



Features of the manifestation of psychophysiological functions in qualified athletes of different combat sports

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Abstract

Purpose. Purpose: to determine the specific features of the manifestation of psychophysiological functions in qualified athletes representing different combat sports.

Material and methods. The study involved 25 qualified combat athletes (Candidate Master of Sports of Ukraine, Master of Sports of Ukraine): freestyle wrestlers (n=11; 17.5±1.04 years) and taekwon-do athletes (n=14; 17.6±0.76 years). To assess psychophysiological functions, five mobile tests were used: «Visuomotor Choice Reaction» - choice reaction; «Reaction Go/No-go» - inhibitory reaction; «Test ST Memory» - short-term visual memory; «Spatial Perception» - spatial perception; and «Size Test» - reaction to changes in object size. The following integral indicators were analyzed for each test: reaction time (ms), standard deviation (SD, ms), percentage of errors (%), accuracy of task performance (%), and task duration (s). Statistical analysis was performed in RStudio (version 2026.01.0+392). Descriptive statistics were presented as mean (Mean), standard deviation (SD), median (Me), and the first and third quartiles (Q1, Q3). Between-group differences were assessed using the Mann-Whitney U test, with statistical significance set at p<0.05.

Results. The results of psychophysiological testing in qualified combat athletes were obtained. It was found that the distributions of the integral psychophysiological indicators in taekwon-do athletes and freestyle wrestlers were generally similar. In taekwon-do athletes, the median reaction time values in the Go/No-Go, Spatial Perception, and VCR tests were slightly lower, indicating a tendency toward faster sensorimotor responses. At the same time, freestyle wrestlers demonstrated slightly higher median values of overall short-term visual memory accuracy. In general, the results showed substantial overlap of the interquartile ranges in the two groups, confirming the similarity of the studied indicators. According to the comparison of the integral psychophysiological indicators between taekwon-do athletes and freestyle wrestlers using the Mann-Whitney U test, no statistically significant between-group differences were found (p>0.05). This indicates an overall similarity in the level of development of the studied psychophysiological functions in athletes of both groups.

Conclusions. The obtained results indicate the absence of statistically significant differences in the level of development of integral psychophysiological functions between qualified taekwon-do athletes and freestyle wrestlers (p>0.05), which points to their overall similarity. At the same time, a tendency toward higher sensorimotor response speed was observed in taekwon-do athletes, whereas freestyle wrestlers demonstrated slightly better short-term visual memory indicators. The substantial overlap of interquartile ranges confirms high individual variability of psychophysiological characteristics within each group. The identified features may be associated with

Анотація

Особливості прояву психофізіологічних функцій у кваліфікованих спортсменів різних видів єдиноборств

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Мета. Мета: визначити особливості прояву психофізіологічних функцій у кваліфікованих спортсменів різних видів єдиноборств.

Матеріал і методи. У дослідженні взяли участь 25 кваліфікованих єдиноборців (КМСУ, МСУ): представники вільної боротьби (n=11; 17.5±1.04 років) і таеквон-до (n=14; 17.6±0.76 років). Для оцінювання психофізіологічних функцій застосовували 5 мобільних тестів: «Visuomotor Choice Reaction» - реакція вибору; «Reaction Go/No-go» - реакція інгібіції; «Test ST Memory» - короточасна зорова пам'ять; «Spatial Perception» - просторове сприйняття; «Size test» - реакція на зміну розміру об'єкта. Проведено аналіз швидкості часу реакції (мс), значень стандартного відхилення (SD, мс), відсотків помилок (%), точності виконання (%) і тривалості виконання завдань (с) загалом за тест. Статистичний аналіз виконували в програмі RStudio (версія 2026.01.0+392). Описову статистику представлено як середнє (Mean), стандартне відхилення (SD), медіана (Me), перший та третій квартиль (Q1, Q3), а міжгрупові відмінності оцінювали за критерієм Манна-Уїтні (Mann-Whitney U test), різниця вважалася достовірною при (p<0.05).

Результати. Отримано результати психофізіологічного тестування кваліфікованих єдиноборців. Встановлено, що розподіли інтегральних психофізіологічних показників у таеквондистів і борців вільного стилю загалом є подібними. У представників таеквон-до медіанні значення часу реакції в тестах Go/No-Go, Spatial Perception та VCR були дещо нижчими, що вказує на тенденцію до швидшого сенсомоторного реагування. Водночас у борців спостерігалися дещо вищі медіанні значення загальної точності короточасної зорової пам'яті. Загалом результати свідчать про суттєве перекриття інтерквартильних розмахів у двох групах, що підтверджує близькість досліджуваних показників. За результатами порівняння інтегральних психофізіологічних показників таеквондистів і борців вільного стилю статистично значущих міжгрупових відмінностей за критерієм Манна-Уїтні не виявлено (p>0.05). Це свідчить про загальну подібність рівня розвитку досліджуваних психофізіологічних функцій у спортсменів обох груп.

Висновки. Отримані результати свідчать про відсутність статистично значущих відмінностей у рівні розвитку інтегральних психофізіологічних функцій між кваліфікованими спортсменами таеквон-до та вільна боротьба (p>0.05), що вказує на їх загальну подібність. Водночас встановлено тенденцію до більш високої швидкості сенсомоторного реагування у таеквондистів та дещо кращих показників короточасної зорової пам'яті у борців. Значне перекриття інтерквартильних розмахів підтверджує високу індивідуальну варіативність психофізіологічних характеристик у межах кожної групи. Виявлені особливості можуть бути





the specificity of competitive activity and the nature of the training process in different combat sports. The obtained data should be taken into account when individualizing training and improving the system of pedagogical control of athletes.

