Technical-tactical differences between adult and master classes in high-level female Brazilian jiu-jitsu matches

Diferencias técnico-tácticas entre las categorías adulta y máster en combates de alto nivel de jiu-jitsu brasileño femenino

Authors

Marco Antônio Ferreira dos Santos[1]
Clovis de Albuquerque Maurício[1]
Daniel Rodrigues Lopes[1]
Ciro José Brito[2]
Esteban Aedo-Muñoz[3]
Wesley Rodrigues Belo[1]
Rodrigo Cunha de Mello Pedreiro[1, 4]
Dany Alexis Sobarzo Soto[5]
Emanuela Pierantozzi[6]
Bianca Miarka[1]

[1] Federal University of Rio de Janeiro (Brazil)
[2] Federal University of Juiz de Fora (Brazil)
[3] Universidad de Santiago de Chile (Chile)
[4] Estácio de Sá University (Brazil)
[5] Universidad Santo Tomás, Puerto Montt (Chile)
[6] Università degli Studi di Genova (Italia)

Corresponding author:
Dany Alexis Sobarzo Soto
danysobarzo@santotomas.cl

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Abstract

Objective: This study aimed to verify age-related differences in technical-tactical behavior in high-level female Brazilian Jiu-Jitsu (BJJ) athletes, comparing adult and master classes.
Methods: 250 female adults matches (≥18 years) and 172 female master matches (≥30 years) from International Championships were analyzed. Time-motion phases and technical actions were coded using validated video analysis procedures. Descriptive statistics were presented as mean (±SD), and comparisons between groups were made using the Mann-Whitney U test ($p \leq .05$).
Results: Adult athlete's demonstrated longer total combat time (363.0-± 123.5 s) compared to masters (323.0 ± 83.0 s; $p \leq .001$). Adults also executed a higher frequency of techniques (17.0 ± 6.0) versus masters (13.0 ± 5.0; $p \leq .001$). Specific combat phases with higher frequency among adults included guard (4.0 ± 2.5 vs. 3.0 ± 1.8; $p = .005$), side control (3.0 ± 1.6 vs. 2.0 ± 1.4; $p = .048$), attack (4.0 ± 2.3 vs. 3.0 ± 2.1; $p = .028$), and low-intensity movement (4.0 ± 2.0 vs. 2.0 ± 1.6; $p \leq .001$). Despite shorter matches, masters showed balanced lateral application (right: 51.7%, left: 48.3%) compared to adults (right: 61.1%, left: 38.4%).
Conclusion: Adult female BJJ athletes showed greater technical volume and longer match durations versus masters. These findings demonstrated the influence of age on the intensity and structure of BJJ performance, with implications for tailored training approaches across age groups.

Keywords

Aging process; martial arts; motor control; sport psychology.

Resumen

Objetivo: Este estudio tuvo como objetivo verificar las diferencias relacionadas con la edad en el comportamiento técnico-táctico en atletas femeninas de alto nivel de Jiu-Jitsu Brasileño (BJJ), comparando las categorías adultas y máster.
Métodos: Se analizaron 250 combates femeninos adultos (≥18 años) y 172 combates femeninos máster (≥30 años) de campeonatos internacionales. Las fases de tiempo-movimiento y las acciones técnicas fueron codificadas utilizando procedimientos validados de análisis de video. Las estadísticas descriptivas se presentaron como media (±DE), y las comparaciones entre grupos se realizaron mediante la prueba U de Mann-Whitney ($p \leq .05$).
Resultados: Las atletas adultas demostraron un mayor tiempo total de combate (363.0 ± 123.5 s) en comparación con las másteres (323.0 ± 83.0 s; $p \leq .001$). Las adultas también ejecutaron una mayor frecuencia de técnicas (17.0 ± 6.0) frente al máster (13.0 ± 5.0; $p \leq .001$). Las fases específicas del combate con mayor frecuencia entre las adultas incluyeron la guardia (4.0 ± 2.5 vs. 3.0 ± 1.8; $p = .005$), control lateral (3.0 ± 1.6 vs. 2.0 ± 1.4; $p = .048$), ataque (4.0 ± 2.3 vs. 3.0 ± 2.1; $p = .028$), y movimiento de baja intensidad (4.0 ± 2.0 vs. 2.0 ± 1.6; $p \leq .001$). A pesar de tener combates más cortos, las atletas máster mostraron una aplicación lateral equilibrada (derecha: 51.7%, izquierda: 48.3%) en comparación con las adultas (derecha: 61.1%, izquierda: 38.4%).
Conclusión: Las atletas adultas de BJJ mostraron un mayor volumen técnico y una mayor duración de los combates en comparación con el máster. Estos hallazgos demuestran la influencia de la edad en la intensidad y estructura del rendimiento en BJJ, con implicaciones para enfoques de entrenamiento adaptados según el grupo etario.

