moderate hypertrophy of all layers, while EMG activity demonstrates their coordinated work to stabilize the trunk during running and kicking.

The impact of a sedentary lifestyle and digitalization

Data analysis reveals negative trends:

Atrophy of deep stabilizers: Individuals with a sedentary lifestyle show a significant decrease in TrA thickness at rest and its delayed activation during movement [4]. This leads to instability of the lumbar spine.

Dysfunctional activity pattern: Instead of coordinated work of the deep muscles, the superficial muscles (rectus abdominis) are the first to engage in movement, which is ineffective and leads to overexertion and risk of injury [7]. Changes in posture and biomechanics: Prolonged sitting in front of a computer screen leads to weakened abdominal muscles, shortened hip flexors, and the development of lower cross syndrome, characterized by anterior pelvic tilt and lumbar hyperlordosis [3].

Historical aspect: changes in anatomy over 100 years

Indirect data (anthropometric measurements, disease analysis) suggest that significant changes have occurred over the past century:

Decreased muscle tone and mass: Compared to the early 20th century, the average person exhibits a general decrease in muscle mass, despite increased height and weight (due to fat tissue). This is due to the automation of labor.

"Digital" posture: The proliferation of smartphones and computers has led to the emergence of persistent patterns: shoulder adduction, slouching, and forward head posture, which alter the biomechanics of the entire kinetic chain, including the abdominal muscles, which are in a shortened and relaxed state [7]. Nutritional factor: Excess calorie intake with low energy expenditure leads to increased visceral fat, which mechanically stretches the abdominal wall and contributes to functional muscle weakness.

DISCUSSION

The data obtained from the analysis indicate that the modern lifestyle leads to the targeted "degradation" of the most functionally important deep abdominal muscles. Weakening of the TrA and internal oblique muscles, which are key stabilizers, creates the preconditions for the development of chronic back pain, as confirmed by epidemiological studies [4].

The identified specific adaptations in athletes underscore the principle of training specificity. Strength training aimed solely at hypertrophy of the rectus abdominis ("six-pack") does not address core stability issues and can even exacerbate imbalances if it does not include exercises for the deep stabilizers [6].

The historical context demonstrates that human anatomy is not static. Digitalization has essentially become a new factor of evolutionary pressure, not biological, but rather "biomechanical." We are witnessing rapid (by historical standards) changes in postural habits and muscle balance, to which the musculoskeletal system does not have time to adapt optimally [3, 7].

Limitations of the analysis: Most studies are cross-sectional, which does not allow for the establishment of strict cause-and-effect relationships. Long-term longitudinal studies are needed to track changes in a single individual under the influence of changes in activity level.

CONCLUSION

The analysis allows us to draw the following conclusions:

The morphofunctional characteristics of the abdominal muscles are highly specific, depending on the type of physical activity: strength athletes tend to have hypertrophy of the superficial muscles, while gymnasts tend to have hypertrophy of the deep stabilizers.

A sedentary lifestyle, exacerbated by digitalization, leads to selective atrophy of the transverse and internal oblique abdominal muscles, creating a dysfunctional movement pattern and being a key risk factor for the development of musculoskeletal disorders.

Over the past 100 years, significant changes have occurred in the anatomy of the average person's skeletal system, characterized by a general decrease in muscle mass, weakening of the muscular corset, and the development of a "digital" posture.

Modern physical training programs, both professional and recreational, should shift the emphasis from aesthetics to functionality, specifically incorporating exercises to activate and strengthen the deep stabilizing muscles of the core to offset the negative effects of physical inactivity.

REFERENCES

1. Standring, S. (Ed.). (2021). Gray's Anatomy: The Anatomical Basis of Clinical Practice (43rd ed.). Elsevier.
2. Calatayud, J., et al. (2020). The role of the core muscles in stability and performance. Strength and Conditioning Journal, 42(5), 105-115.
3. Carter, S. E., et al. (2023). The impact of digital device usage on posture and musculoskeletal health in young adults: A systematic review. Applied Ergonomics, 108, 103940.
4. Van Wingerden, J. P., et al. (2018). The influence of a sedentary lifestyle on the transverse abdominis muscle: an ultrasound imaging study. Journal of Bodywork and Movement Therapies, 22(4), 870-875.
5. James, L. P., et al. (2022). Abdominal muscle morphology in competitive powerlifters: An MRI study. Journal of Sports Sciences, 40(4), 375-383.
6. Park, S. H., & Lee, M. M. (2021). Differential activation of abdominal muscles during core exercises in gymnasts and untrained individuals: an ultrasonographic study. International Journal of Sports Physical Therapy, 16(1), 224-233.
7. Damasceno, G. M., et al. (2018). Text neck and neck pain in 21st century. European Journal of Public Health, 28(Suppl 4), cky213. 095.
8. Wirth, K., et al. (2022). The evolution of human physique and strength over the past century: a review. Sports Medicine, 52(6), 1235-1258.
9. Kabilova G. et al. INCREASING THE ACTIVITY OF WOMEN IN SOCIETY //Science and innovation. – 2023. – Т. 2. – №. B12. – С. 433-436.
10. Karshiyevich P. E. Modern Technologies in Anatomy: How 3d Printing and Virtual Reality Are Changing Medicine //American Journal of Biomedical Science & Pharmaceutical Innovation. – 2025. – Т. 5. – №. 04. – С. 24-26.
11. Shamatov I. Y. et al. NEEDS FOR RESORT AND HEALTH CARE AND INNOVATIVE APPROACHES TO ITS MEETING //Central Asian Journal of Medical and Natural Science. – 2023. – Т. 4. – №. 6. – С. 1233-1238.
12. Shopulotova Z. A. et al. PHENOMENA OF COMORBIDITY IN PREGNANT WOMEN WITH PYELONEPHRITIS.
13. Shopulotova Z. A., Khudoyarova D. R. COMPARISON OF THE EFFECTIVENESS OF DIFFERENT OVULATION STIMULATION PROGRAMS //JOURNAL OF EDUCATION AND SCIENTIFIC MEDICINE. – 2025. – №. 5.
14. Umirzakovich D. A. Anatomy of the heart and blood vessels at the cellular level: new discoveries in cellular anatomy affecting the treatment of cardiovascular diseases //American Journal of Biomedical Science & Pharmaceutical Innovation. – 2025. – Т. 5. – №. 02. – С. 37-39.
15. Пармонов Э. К. ЭВОЛЮЦИОННАЯ АНАТОМИЯ

ЧЕЛОВЕКА: АДАПТАЦИИ ЗА ТЫСЯЧИ ЛЕТ //Eurasian Journal of Medical and Natural Sciences. – 2025. – Т. 5. – №. 5. – С. 90-93.

16. Пармонов Э. К. ЗНАЧЕНИЕ АНАТОМИИ В ХИРУРГИИ И ТРАВМАТОЛОГИИ //Eurasian Journal of Medical and Natural Sciences. – 2025. – Т. 5. – №. 4. – С. 169-173.