1ST

THE PROCEEDINGS BOOK

SCIENCE EGYPT

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27–31 July 2026 | Sharm El Sheikh, Egypt



EDITORS

Prof. Dr. Arzu AL

Prof. Dr. Ceyda Aysuna TÜRKYILMAZ

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COMPARATIVE ANALYSIS OF COP PARAMETERS IN STATIC AND DYNAMIC ROTATIONAL MOVEMENTS

Prof. Nikolina Dimitrova, D. Sc.
Department for Foreign Languages and Information Technologies National, Sports Academy "V. Levski", Sofia, Bulgaria
ORCID ID: 0000-0003-2224-2409

ABSTRACT

Postural stability represents a complex interaction between neuromuscular control, sensory integration, and the mechanical characteristics of the human body. The Center of Pressure (COP) is one of the most sensitive biomechanical indicators for evaluating balance in both static and dynamic conditions. The **aim** of this study is to perform a comparative analysis of key COP parameters during quiet standing and controlled dynamic rotational movements, in order to identify specific differences in postural control strategies.

Healthy adult participants performed two standardized tasks: (1) quiet standing in an upright position and (2) slow rotational movements around the vertical axis. COP data were recorded using a stabilometric platform and analyzed in terms of amplitude, COP path length, mean velocity, ellipse area, and frequency components using Fast Fourier Transform (FFT).

The **results** demonstrate a clear increase in COP amplitude and velocity during rotational movements compared to quiet standing. The area of the postural ellipse increased significantly, reflecting a higher challenge to postural regulation. FFT analysis revealed a shift toward higher frequencies during rotational tasks, suggesting more active neuromuscular engagement. COP trajectories also changed characteristically—from compact and stable patterns in static conditions to elongated and asymmetric paths during rotations.

These findings confirm that dynamic rotational tasks reveal specific features of postural control that are not observable in static conditions. This highlights the importance of rotational assessments for evaluating balance, functional stability, and fall risk. The study provides an applicable methodological framework for clinical and sports analysis, as well as a basis for future developments in biomechanical diagnostics.

Keywords: COP, postural control, stability, rotational movements, biomechanics, FFT analysis

INTRODUCTION

Postural stability is a key component of human motor function and represents a primary indicator of the effectiveness of neuromuscular regulation. Classical biomechanical models describe postural control as a dynamic system in which sensory, motor, and cognitive mechanisms interact (Winter, 2009; Prieto et al., 1996). The analysis of the Center of Pressure (COP) is an established method for evaluating balance, providing sensitive indicators of stability in both static and dynamic conditions (Ruhe et al., 2011).

The development of motor skills and postural regulation has been thoroughly examined in the works of Gallahue and Ozmun (2012), Haywood and Getchell (2018), as well as in classical pedagogical models of physical education (Movement, 1972; Council of Europe, 1988). The importance of early motor learning and the biomechanical foundations of motor development are emphasized in the study by Dimitrova (2001). Subsequent publications highlight the role of wellness concepts, integrated educational models, and psycho-emotional resilience (Dimitrova, 2019; 2023; 2024), as well as the connection between health prevention and specific populations (Dimitrova & Nesheva, 2021). The social and cultural dimensions of wellness practices are discussed by Dimitrova et al. (2018), while the relationship between emotional intelligence, leadership, and motor activity is explored by Dimitrova & Tomova (2025).

In the context of contemporary educational and sports practices, there is growing interest in innovative models for organizing and managing the motor learning process (Chipeva, 2026), as well as in the psycho-emotional effects of physical activity, including dance and artistic movement forms (Petkova-Nesheva, 2026). Research shows that motor activity provides significant cognitive, social, and psychological benefits (Lakes & Hoyt, 2004; Lubans et al., 2016; Tangney et al., 2004; Connor &

Davidson, 2003), while natural environments and adapted motor programs contribute to the overall development of children and adolescents (Becker et al., 2017; Mygind et al., 2019; Aleksandrova, 2021). Sports such as judo offer a unique environment for the development of motor, cognitive, and social skills (International Judo Federation, 2020; Biedrzycki & Laskowski, 2024; Franchini et al., 2015; Sterkowicz-Przybycień et al., 2017; Kons et al., 2024). These practices support self-regulation, social competence, and psycho-emotional resilience (Vertonghen & Theeboom, 2010; Gresham & Elliott, 2008; Wiese-Bjornstal, 1993). Additionally, research on physical activity and health underscores the importance of motor engagement for physical and mental well-being (Janssen & LeBlanc, 2010; WHO, 2020; Parijkova & Hill, 1998).