Palabras clave

Artes marciales; control motor; psicología del deporte; proceso de envejecimiento.

Introduction

Brazilian Jiu-Jitsu (BJJ) is a grappling-based combat sport characterized by complex technical-tactical interactions and high physical and cognitive demands (Dos Santos et al., 2023; Riquelme-Hernández et al., 2022; Reale et al., 2018). Over the past decades, BJJ has experienced substantial international growth, with increasing participation among women across various age categories, including adult and master classes (Kajmovic et al., 2022; Merino-Fernández et al., 2022). Despite these advances, a specific gap remains in the literature concerning how aging influences technical-tactical performance in high-level female BJJ athletes. The existing knowledge does not yet clarify how age affects strategic behavior and execution during matches in female BJJ athletes.

Age, a multifactorial variable, has been consistently linked to changes in physiological (Janiszewska & Przybylowicz, 2020; Vieira Pereira et al., 2025), psychological (Fernandez et al., 2023), and cognitive domains (Coco et al., 2022; Stacey et al., 2021) within the context of combat sports performance. In BJJ, age-related changes could potentially impact fundamental attributes such as muscular strength (Belo et al., 2020), flexibility (Wąsacz & Pociecha, 2021), tactical actions, and reaction time (Coswig et al., 2018; Franchini & da Silva, 2019), as well as cognitive processing (Coco et al., 2022). Understanding how these age-related alterations intersect with the execution of technical maneuvers—such as approach, gripping, attack, defense, and pauses—can deepen our knowledge of age-related effects on the sport's intricacies (Coswig, Bartel, & Del Vecchio, 2018).

A preliminary investigation of grappling combat conducted by Miarka et al. (2014) analyzed time-motion patterns in female judo athletes and reported differences across age categories. Specifically, adult female judo athletes demonstrated longer total combat time, standing combat time, and gripping duration compared to their pre-cadet, cadet, and junior counterparts, highlighting the influence of age and experience on tactical and technical performance (Miarka et al., 2014). Complementary findings by Challis et al. (2015) identified a 3:1 work-to-rest ratio during lightweight women's judo matches, reflecting the balance between exertion and recovery during competition. These results offer critical insight into the physiological demands placed on female judo athletes (Magno et al., 2022; Moreira et al., 2012).

Further investigations distinguished performance differences between Olympic and non-Olympic judo matches, as well as between winning and losing outcomes (Sterkowicz-Przybycień et al., 2017). This study revealed disparities in decision-making, gripping frequency, and attack orientation among high-level female athletes, suggesting that factors such as age may influence strategic decisions and tactical execution (Coswig et al., 2018). Although Judo and BJJ demonstrate motor patterns and tactical foundations, their competitive structures differ significantly (Coswig et al., 2018; Dos Santos et al., 2019). BJJ emphasizes ground fighting, has longer match durations, and permits a wider range of submissions and positions. These regulatory and structural differences demand sport-specific analyses rather than direct extrapolations.