Keywords: combat sports, freestyle wrestling, taekwon-do, qualified athletes, psychophysiological indicators.

Introduction

The current stage of development of sports science is characterized by increasing attention to the comprehensive study of psychophysiological mechanisms that ensure the effectiveness of athletes' competitive performance (Свтифієв та ін., 2023; Chaabene et al., 2017; Demirkan et al., 2015). In combat sports, where the outcome of a bout is largely determined by the speed of decision-making, the accuracy of motor actions, and the ability to predict an opponent's behavior, the psychophysiological functions of the body acquire particular importance. These functions include sensorimotor reactions, attention, short-term memory, information-processing speed, as well as the features of neuropsychic regulation of activity (Мартинюк та ін., 2025; Chen et al., 2017; Xianyu & Korobeynikov, 2024).

Combat sports impose different demands on athletes' psychophysiological indicators due to the specificity of technical and tactical actions, bout structure, and competition regulations. For example, in striking sports greater importance is attached to choice reaction and sensorimotor response speed, whereas in wrestling greater significance is attributed to spatial perception, anticipation, and working memory indicators (Korobeynikov et al., 2020; Miarka et al., 2020; Podrigalo et al., 2025).

An analysis of scientific studies indicates the presence of a considerable number of works devoted to the study of individual psychophysiological characteristics of athletes; however, the issue of their comprehensive manifestation in representatives of different combat sports remains insufficiently disclosed. Most studies focus on individual indicators (reaction time, movement accuracy, cognitive functions) without considering their interrelations and the influence of sport-specific characteristics (Bajkowski et al., 2024; Hausegger et al., 2019; Korobeynikov et al., 2022b). This complicates the formation of a holistic understanding of the psychophysiological profile of a qualified combat athlete.

In addition, current trends in elite sport development associated with the intensification of competitive activity and increasing rivalry necessitate the search for new approaches to the individualization of the training process (Miarka, 2016; Pashkov et al., 2021; Tropin et al., 2021, 2023). In this context, studying the specific features of psychophysiological function manifestation in athletes of different combat sports makes it possible not only to identify their specific characteristics but also to substantiate effective methods of pedagogical control, performance prediction, and training optimization.

Thus, the relevance of this study is determined by the need for an in-depth analysis of the psychophysiological characteristics of qualified athletes in different combat sports, taking into account the specifics of their competitive activity, which will contribute to increasing the effectiveness of the training process and achieving high sports results.

обумовлені специфікою змагальної діяльності та характером тренувального процесу в різних видах єдиноборств. Отримані дані доцільно враховувати при індивідуалізації підготовки та вдосконаленні системи педагогічного контролю спортсменів.

Ключові слова: єдиноборства, вільна боротьба, таеквон-до, кваліфіковані спортсмени, психофізіологічні показники.

Relationship of the study with scientific programs, plans, and topics. The study was conducted in accordance with the research topic of the Kharkiv State Academy of Physical Culture, «Innovative technologies and modern approaches to improving the competitive training of combat athletes».

Purpose – to determine the specific features of the manifestation of psychophysiological functions in qualified athletes representing different combat sports.

Material and methods

The study involved 25 qualified combat athletes (Candidate Master of Sports of Ukraine, Master of Sports of Ukraine): freestyle wrestlers ($n=11$; 17.5 ± 1.04 years) and taekwon-do athletes ($n=14$; 17.6 ± 0.76 years). Testing was carried out in the second half of the day using three identical 9th-generation iPad mobile devices.

The study was conducted in accordance with the basic bioethical principles, in particular the Council of Europe Convention on Human Rights and Biomedicine dated 04.04.1997, the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects (1964-2008), and the Order of the Ministry of Health of Ukraine No. 690 dated 23.09.2009. For underage combat athletes, consent to participate in testing was provided by their parents, who were present during the study. All participants were informed about the purpose, testing procedure, and the possibility of leaving the study at any time for any reason. At the time of testing, all participants were in good health and feeling well.

To assess psychophysiological functions, five mobile tests were used: «Visuomotor Choice Reaction» - choice reaction; «Reaction Go/No-go» - inhibitory reaction; «Test ST Memory» - short-term visual memory; «Spatial Perception» - spatial perception; «Size Test» - reaction to changes in object size. The analysis covered reaction time speed (ms), standard deviation values (SD, ms), error percentages (%), accuracy (%), and task completion duration (s) for each test as a whole. All proposed tests had been validated in previous studies (Romanenko et al., 2022, 2024a, 2024b, 2025a, 2025b).

Statistical analysis was performed in RStudio (version 2026.01.0+392). Descriptive statistics were presented as mean (Mean), standard deviation (SD), median (Me), and the first and third quartiles (Q1, Q3). Between-group differences were assessed using the Mann-Whitney U test, with statistical significance set at $p<0.05$.

Research results and discussion

Based on the obtained results, it was established that the distributions of the integral psychophysiological indicators in taekwon-do athletes and freestyle wrestlers were generally similar (Table 1, 2).