OBJECTIVE

The aim of the present study is to perform a comparative analysis of key Center of Pressure (COP) parameters during static stance and controlled dynamic rotational movements. By evaluating the spatial characteristics, amplitude, velocity, postural ellipse area, and frequency components of COP, the study seeks to identify specific differences in postural strategies and neuromuscular regulation under both conditions.

METHODOLOGY

In accordance with the stated objective, the study includes several key tasks: recording COP parameters during static stance and controlled rotational movements; analyzing the spatial characteristics of COP trajectories; evaluating amplitude, velocity, and postural ellipse area; as well as performing spectral analysis using FFT to identify the frequency components of postural control. The methodology is based on COP measurement using a stabilometric platform, with participants performing two standardized tasks — quiet upright standing and slow rotational movement around the vertical axis. The collected data were processed using specialized software, enabling quantitative comparison of the key parameters and revealing specific differences between static and dynamic conditions.

RESULTS

The conducted analysis of COP parameters revealed clear differences between static stance and controlled rotational movement. The dynamic task led to increased amplitude, greater spatial dispersion of COP, and a pronounced involvement of higher frequencies in the spectral analysis. The presented figures visualize these changes and allow direct comparison of postural strategies under both conditions. Figure 1 illustrates the characteristic COP trajectory during quiet, motionless standing. The data show a compact and concentrated pattern of sway, which is typical of stable postural regulation. The amplitude of deviations is low, and COP movement remains within a limited area, reflecting effective balance control under minimal sensorimotor load.

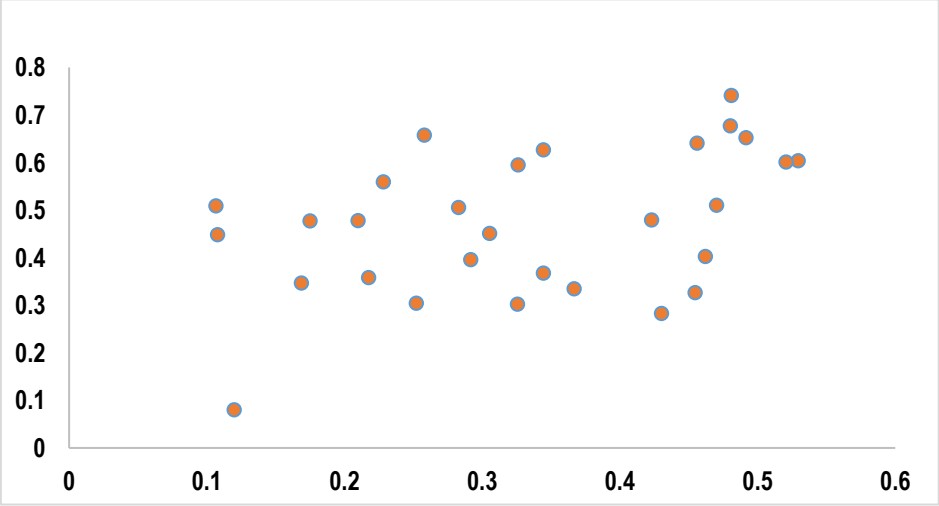


Figure 1. COP trajectory in static stance

Figure 1 illustrates the characteristic COP trajectory during quiet, motionless standing. The data show a compact and concentrated pattern of sway, which is typical of stable postural regulation. The amplitude of deviations is low, and COP movement remains within a limited area, reflecting effective balance control under minimal sensorimotor load.