Technical excellence in BJJ requires the integration of diverse techniques (Coswig et al., 2018; Dos Santos et al., 2019), each demanding a unique combination of physical strength, motor control, and biomechanical precision (Øvretveit, 2018). Chronological aging may induce changes in muscle architecture (Coratella et al., 2018), injury susceptibility and joint mobility (Carvalho et al., 2022; Eustaquio et al., 2021; Lip et al., 2015; Santos et al., 2022), and neuromuscular coordination (Helm et al., 2018), potentially affecting the quality and efficiency of technical execution. Investigating these age-related effects is essential to understanding the dynamic interaction between aging and performance in BJJ.

The tactical dimension of BJJ involves strategic decision-making based on positional control, situational awareness, and submission opportunities (Coswig et al., 2018; Dos Santos et al., 2023; Spanias et al., 2022). With age and experience, athletes may develop enhanced strategic insight and adaptability (Dos Santos et al., 2019; Zadorozhna et al., 2021). It is therefore relevant to explore how aging may influence the development of tactical preferences and approaches.

Considering the unique physiological and psychological characteristics of female athletes (Del Vecchio et al., 2016; Dos Santos et al., 2023; Fernández et al., 2020), there is a pressing need to examine age-related differences within this population. While some age-related adaptations may resemble those found in males (Sterkowicz-Przybycień et al., 2017), gender-specific differences may emerge in technical execution and tactical decision-making (Barreto et al., 2022). These gaps highlight the need for

focused investigations that can inform coaching strategies, athlete development, and injury prevention tailored to age and gender in BJJ.

Therefore, the present study seeks to answer the following research question: Do adult and master female BJJ athletes differ in their technical-tactical behavior during high-level matches? To address this, we use time-motion analysis to identify performance-related patterns across age groups.

Method

Participants

The dataset included a randomized analysis of 250 adult female matches (age: ≥ 18 years) and 172 master female matches (age: ≥ 30 years) from the BJJ Pan American Championship held in Florida, USA. These matches were subjected to a time-motion analysis, segmenting each bout into distinct phases: approach, gripping, transition between standing and ground combat, guard, lateral control, mount, attack, defensive actions, and low-intensity overall movement, quantified in seconds and frequency. All phases of the tournament were included in the analysis, encompassing elimination rounds, semifinals, and finals. In addition, matches across all official weight categories were considered, ensuring a comprehensive and representative assessment of competitive performance among adult and master female athletes.

The sample size was verified through statistical analysis, ensuring a 99% confidence level with a 1% margin of error. All data used in this analysis were obtained from the publicly available IBJJF platform, reinforcing the transparency and reproducibility of the findings. Moreover, the study followed ethical standards and was exempt from review by the local Research Ethics Committee, in accordance with the principles of the World Medical Association's Declaration of Helsinki. This protocol affirms the ethical integrity of the research while aligning with established guidelines for research involving human subjects.

Procedures and Measurements

The study employed a structured protocol that grouped variables into macro-categories, allowing the classification of techniques utilized during combat. Each technique was assigned to its appropriate group, with an explanation of its specific nature, laterality, and whether it resulted in scoring or submission. To ensure the accuracy of the analysis, intra-observer agreement was evaluated. An expert with a decade of experience in BJJ and a degree in Physical Education (here referred to as Expert A) analyzed 20 BJJ matches using FRAMI software (BRA, Miarka et al., 2011). Ten of these matches were randomly selected for repeated analysis to assess intra-observer reliability. Cronbach's alpha coefficients indicated strong agreement for the time-motion indicators: approach (r = .92), gripping (r = .97), transition (r = .93), side control (r = .95), mount (r = .89), attack (r = .96), defense (r = .98), low-intensity movement (r = .89), and total time (r = .93).

The primary data collection instrument was based on the established phases of BJJ combat, including approach, gripping, attack, defense, and low-intensity movement (Coswig et al., 2018). To enhance the analytical framework, additional phases were incorporated: transition, side control, guard, and mount positions (dos Santos et al., 2023; Spanias et al., 2022).

Approach time refers to moments when athletes engaged in non-contact movements, observing opponents and identifying potential grip points, particularly on the kimono (Sterkowicz-Przybycień, Miarka, & Fukuda, 2017).