Table 1 - Psychophysiological indicators of freestyle wrestlers (n=11)

Indicators	Mean	SD	Median	Q1	Q3
GNG: reaction time, ms	362.67	30.73	370.10	356.20	377.95
GNG: SD of reaction time, ms	41.32	10.41	39.70	36.35	46.35
GNG: errors, %	15.91	11.36	10.00	10.00	22.50
Size: reaction time, ms	933.74	124.66	888.50	867.35	1004.35
Size: SD of reaction time, ms	209.93	60.83	193.20	172.00	231.55
Size: errors, %	7.50	6.49	6.50	1.20	10.25
SP: overall reaction time, ms	754.70	114.08	732.90	677.55	816.25
SP: SD of reaction time, ms	156.10	65.61	143.00	106.75	178.50
SP: errors, %	4.15	2.97	3.80	2.50	6.20
STM: accuracy, %	90.43	5.21	92.00	88.65	92.70
STM: test duration, s	136.11	22.04	123.70	115.95	149.65
VCR: overall reaction time, ms	761.76	79.45	743.30	713.00	787.60
VCR: SD of reaction time, ms	163.94	41.90	168.60	138.05	192.95
VCR: errors, %	1.82	2.50	0.00	0.00	3.75

Note: GNG - inhibitory reaction; Size - reaction to changes in object size; SP - spatial perception; STM - short-term visual memory; VCR - choice reaction.

Table 2 - Psychophysiological indicators of taekwon-do athletes (n=14)

Indicators	Mean	SD	Median	Q1	Q3
GNG: reaction time, ms	341.49	29.85	338.35	328.42	359.05
GNG: SD of reaction time, ms	45.94	7.86	47.10	42.82	51.40
GNG: errors, %	15.71	15.92	12.50	5.00	22.50
Size: reaction time, ms	891.88	100.14	887.65	831.75	931.08
Size: SD of reaction time, ms	186.93	60.52	198.80	145.60	220.30
Size: errors, %	5.22	4.13	4.80	1.08	9.00
SP: overall reaction time, ms	711.09	58.12	706.25	668.52	741.40
SP: SD of reaction time, ms	126.47	34.47	123.85	102.58	145.67
SP: errors, %	7.14	3.52	7.50	5.00	9.70
STM: accuracy, %	89.53	4.49	90.70	86.85	92.52
STM: test duration, s	139.38	25.70	133.35	125.60	145.82
VCR: overall reaction time, ms	715.96	65.71	699.85	681.92	748.98
VCR: SD of reaction time, ms	189.94	33.49	184.35	173.72	204.70
VCR: errors, %	2.68	3.02	2.50	0.00	5.00

Note: GNG - inhibitory reaction; Size - reaction to changes in object size; SP - spatial perception; STM - short-term visual memory; VCR - choice reaction.

In taekwon-do athletes, the median reaction time values in the Go/No-Go, Spatial Perception, and VCR tests were slightly lower, indicating a tendency toward faster sensorimotor responding. At the same time, wrestlers showed slightly higher median values of overall short-term visual memory accuracy. In general, the results indicate substantial overlap of the interquartile ranges in the two groups, confirming the similarity of the studied indicators. In some tests, isolated extreme values were also identified; however, they do not alter the overall tendency (Figure 1).

According to the comparison of the integral psychophysiological indicators of taekwon-do athletes and freestyle wrestlers using the Mann-Whitney U test, no statistically significant between-group differences were found ($p > 0.05$) (Table 3). This indicates an overall similarity in the level of development of the studied psychophysiological functions in athletes of both groups.

The obtained results provide grounds to assume that in qualified athletes specializing in different combat sports,

integral psychophysiological characteristics have much in common. The absence of statistically significant differences is associated with similar mechanisms of formation and improvement of sensorimotor and cognitive functions in the process of long-term specialized training and regular competitive activity.

Discussion

The obtained results indicate a general similarity of integral psychophysiological characteristics in qualified athletes specializing in taekwon-do and freestyle wrestling. The absence of statistically significant between-group differences ($p > 0.05$) for all studied indicators confirms the assumption about the universality of the basic mechanisms of sensorimotor and cognitive activity that are formed under conditions of long-term sports training regardless of the specificity of the combat sport (Coswig et al., 2019; Quinzi et al., 2022; Yao, 2022).

At the same time, the identified tendencies toward better reaction speed indicators in taekwon-do athletes (in particular