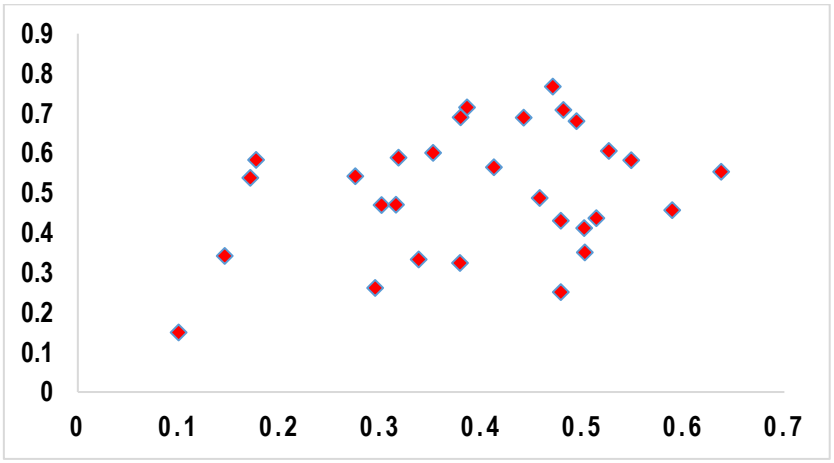


Figure 2. COP trajectory during rotational movement

Following the analysis of the COP trajectory in static stance, where sway patterns are compact and evenly distributed, it is necessary to examine COP behavior under dynamic loading. Rotational movements impose substantially higher demands on the postural system, leading to characteristic changes in the spatial profile of COP. These differences are clearly visible in Figure 2.

Figure 2 illustrates the characteristic COP trajectory during controlled rotational movement around the vertical axis. In contrast to the compact and stable pattern observed in static stance, here the COP path is markedly elongated, asymmetric, and exhibits clearly increased sway amplitudes. The trajectory shows pronounced deviations in both the mediolateral and anteroposterior directions, reflecting the elevated demands placed on postural regulation and the need for more active neuromuscular correction. These changes visually confirm the increased complexity of maintaining balance during dynamic rotational tasks.

After the spatial analysis of COP trajectories in static and rotational stance, it is necessary to examine the frequency characteristics of postural control. Spectral analysis using FFT makes it possible to identify the dominant frequency components underlying the observed COP fluctuations.

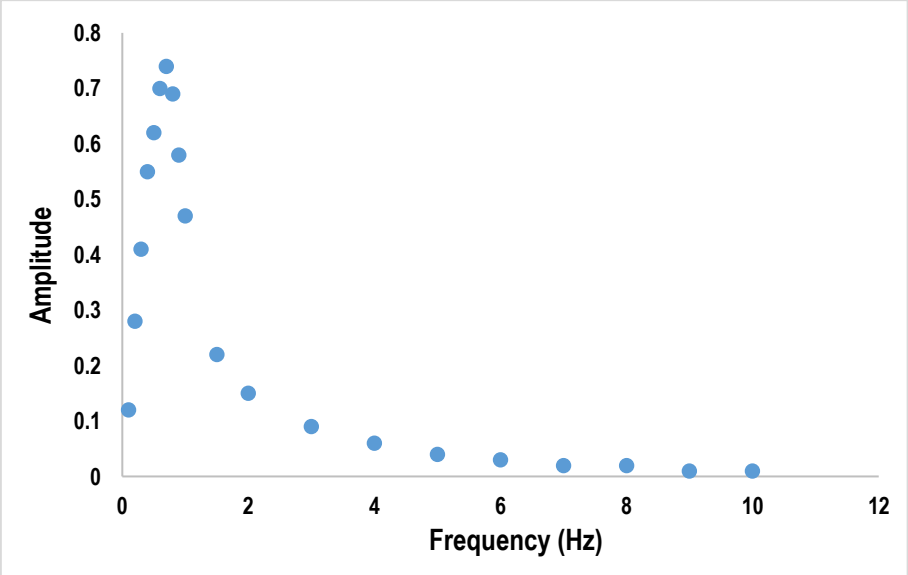


Figure 3. FFT spectrum – static stance

Figure 3 presents the frequency spectrum of the COP signals during quiet static stance. The data show a clear dominance of low-frequency components below 1 Hz, which is characteristic of stable postural regulation with minimal involvement of rapid corrective mechanisms. The amplitude gradually decreases as frequency increases, reflecting smooth and predictable balance control in the absence of external dynamic perturbations.

To evaluate the influence of dynamic loading on the frequency characteristics of postural control, it is necessary to examine the FFT analysis during rotational movement as well. Comparing the static and dynamic tasks makes it possible to trace how neuromuscular activity changes under more complex conditions for maintaining balance.