Gripping time encompassed the initiation and maintenance of contact through kimono grips (Spanias et al., 2022; Shishime & Fujita, 2021; Courel et al., 2014).

Transition time represented the phase involving takedowns or guard pulls, often used to minimize exposure to counterattacks and initiate ground engagement (Kirk et al., 2023).

Guard time described the position in which an athlete used their legs to control or restrain the opponent (Del Vecchio et al., 2016).

Side control was a common groundwork position that facilitated control and submission opportunities (Mok et al., 2020).

Mounting time denoted when an athlete achieved the mount position, adopting a kneeling posture over the opponent to maintain control (Fogarty et al., 2019; dos Santos et al., 2023).

Attack and defense time captured key offensive and defensive movements. Attacks included throws, sweeps, guard passes, and submission attempts (Coswig et al., 2018; Spanias et al., 2022), while defense involved blocking or countering such efforts (Branco et al., 2017).

Low-intensity movement time comprised non-dominant actions such as grip adjustments, defensive posture maintenance, and pauses during combat (Chaabène et al., 2014).

Statistical analysis

All statistical analyses were performed using SPSS 22.0 for Windows. Descriptive statistics are presented as median values with 25th and 75th percentiles. To compare adult and master female BJJ matches, the Mann-Whitney U test was used due to its suitability for comparing two independent, non-normally distributed samples. The effect size (r) was calculated by converting the p-value from the Mann-Whitney U test into a Z-score and dividing it by the square root of the total sample size ($ES = Z / \sqrt{N}$). Effect sizes were classified as small ($r \approx 0.10$), medium ($r \approx 0.30$), and large ($r \geq 0.50$).A significance level of $p \leq .05$ was adopted for all tests.

Results

A total of 7,184 attack techniques were categorized, with 4,626 (64.4%) from adult matches and 2,558 (35.6%) from master matches. A statistically significant difference in the frequency of attack techniques was found between age groups ($U = 11506.00$, $p = 0.028$, $ES = 0.107$). The adult group presented a higher median number of attack actions per match (18) compared to the master group (14.5).
Table 1 presents the combat time (in seconds) for each technical-tactical phase in both age groups. A significant difference was observed in total combat time between adults and masters ($U = 14414.000$; $p \leq 0.001$, $ES = 0.160$), with adult matches showing longer durations. No other phase showed significant time differences ($p \geq 0.05$).

Figure 1. Technical-tactical analysis of female BJJ high-level athletes, according to the combat time (seconds).

Phase	Adult_Med	Adult_Q1	Adult_Q3	Master_Med	Master_Q1	Master_Q3	P	ES
Approach	6.0	3.6	9.9	5.7	3.4	11.1	0.926	0.005
Gripping	4.6	2.6	21.0	4.9	2.4	13.5	0.747	0.016
Transition	2.3	1.5	3.5	2.3	1.6	4.1	0.619	0.024
Guard	93.0	33.7	196.1	73.6	35.2	139.1	0.063	0.091
Side control	42.0	25.8	82.1	49.2	27.4	88.1	0.685	0.02
Mount	39.9	16.4	94.7	34.5	15.2	79.6	0.543	0.03
Attack	37.2	16.3	72.3	31.1	12.5	66.8	0.304	0.05
Defense	29.1	13.7	29.1	32.6	12.9	70.6	0.815	0.011
Low-intensity movement	90.6	37.7	195.1	82.3	34.7	181.1	0.372	0.043
Total BJJ combat time	363.0	243.0	490.0	323.0	231.5	377.8	0.001	0.16

Note. Med – Median / Q1 – First quartile / Q3 – Third quartile / P = p-value (p>0.05)/ ES = effect Size.

Table 2 summarizes the frequency of technical-tactical actions across all combat phases. Significant group differences were identified in the guard phase ($p \leq 0.005$), side control ($p \leq 0.048$), attack ($p \leq 0.028$), defense ($p \leq 0.008$), low-intensity movement ($p \leq 0.001$), and total frequency ($p \leq 0.001$). The adult group showed consistently higher values across most of these categories.