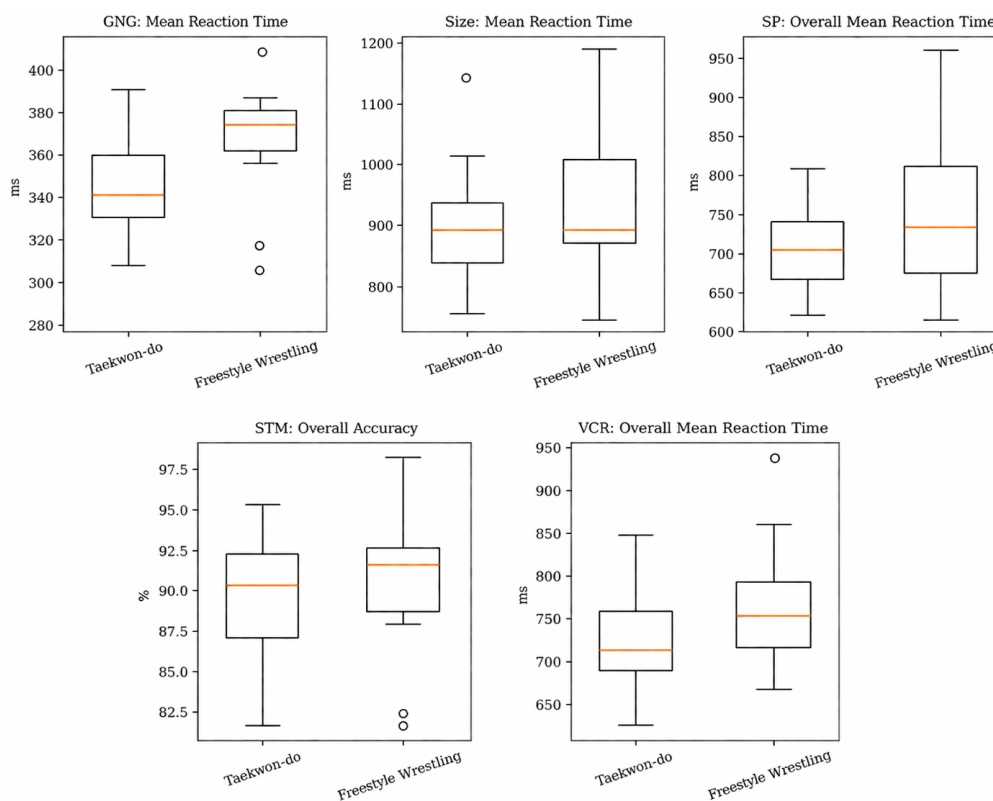


Figure 1. – Boxplots of integral psychophysiological indicators of taekwon-do athletes and freestyle wrestlers

Table 3 - Differences in psychophysiological indicators of the studied combat athletes

Indicators	U	p
GNG: reaction time, ms	45.0	0.085
GNG: SD of reaction time, ms	103.0	0.163
GNG: errors, %	69.0	0.678
Size: reaction time, ms	63.0	0.460
Size: SD of reaction time, ms	65.0	0.529
Size: errors, %	46.5	0.097
SP: overall reaction time, ms	64.0	0.494
SP: SD of reaction time, ms	55.0	0.239
SP: errors, %	95.0	0.334
STM: accuracy, %	69.0	0.680
STM: test duration, s	67.0	0.603
VCR: overall reaction time, ms	49.0	0.132
VCR: SD of reaction time, ms	99.0	0.239
VCR: errors, %	79.0	0.931

Note: GNG - inhibitory reaction; Size - reaction to changes in object size; SP - spatial perception; STM - short-term visual memory; VCR - choice reaction.

in the Go/No-Go, Spatial Perception, and choice reaction tests) are consistent with the specificity of their competitive activity, which is characterized by high dynamism, the need for immediate responses to an opponent's actions, and the predominance of striking techniques. This corresponds to data from a number of studies indicating that in speed-coordination sports a more pronounced ability for rapid processing of sensory information and decision-making is formed (De la Fuente et al., 2019; Lee et al., 2010; Podrigalo et al., 2023).

In contrast, the slightly higher short-term visual memory accuracy indicators in wrestlers may be related to the specificity of this sport, where a significant part of the bout takes place in

direct contact and success depends on the ability to analyze the opponent's body position, memorize technical and tactical actions, and predict further actions. This indirectly confirms the concept of the leading role of cognitive processes in complex-coordination and contact combat sports (Gierczuk et al., 2012; Korobeynikov et al., 2022a; Turlykhanov et al., 2022).

An important aspect is also the substantial overlap of the interquartile ranges of indicators in the two groups, which indicates a high level of individual variability within each group. This may point to a significant influence of individual bout style, qualification level, competitive experience, and training characteristics on the manifestation



of psychophysiological functions. Thus, even within one sport, different psychophysiological profiles of athletes may be formed. The absence of statistically significant differences may also be partly due to the limited sample size, which reduces the statistical power of the study and complicates the detection of subtle between-group differences. In this context, it is advisable to conduct further studies involving a larger number of participants and using multivariate analysis methods, in particular discriminant or cluster analysis.

Overall, the obtained results are consistent with current views that qualified athletes from different combat sports develop a high level of basic psychophysiological functions, which is a necessary prerequisite for effective competitive performance (Korobeynikov et al., 2023; Muiños & Ballesteros, 2014; Sarmet Moreira et al., 2018). At the same time, sport specificity manifests itself mainly at the level of tendencies rather than statistically significant differences, which emphasizes the expediency of individualizing the training process taking into account not only the sport but also the individual psychophysiological characteristics of the athlete.

Conclusions

The obtained results indicate the absence of statistically significant differences in the level of development of integral psychophysiological functions between qualified taekwondo athletes and freestyle wrestlers ($p > 0.05$), which points to their overall similarity. At the same time, a tendency toward higher sensorimotor response speed was observed in taekwondo athletes, whereas wrestlers demonstrated slightly better short-term visual memory indicators. The substantial overlap of interquartile ranges confirms high individual variability of psychophysiological characteristics within each group. The identified features may be associated with the specificity of competitive activity and the nature of the training process in different combat sports. The obtained data should be taken into account when individualizing training and improving the system of pedagogical control of athletes.

Prospects for further research. Prospects for further research in this area will be aimed at developing training tasks that take into account the psychophysiological characteristics of athletes engaged in freestyle wrestling and taekwondo.

Conflict of interest

N. Boychenko is the editor-in-chief, **Romanenko V., Tropin Y.** are members of the editorial board of the journal "Martial arts". To ensure a transparent and impartial review process, the editor-in-chief and the mentioned members of the editorial board were completely excluded from editorial processing, coordination of review, and making the final decision on this article. Other authors declare no conflict of interest.