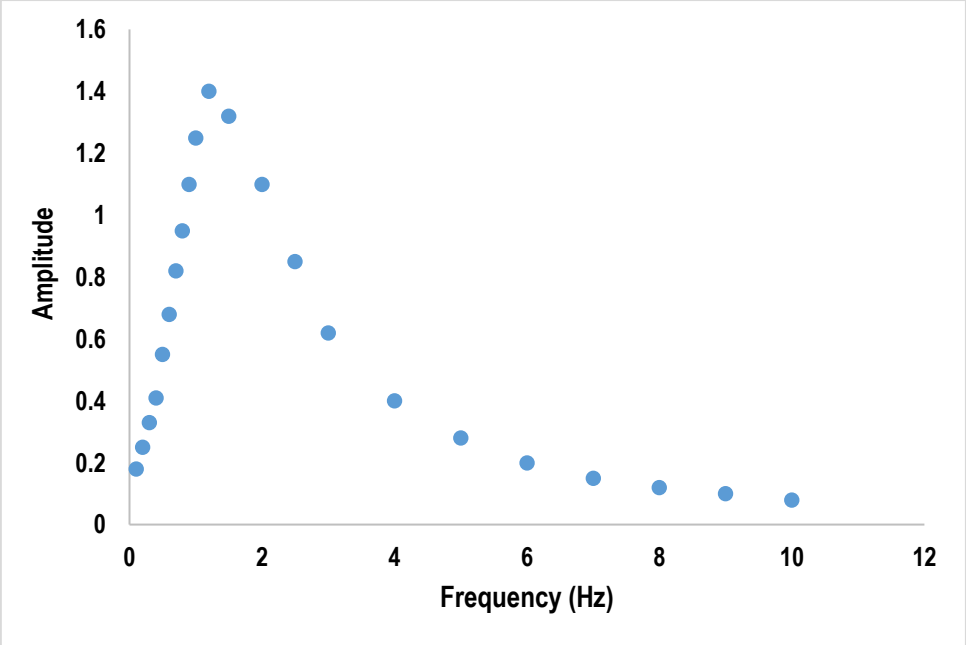


Figure 4. FFT spectrum – rotational movement

Figure 4 presents the frequency spectrum of the COP signals during controlled rotational movement. In contrast to static stance, a clear shift toward higher frequencies is observed, with amplitude reaching peak values around 1–2 Hz. This indicates the activation of faster corrective mechanisms and increased dynamic engagement of the postural system. The spectrum is broader, and amplitudes in the low-frequency range are considerably higher, reflecting the increased complexity and instability of the task.Following the individual analysis of the frequency spectra in static and rotational stance, their direct comparison should be presented. This allows simultaneous visualization of the differences in amplitude and frequency distribution that characterize the two postural tasks.

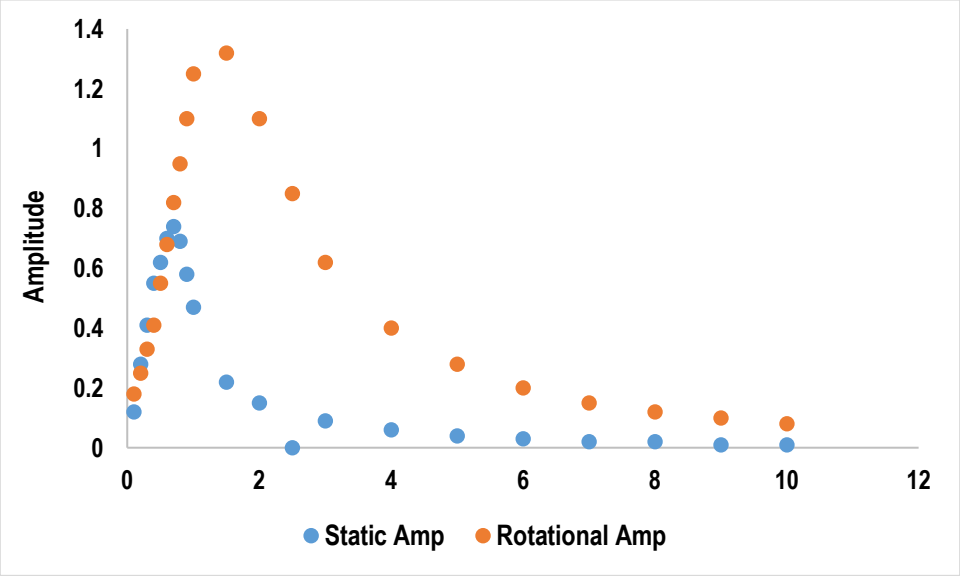


Figure 5. Comparative COP ellipse areas (static vs. rotation)

Figure 5 presents the amplitude values of the FFT spectrum for both static stance and rotational movement. The data show a clearly pronounced predominance of amplitudes during rotation in the low-frequency range (0.1–2 Hz), reflecting more active neuromuscular regulation and increased postural load. Static stance demonstrates lower and gradually decreasing amplitudes, characteristic of stable balance control. The comparative visualization highlights the differences in postural strategies and confirms that dynamic rotational tasks require substantially more complex corrective activity.The obtained results clearly indicate that dynamic rotational movements lead to significantly greater spatial deviations, increased amplitudes, and a shift toward higher frequencies compared to static stance, emphasizing the differences in postural strategies between the two tasks.These findings outline distinct differences between static and rotational stance, forming a basis for a more in-depth interpretation of postural mechanisms in the “Discussion” section.