Figure 2. Frequencies of techniques applied by international BJJ fighters in each combat phase, compared according to age class (adults and masters).

Phase	Adult_Med	Adult_Q1	Adult_Q3	Master_Med	Master_Q1	Master_Q3	U	P	ES
Approach	1	1	2	1	1	1	16927.0	0.099	0.08
Gripping	1	1	2	1	1	2	11704.0	0.122	0.075
Transition	1	1	1	1	1	1	5356.0	0.441	0.038
Guard	4	2	7	3	2	4	10636.0	0.005	0.137
Side control	3	1	4	2	1	3	1347.0	0.048	0.096
Mount	1	1	2	1	1	2	882.5	0.859	0.009
Attack	4	2	5	3	2	5	11506.0	0.028	0.107
Defense	3	2	4	3	1	4	13530.5	0.008	0.129
Low-intensity movement	4	2	6	2	1	5	12038.0	0.001	0.16
Total BJJ frequencies	17	10	22	13	9	18	16485.5	0.001	0.16

Note: Med – Median / Q1 – First quartile / Q3 – Third quartile / P = p-value (p>0.05) / U – statistical test coefficient/ES – effect size.

Regarding laterality, 61.1% of techniques in the adult group were executed on the right side and 38.4% on the left. The master group exhibited a more balanced distribution: 51.7% right and 48.3% left.

Discussion

The findings of this study revealed distinct patterns in female BJJ combat phases between the adult and master classes. Contrary to the initial interpretation, adult athletes demonstrated higher frequencies in the lateral control and attack phases. Master athletes exhibited reduced occurrence in these phases, while mount and gripping times also differed slightly. Approach and transition times remained comparable across the classes; however, gripping time in the master class was shorter than in the adult class, suggesting that female athletes in the master category may expedite their decision-making process for the subsequent phase (transition), utilizing less time than their adult counterparts. Guard and low-intensity movement phases were more pronounced in the adult class, whereas the defense phase was slightly higher in the master class.

Intensity

Although adult athletes executed a greater absolute number of techniques than master athletes, this was expected due to longer combat durations. The relative intensity, defined as the number of actions per unit of time, appears to remain balanced between groups. This finding implies that, despite longer matches in the adult class, master athletes perform with comparable technical efficiency within shorter match durations. This suggests preserved tactical diversity among older athletes.

Contrary to previous studies involving male BJJ athletes (Spanias et al., 2022; Andreato et al., 2013), projection techniques were rare in this sample, occurring only 47 times across all matches. This may reflect a strategic preference in female matches for guard pulls and transitions directly to groundwork, aiming to reduce energy expenditure and control the fight through submissions (Del Vecchio et al., 2016).

Transitions

Guard pulls were frequently used as a transition strategy to minimize standing engagement and initiate ground control rapidly. This aligns with the notion that female athletes may prefer initiating combat in more stable positions, avoiding the unpredictability of prolonged standing phases. This also suggests potential adaptations in training that prioritize ground transitions and guard-based offensive tactics.

Defensive actions were primarily triggered in response to projection, guard passing, and sweeping attempts, reinforcing the role of structured progression toward submissions via scoring techniques. This tactical layering might stem from training environments or match regulation structures, emphasizing positional dominance before submission attempts (Spanias et al., 2022; Lima et al., 2017).

Laterality

Analysis of laterality revealed that adult athletes showed a stronger preference for right-sided technique execution (61.1%), while masters displayed a more symmetrical distribution (51.7% right vs. 48.3%

left). This may reflect increased strategic variability or compensatory adaptations in older athletes. These findings raise questions about motor learning and teaching practices within BJJ academies, particularly whether unilateral dominance is being reinforced (Courel et al., 2014).

Practical Implications

From a coaching perspective, these findings support the development of age-specific training protocols. For master athletes, focusing on efficient gripping and faster transitions may compensate for reduced physical capacities, while reinforcing symmetrical technical execution could enhance adaptability and prevent overuse injuries. For adult athletes, training can emphasize sustained technical volume, transitions from guard to attack, and control positions like side control. In both cases, strategic use of low-intensity phases to conserve energy or protect a lead should be addressed in training and competition planning.