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BIBLIOGRAPHY

- Євтифієв, А. С., Бочкарев, С. В., Євтифієва, І. І., Донець, Ю. Г., Недбайло, І. А., & Натарова, В. В. (2023). Кореляційний аналіз психофізіологічних показників борців вільного стилю як фактор успішності змагальної діяльності. Науковий часопис НПУ імені М. П. Драгоманова, 7(167), 84-88. [http://doi.org/10.31392/NPU-nc-series15.2023.7\(167\).16](http://doi.org/10.31392/NPU-nc-series15.2023.7(167).16)
- Мартинюк, Ю. Є., Мулик, К. В., Бойченко, Н. В., Джерелій, В. В., & Серєда, Н. В. (2025). Взаємозв'язок показників змагальної діяльності та психофізіологічних реакцій у кваліфікованих борців. Освіта. Інноватика. Практика, 6(13), 50-56. <https://doi.org/10.31110/2616-650X-vol13i6-007>
- Bajkowski, D. S., & Cynarski, W. J. (2024). Testing factors influencing handgrip strength and reaction time to visual stimulus in selected martial arts. *Journal of Kinesiology and Exercise Sciences*, 105(34), 46-59. <https://doi.org/10.5604/01.3001.0054.3260>
- Chaabene, H., Negra, Y., Bouguezzi, R., Mkaouer, B., Franchini, E., Julio, U., & Hachana, Y. (2017). Physical and Physiological Attributes of Wrestlers: An Update. *Journal of strength and conditioning research*, 31(5), 1411-1442. <https://doi.org/10.1519/JSC.0000000000001738>
- Chen, W.-Y., Wu, S. K., Song, T.-F., Chang, Y.-C., & Goodbourn, P. T. (2017). Perceptual and Motor Performance of Combat-Sport Athletes Differs According to Specific Demands of the Discipline. *Perceptual and Motor Skills*, 124(1), 293-313. <https://doi.org/10.1177/0031512516681342>

References

- Yevtyfiyev, O. S., Bochkar'ov, S. V., Yevtyfiyeva, I. I., Donets', YU. R., Nedbaylo, I. A., & Natarova, V. V. (2023). Korelyatsiynyy analiz psikhofiziologichnykh pokaznykh bortsiv vil'noho stilyu yak faktor uspihnosti zmahal'noyi diyal'nosti [Correlation analysis of psychophysiological indicators of freestyle wrestlers as a factor in the success of wrestling activities.]. *Naukovyy zhurnal NPU imeni M. P. Drahomanova* [Scientific Hours of NPU named after M. P. Drahomanov], no 7(167), 84-88. [http://doi.org/10.31392/NPU-nc-series15.2023.7\(167\).16](http://doi.org/10.31392/NPU-nc-series15.2023.7(167).16) [in Ukrainian].
- Martyniuk, YU. YE., Mulyk, K. V., Boychenko, N. V., Dzhereliy, V. V., & Sereda, N. V. (2025). Vzymozv'yazok pokaznykh zmahal'noyi diyal'nosti ta psikhofiziologichnykh reaktsiy u kvalifikovanykh bortsiv [The relationship between indicators of mental activity and psychophysiological reactions in qualified wrestlers]. *Osvita. Innovatyka. Praktyka* [Osvita. Innovation. Practice], no 6 (13), 50-56. <https://doi.org/10.31110/2616-650X-vol13i6-007> [in Ukrainian].
- Bajkowski, D. S., & Cynarski, W. J. (2024). Testing factors influencing handgrip strength and reaction time to visual stimulus in selected martial arts. *Journal of Kinesiology and Exercise Sciences*, 105(34), 46-59. <https://doi.org/10.5604/01.3001.0054.3260>
- Chaabene, H., Negra, Y., Bouguezzi, R., Mkaouer, B., Franchini, E., Julio, U., & Hachana, Y. (2017). Physical and Physiological Attributes of Wrestlers: An Update. *Journal of strength and conditioning research*, 31(5), 1411-1442. <https://doi.org/10.1519/JSC.0000000000001738>