DISCUSSION

The obtained results clearly demonstrate that dynamic rotational movements impose substantially higher demands on the postural system compared to static stance. The elongated and asymmetric COP trajectory during rotation reflects more complex corrective mechanisms required to maintain balance while moving around the vertical axis. This corresponds to established models in postural biomechanics, according to which dynamic tasks activate a broader range of neuromuscular strategies.The spectral analysis using FFT further confirms these differences. While static stance is characterized by dominant low-frequency components, rotational movement shows a distinct shift toward higher frequencies and markedly increased amplitudes. This frequency profile indicates faster and more intensive corrective responses necessary for stabilizing the body under dynamic loading.The comparative analysis between the static and rotational tasks highlights that rotational movements reveal specific features of postural control that do not manifest during quiet standing. This has important practical implications for both clinical balance assessment and sports practice, where rotational movements are a key component of functional stabilit

CONCLUSION

The present study demonstrates clearly expressed differences in postural control during static stance and dynamic rotational movements. The rotational task leads to increased COP amplitude, greater spatial dispersion, and a shift toward higher frequencies in the spectral analysis, reflecting the activation of more complex and faster corrective mechanisms. Under static conditions, postural regulation remains stable, compact, and dominated by low-frequency components.

These results highlight the importance of rotational movements as a specific tool for assessing functional stability and neuromuscular adaptation.
Incorporating dynamic tasks into clinical and sports practice can provide a more comprehensive picture of postural capabilities and support the early detection of balance deficits.

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Declarations of informed consent have been signed regarding the publication of survey data.
AI tools (ChatGPT) were used only for linguistic editing and translation.

REFERENCES

Aleksandrova, V. (2021). Adapted swimming for children with disabilities. IPRESS.
Becker, C., Lauterbach, G., Spengler, S., Dettweiler, U., & Mess, F. (2017). Effects of regular classes in outdoor education settings. International Journal of Environmental Research and Public Health, 14(5), 485.
Biedrzycki, J., & Laskowski, R. (2024). The impact of judo training on cognitive functions. Baltic Journal of Health and Physical Activity, 16(4).
Chipeva, M. (2026). Innovative model for organizing and managing the educational process in sports for university students. Trakia Journal of Sciences, 24(2), 128–134. https://doi.org/10.15547/tjs.2026.02.006 (doi.org in Bing)
Connor, K., & Davidson, J. (2003). Development of the CD-RISC resilience scale. Depression and Anxiety, 18(2), 76–82.
Council of Europe. (1988). EUROFIT: Handbook for the EUROFIT tests of physical fitness.
Dimitrova, B. (2001). Biomechanical aspects of physical education in preschool age [Doctoral dissertation].
Dimitrova, B. (2019). New smart educational model “Wellness instructor” (pp. 11–39). Avangard Prima.
Dimitrova, B. (2023). Educational policy, specialised staff, innovations and recreational industry. Strategies for Policy in Science and Education, 31(5), 532–546. https://doi.org/10.53656/str2023-5-6-imp
Dimitrova, B. (2024). The role of wellness, SPA and thalassotherapy in stress management. Smart Innovations in Recreation, Wellness Industry and Niche Tourism, 6(2), 7–14.
Dimitrova, B., & Nesheva, I. (2021). Research to improve health care for women with normal pregnancy. Trakia Journal of Sciences, 19(1), 684–690.
Dimitrova, B., & Tomova, T. (2025). Wellness lifestyle, emotional intelligence, workplace and leadership success. Smart Innovations in Recreation, Wellness Industry and Niche Tourism, 6(2), 51–56.
Dimitrova, B., Polomenov, M., Treneva, V., Nesheva, I., Ivanova, V., & Trendafilov, D. (2018). Sotsialna znachimost na uelnes kulturata. Avangard.
Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th ed.). Sage.
Franchini, E., Del Vecchio, F., Julio, U. F., Matheus, L., & Candau, R. (2015). Specificity of performance adaptations to a periodized judo training program. Revista Andaluza de Medicina del Deporte, 8(2), 67–72.
Gallahue, D., & Ozmun, J. (2012). Understanding motor development: Infants, children, adolescents, adults. McGraw Hill.
Getchell, N., Tortella, P., Fumagalli, G. F., & Sääkslahti, A. (2022). Promoting motor development in children in the COVID-19 era. Frontiers in Public Health, 10, 988085.
Gresham, F., & Elliott, S. (2008). Social Skills Improvement System (SSIS) Rating Scales. Pearson.