- Coswig, V., Sant'Ana, J., Coelho, M. N., & Moro, A. R. P. (2019). Diefenthaler F. Development of a mobile phone app for measuring striking response time in combat sports: Cross-sectional validation study. *JMIR mHealth and uHealth*, 7(11), e14641. <https://doi.org/10.2196/14641>
- De la Fuente, A., Gómez-Landero, A. & Rodríguez, L. A. (2019). Motor differences in cadet taekwondo athletes according to competition level. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, 19(73), 63–75. <https://doi.org/10.15366/rimcafd2019.73.005>
- Demirkan, E., Koz, M., Kutlu, M., & Favre, M. (2015). Comparison of Physical and Physiological Profiles in Elite and Amateur Young Wrestlers. *Journal of strength and conditioning research*, 29(7), 1876–1883. <https://doi.org/10.1519/JSC.0000000000000833>
- Hausegger, T., Christian, V., & Ernst-Joachim, H. (2019). Peripheral Vision in Martial Arts Experts: The Cost-Dependent Anchoring of Gaze. *Journal of Sport and Exercise Psychology*, 3(41), 137–145. <https://doi.org/10.1123/jsep.2018-0091>
- Gierczuk, D., Bujak, Z., Rowiński, J., & Dmitriyev, A. (2012). Selected coordination motor abilities in elite wrestlers and taekwon-do competitors. *Polish Journal of Sport and Tourism*, 19, 230-234. <https://doi.org/10.2478/v10197-012-0022-1>
- Korobeynikov, G., Potop, V., & Korobeinikova, I. (2020). Relation between typological characteristics of nervous system and high sport achieving of wrestlers. *Journal of Physical Education and Sport*, 1621-1627. <https://doi.org/10.7752/jpes.2020.03221>
- Korobeynikov, G., Baić, M., Potop, V., Korobeinikova, L., Raab, M., Starčević, N., ... & Danko, T. (2022a). Comparative analysis of psychophysiological states among Croatian and Ukrainian wrestling. *Journal of Physical Education and Sport (JPES)*, 22(8), 1832-1838. <https://doi.org/10.7752/jpes.2022.08230>
- Korobeynikov, G., Korobeinikova, L., Raab, M., Korobeinikova, I., Danko, T., Kokhanevich, A., Cynarski, W. J., & Mytskan, T. (2022b). Psychophysiological state and decision making in wrestlers. *Ido Movement for Culture*, 22(5), 1-9. <https://doi.org/10.14589/ido.22.5.2>
- Korobeynikov, G., Korobeinikova, L., Raab, M., Baić, M., Borysova, O., Korobeinikova, I., Shengpeng, G., & Khmel-nitska, I. (2023). Cognitive functions and special working capacity in elite boxers. *Pedagogy of Physical Culture and Sports*, 27(1), 84-90. <https://doi.org/10.15561/26649837.2023.0110>
- Lee, J., Kim, S., & Song, Y. (2010). Visual search patterns and reaction movement in Taekwondo according to expertise. *Journal of Sport & Exercise Psychology*, 32, S. 99-S100.
- Miarka, B. (2016). Technical-tactical and physiological demands of wrestling combats. *Revista de Artes Marciales Asiáticas*, 21(1), 18–31. <https://doi.org/10.18002/rama.v11i1.3309>
- Miarka, B., Soto, D. A. S., Aedo-Muñoz, E., Fernandes, J. R., Brabec, L., & Brito, C. J. (2020). Effects of Competitive Wrestling Bouts on Physiological Measures: A Systematic Review and Meta-analysis. *Sports Orthopaedics and Traumatology*, 36(1), 34-51. <https://doi.org/10.1016/j.orthtr.2020.01.005>
- Muñoz, M., & Ballesteros, S. (2014). Peripheral vision and perceptual asymmetries in young and older martial arts athletes and nonathletes. *Atten Percept Psychophys*, 76, 2465–2476. <https://doi.org/10.3758/s13414-014-0719-y>
- Pashkov, I., Tropin, Y., Romanenko, V., Goloha, V., & Kovalenko, J. (2021). Analysis of competitive of highly qualified wrestlers. *Slobozhanskyi herald of science and sport*, 9(5), 30-39. <https://doi.org/10.15391/snsv.2021-5.003>
- Podrigalo, L., Romanenko, V., Podrihalo, O., Iermakov, S., Huba, A., Perevoznyk, V., & Podavalenko, O. (2023). Comparative analysis of psychophysiological features of taekwondo athletes of different age groups. *Pedagogy of Physical Culture and Sports*, 27(1), 38-44. <https://doi.org/10.15561/26649837.2023.0105>
- Podrigalo, L., Iermakov, S., Romanenko, V., Baibikov, M., Galimskyi, V., Shutieiev, V., & Merdov, S. (2025). Prediction of success in taekwondo based on psychophysiological testing results. *Pedagogy of Physical*
- Chen, W-Y., Wu, S. K., Song, T-F., Chang, Y-C., & Goodbourn, P. T. (2017). Perceptual and Motor Performance of Combat-Sport Athletes Differs According to Specific Demands of the Discipline. *Perceptual and Motor Skills*, 124(1), 293–313. <https://doi.org/10.1177/0031512516681342>
- Coswig, V., Sant'Ana, J., Coelho, M. N., & Moro, A. R. P. (2019). Diefenthaler F. Development of a mobile phone app for measuring striking response time in combat sports: Cross-sectional validation study. *JMIR mHealth and uHealth*, 7(11), e14641. <https://doi.org/10.2196/14641>
- De la Fuente, A., Gómez-Landero, A. & Rodríguez, L. A. (2019). Motor differences in cadet taekwondo athletes according to competition level. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, 19(73), 63–75. <https://doi.org/10.15366/rimcafd2019.73.005>
- Demirkan, E., Koz, M., Kutlu, M., & Favre, M. (2015). Comparison of Physical and Physiological Profiles in Elite and Amateur Young Wrestlers. *Journal of strength and conditioning research*, 29(7), 1876–1883. <https://doi.org/10.1519/JSC.0000000000000833>
- Hausegger, T., Christian, V., & Ernst-Joachim, H. (2019). Peripheral Vision in Martial Arts Experts: The Cost-Dependent Anchoring of Gaze. *Journal of Sport and Exercise Psychology*, 3(41), 137–145. <https://doi.org/10.1123/jsep.2018-0091>
- Gierczuk, D., Bujak, Z., Rowiński, J., & Dmitriyev, A. (2012). Selected coordination motor abilities in elite wrestlers and taekwon-do competitors. *Polish Journal of Sport and Tourism*, 19, 230-234. <https://doi.org/10.2478/v10197-012-0022-1>
- Korobeynikov, G., Potop, V., & Korobeinikova, I. (2020). Relation between typological characteristics of nervous system and high sport achieving of wrestlers. *Journal of Physical Education and Sport*, 1621-1627. <https://doi.org/10.7752/jpes.2020.03221>
- Korobeynikov, G., Baić, M., Potop, V., Korobeinikova, L., Raab, M., Starčević, N., ... & Danko, T. (2022a). Comparative analysis of psychophysiological states among Croatian and Ukrainian wrestling. *Journal of Physical Education and Sport (JPES)*, 22(8), 1832-1838. <https://doi.org/10.7752/jpes.2022.08230>
- Korobeynikov, G., Korobeinikova, L., Raab, M., Korobeinikova, I., Danko, T., Kokhanevich, A., Cynarski, W. J., & Mytskan, T. (2022b). Psychophysiological state and decision making in wrestlers. *Ido Movement for Culture*, 22(5), 1-9. <https://doi.org/10.14589/ido.22.5.2>
- Korobeynikov, G., Korobeinikova, L., Raab, M., Baić, M., Borysova, O., Korobeinikova, I., Shengpeng, G., & Khmel-nitska, I. (2023). Cognitive functions and special working capacity in elite boxers. *Pedagogy of Physical Culture and Sports*, 27(1), 84-90. <https://doi.org/10.15561/26649837.2023.0110>
- Lee, J., Kim, S., & Song, Y. (2010). Visual search patterns and reaction movement in Taekwondo according to expertise. *Journal of Sport & Exercise Psychology*, 32, S. 99-S100.
- Miarka, B. (2016). Technical-tactical and physiological demands of wrestling combats. *Revista de Artes Marciales Asiáticas*, 21(1), 18–31. <https://doi.org/10.18002/rama.v11i1.3309>
- Miarka, B., Soto, D. A. S., Aedo-Muñoz, E., Fernandes, J. R., Brabec, L., & Brito, C. J. (2020). Effects of Competitive Wrestling Bouts on Physiological Measures: A Systematic Review and Meta-analysis. *Sports Orthopaedics and Traumatology*, 36(1), 34-51. <https://doi.org/10.1016/j.orthtr.2020.01.005>
- Muñoz, M., & Ballesteros, S. (2014). Peripheral vision and perceptual asymmetries in young and older martial arts athletes and nonathletes. *Atten Percept Psychophys*, 76, 2465–2476. <https://doi.org/10.3758/s13414-014-0719-y>
- Pashkov, I., Tropin, Y., Romanenko, V., Goloha, V., & Kovalenko, J. (2021). Analysis of competitive of highly qualified wrestlers. *Slobozhanskyi herald of science and sport*, 9(5), 30-39. <https://doi.org/10.15391/snsv.2021-5.003>
- Podrigalo, L., Romanenko, V., Podrihalo, O., Iermakov, S., Huba, A., Perevoznyk, V., & Podavalenko, O. (2023). Comparative analysis of psychophysiological features of taekwondo athletes of different age groups. *Pedagogy of Physical Culture and Sports*, 27(1), 38-44. <https://doi.org/10.15561/26649837.2023.0105>
- Podrigalo, L., Iermakov, S., Romanenko, V., Baibikov, M., Galimskyi, V., Shutieiev, V., & Merdov, S. (2025). Prediction of success in taekwondo based on psychophysiological testing results. *Pedagogy of Physical*