Haywood, K., & Getchell, N. (2018). Life span motor development (7th ed.). Human Kinetics.

International Judo Federation. (2020). Judo for children: Educational and social benefits. IJF Education Department.

Janssen, I., & LeBlanc, A. (2010). Systematic review of the health benefits of physical activity in youth. International Journal of Behavioral Nutrition and Physical Activity, 7, 40.

Kons, R. L., Detanico, D., Costa, F. E., Franchini, E., Dopico Calvo, X., Aznar, J. M., Loturco, I., & Weldo, A. (2024). Strength and conditioning practices of judo coaches. International Journal of Sports Science and Coaching, 19(2), 573–585.

Lakes, K., & Hoyt, W. (2004). Promoting self-regulation through school-based martial arts training. Journal of Applied Developmental Psychology, 25(3), 283–302.

Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., Kelly, P., Smith, J., Raine, L., & Biddle, S. (2016). Physical activity for cognitive and mental health in youth. Pediatrics, 138(3), e20161642.

Movement: Physical education in the primary years. (1972). Department of Education and Science.

Mygind, L., Mygind, E., Kjeldsted, E., Hartmeyer, R. D., Bølling, M., & Bentsen, P. (2019). Mental, physical and social health benefits of immersive nature experience. Health & Place, 58.

Parijkova, J., & Hill, A. (1998). Physical fitness and nutrition during growth. Karger.

Payne, G. V., & Isaacs, L. (2020). Human motor development: A lifespan approach (10th ed.). Routledge.

Petkova-Nesheva, I. (2026). Dance as a tool for physical activity with a psycho-emotional effect. In V International Scientific Conference "Advancing Science with Collaborative Innovation" (pp. 87–90). Seoul, South Korea. https://doi.org/10.5281/zenodo.18234565

Prieto, T. E., Myklebust, J. B., Hoffmann, R. G., Lovett, E. G., & Myklebust, B. M. (1996). Measures of postural steadiness. IEEE Transactions on Biomedical Engineering, 43(9), 956–966.

Ravens-Sieberer, U., Auquier, P., Erhart, M., Gosch, A., Rajmil, L., Bruil, J., Power, M., Duer, W., Cloetta, B., Czemy, L., Mazur, J., Czimbalmos, A., Tountas, Y., Hagquist, C., & Kilroe, J. (2007). The KIDSCREEN-27 quality of life measure. Quality of Life Research, 16(8), 1347–1356.

Ruhe, A., Fejer, R., & Walker, B. (2011). Center of pressure excursion as a measure of balance performance. Gait & Posture, 34(4), 433–445.

Shi, P., & Feng, X. (2022). Motor skills and cognitive benefits in youth. Frontiers in Psychology, 13.

Sterkowicz-Przybycień, K., Miarka, B., & Fukuda, D. (2017). Sex and weight category differences in time-motion analysis of elite judo athletes. Journal of Strength and Conditioning Research, 31(3), 817–825.

Tabachnick, B., & Fidell, L. (2019). Using multivariate statistics (7th ed.). Pearson.

Tangney, J., Baumeister, R., & Boone, A. (2004). High self-control predicts good adjustment. Journal of Personality, 72(2), 271–324.

Trendafilov, D., & Dimitrova, B. (2013). Aqua spinning as anti-stress health prevention. Sport Mont, XI(37–39), 467–473.

Vertonghen, J., & Theeboom, M. (2010). The social psychological outcomes of martial arts practice among youth. Journal of Sports Science and Medicine, 9, 528–537.

WHO. (2020). Guidelines on physical activity. World Health Organization.

Wiese-Bjornstal, D. (1993). Giving and evaluating demonstrations. Strategies, 6(7), 13–15.

Winter, D. A. (2009). Biomechanics and motor control of human movement (4th ed.). John Wiley & Sons.

Wrisberg, C. A., & Mead, B. J. (1983). Developing coincident timing skill in children: A comparison of training methods. Research Quarterly for Exercise & Sport, 54(1), 67–74. https://doi.org/10.1080/02701367.1983.10605274