- Culture and Sports*, 29(4), 350-356. <https://doi.org/10.15561/26649837.2025.0412>
- Quinzi, F., Modica, M., Berchicci, M., Bianco, V., Perri, R. L., & Di Russo, F. (2022). Does sport type matter? The effect of sport discipline on cognitive control strategies in preadolescents. *International Journal of Psychophysiology*, 177, 230–239. <https://doi.org/10.1016/j.ijpsycho.2022.05.016>
- Romanenko, V., Piatysotska, S., Tropin, Y., Rydzik, Ł., Holokha, V., & Boychenko, N. (2022). Study of the reaction of the choice of combat athletes using computer technology. *Slobozhanskyi Herald of Science and Sport*, 26(4), 97–103. <https://doi.org/10.15391/snsv.2022-4.001>
- Romanenko, V., Piatysotska, S., Lytvynenko, A., Baibikov, M., Boychenko, N., & Ponomarov, V. (2024a). Methodology for assessing the reaction of combat athletes to a moving object. *Slobozhanskyi Herald of Science and Sport*, 28(2), 69–77. <https://doi.org/10.15391/snsv.2024-2.003>
- Romanenko, V., Piatysotska, S., Podrigalo, L., Baibikov, M., Boychenko, N., & Volodchenko, O. (2024b). Methodology for evaluating the “Go/No-Go” reaction in martial arts. *Journal of Physical Education and Sport*, 24(12), 2139–2146. <https://doi.org/10.7752/jpes.2024.12312>
- Romanenko, V., Cynarski, W. J., Tropin, Y., Kovalenko, Y., Korobeynikov, G., Piatysotska, S., Mikhalskyi, V., Holokha, V., & Gazyiyev, S. (2025a). Methodology for Assessing Spatial Perception in Martial Arts. *Appl. Sci*, 15, 3413. <https://doi.org/10.3390/app15063413>
- Romanenko, V., Tropin, Y., Podrigalo, L., Boychenko, N., Abdula, A., Sereda, N., & Yatsiv, Y. (2025b). Specific features of cognitive skill development in athletes of situational sports. *Pedagogy of Physical Culture and Sports*, 29(3), 194–203. <https://doi.org/10.15561/26649837.2025.0305>
- Sarmet Moreira, P. V., Franchini, E., Fernandes Ervilha, U., Cardozo, A. C., & Gonçalves, M. (2018). Relationships of the expertise level of taekwondo athletes with electromyographic, kinematic and ground reaction force performance indicators during the dollyo chagui kick. *Archives of Budo*, 14, 59–69.
- Tropin, Y., Latyshev, M., Saienko, V., Holovach, I., Rybak, L., & Tolchieva, H. (2021). Improvement of the Technical and Tactical Preparation of Wrestlers with the Consideration of an Individual Combat Style. *Sport Mont*, 19(2), 23–28. <https://doi.org/10.26773/smj.210604>
- Tropin, Y., Romanenko, V., Korobeynikova, L., Boychenko, N., & Podrihalo, O. (2023). Special physical training of qualified wrestlers of individual styles of wrestling. *Slobozhanskyi Herald of Science and Sport*, 27(2), 56–63. <https://doi.org/10.15391/snsv.2023-2.001>
- Turlykhanov, D., Korobeynikov, G., Korobeinikova, L., Raab, M., & Korobeinikova, I. (2022). Psychophysiological state and decision making in elite wrestlers. *International Journal of Wrestling Science*, 12(1), 28–32.
- Xianyu, W., & Korobeynikov, G. (2024). Peculiarities of Functional Preparation in Wrestling Athletes of High Qualifications. *Physical Education, Sport and Health Culture in Modern Society*, 3(67), 58–66. <https://doi.org/10.29038/2220-7481-2024-03-58-66>
- Yao, Q. (2022). The reaction speed of different types of training on fencing athletes. *Revista Brasileira de Medicina do Esporte*, 28(2), 141–143. https://doi.org/10.1590/1517-8692202228022021_0453
- Culture and Sports*, 29(4), 350-356. <https://doi.org/10.15561/26649837.2025.0412>
- Quinzi, F., Modica, M., Berchicci, M., Bianco, V., Perri, R. L., & Di Russo, F. (2022). Does sport type matter? The effect of sport discipline on cognitive control strategies in preadolescents. *International Journal of Psychophysiology*, 177, 230–239. <https://doi.org/10.1016/j.ijpsycho.2022.05.016>
- Romanenko, V., Piatysotska, S., Tropin, Y., Rydzik, Ł., Holokha, V., & Boychenko, N. (2022). Study of the reaction of the choice of combat athletes using computer technology. *Slobozhanskyi Herald of Science and Sport*, 26(4), 97–103. <https://doi.org/10.15391/snsv.2022-4.001>
- Romanenko, V., Piatysotska, S., Lytvynenko, A., Baibikov, M., Boychenko, N., & Ponomarov, V. (2024a). Methodology for assessing the reaction of combat athletes to a moving object. *Slobozhanskyi Herald of Science and Sport*, 28(2), 69–77. <https://doi.org/10.15391/snsv.2024-2.003>
- Romanenko, V., Piatysotska, S., Podrigalo, L., Baibikov, M., Boychenko, N., & Volodchenko, O. (2024b). Methodology for evaluating the “Go/No-Go” reaction in martial arts. *Journal of Physical Education and Sport*, 24(12), 2139–2146. <https://doi.org/10.7752/jpes.2024.12312>
- Romanenko, V., Cynarski, W. J., Tropin, Y., Kovalenko, Y., Korobeynikov, G., Piatysotska, S., Mikhalskyi, V., Holokha, V., & Gazyiyev, S. (2025a). Methodology for Assessing Spatial Perception in Martial Arts. *Appl. Sci*, 15, 3413. <https://doi.org/10.3390/app15063413>
- Romanenko, V., Tropin, Y., Podrigalo, L., Boychenko, N., Abdula, A., Sereda, N., & Yatsiv, Y. (2025b). Specific features of cognitive skill development in athletes of situational sports. *Pedagogy of Physical Culture and Sports*, 29(3), 194–203. <https://doi.org/10.15561/26649837.2025.0305>
- Sarmet Moreira, P. V., Franchini, E., Fernandes Ervilha, U., Cardozo, A. C., & Gonçalves, M. (2018). Relationships of the expertise level of taekwondo athletes with electromyographic, kinematic and ground reaction force performance indicators during the dollyo chagui kick. *Archives of Budo*, 14, 59–69.
- Tropin, Y., Latyshev, M., Saienko, V., Holovach, I., Rybak, L., & Tolchieva, H. (2021). Improvement of the Technical and Tactical Preparation of Wrestlers with the Consideration of an Individual Combat Style. *Sport Mont*, 19(2), 23–28. <https://doi.org/10.26773/smj.210604>
- Tropin, Y., Romanenko, V., Korobeynikova, L., Boychenko, N., & Podrihalo, O. (2023). Special physical training of qualified wrestlers of individual styles of wrestling. *Slobozhanskyi Herald of Science and Sport*, 27(2), 56–63. <https://doi.org/10.15391/snsv.2023-2.001>
- Turlykhanov, D., Korobeynikov, G., Korobeinikova, L., Raab, M., & Korobeinikova, I. (2022). Psychophysiological state and decision making in elite wrestlers. *International Journal of Wrestling Science*, 12(1), 28–32.
- Xianyu, W., & Korobeynikov, G. (2024). Peculiarities of Functional Preparation in Wrestling Athletes of High Qualifications. *Physical Education, Sport and Health Culture in Modern Society*, 3(67), 58–66. <https://doi.org/10.29038/2220-7481-2024-03-58-66>
- Yao, Q. (2022). The reaction speed of different types of training on fencing athletes. *Revista Brasileira de Medicina do Esporte*, 28(2), 141–143. https://doi.org/10.1590/1517-8692202228022021_0453

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