Limitations and Future Directions

One limitation of the present study lies in time-motion analysis. While it quantifies phase durations and action frequencies, it does not capture cognitive processes, decision-making under pressure, or opponent interaction quality. Additionally, segmenting fights into predefined phases introduces a degree of subjectivity, even when standardized criteria are applied. Future research could integrate physiological (e.g., heart rate, lactate), biomechanical (e.g., movement efficiency), or psychological (e.g., decision-making stress) variables to enhance ecological validity. Moreover, qualitative video analysis or AI-based tracking could provide deeper insights into contextual behaviors, such as feints, resets, or failed attacks. Finally, longitudinal tracking of athletes over multiple seasons could better clarify how age-related adaptations evolve in real-world training and competition scenarios.

This study offers valuable insights for coaches and practitioners by identifying age-related differences in technical-tactical behavior and time-motion demands in female BJJ athletes. Understanding that master athletes perform with shorter gripping times and fewer actions, yet maintain proportional technical intensity, can inform more effective, targeted, and safer training programs across age groups.

Conclusions

In conclusion, the findings of the present study offer a comprehensive insight into the temporal dynamics of international female BJJ athletes in the adult and master classes. Significant differences were identified in total combat time, with adult athletes engaging in longer matches compared to their master counterparts. Additionally, the study revealed variations in the frequency of techniques employed across combat phases and age groups. The adult class exhibited higher values in several phases, including guard, side control, attack, movement, and total technique frequency, whereas the master class displayed more balanced laterality in technique execution, suggesting strategic adaptability.

These results highlight the importance of age classification in shaping tactical behavior. Differences in technique frequency and combat duration provide valuable support for developing targeted training programs and strategic planning, ultimately improving athletes' physical preparation and competitive performance. These insights can contribute to more effective and age-appropriate tactical decision-making.

References

Andreato, L. V., Franchini, E., De Moraes, S. M. F., Pastório, J. J., da Silva, D. F., Esteves, J. V. D. C., Branco, B. H. M., Romero, P. V. da S., & Machado, F. A. (2013). Physiological and technical-tactical analysis in Brazilian Jiu-Jitsu competition. *Asian Journal of Sports Medicine*. https://doi.org/10.5812/asjsm.34496

Barreto, L. B. M., Aedo-Muñoz, E. A., Soto, D. A. S., Miarka, B., & Brito, C. J. (2021). Road to Tokyo Olympic Games: Do new judo rules change the technical-tactical behaviour of elite male athletes? *International Journal of Performance Analysis in Spor*t, 21(6), 1140–1148.

Belo, W. R., Øvretveit, K., De Salles, B. F., Dos Santos, L. G., Ribeiro, F. M., Dias, I. B., & Simão, R. (2020). The effects of straight and alternating sets on volume load, training efficiency, and metabolic response in grapplers. Journal of Sports Medicine and Physical Fitness, 60(5), 713–719. https://doi.org/10.23736/S0022-4707.20.10490-0

Branco, B. H. M., Andreato, L. V., Miarka, B., de Franzói Moraes, S. M., Esteves, J. V., & Massuça, L. M. (2017). Time-motion analysis and patterns of salivary cortisol during different judo championship phases. *Sport Sciences for Health,* 13(2), 419–426. https://doi.org/10.1007/s11332-017-0376-3

Carvalho, G. N. de, Rego, R. da S., Chagas, A., Schreiner, D. de O., Teixeira, F. G., Antonietto, N. R., Pérez, D. I. V., Brito, C. J., & Miarka, B. (2022). Women Brazilian Jiu-Jitsu practitioners showed a higher incidence of concussion: An epidemiological analysis. *Motricidade*, 18(2). https://doi.org/10.6063/motricidade.25225

Chaabène, H., Mkaouer, B., Franchini, E., Souissi, N., Selmi, M. A., Nagra, Y., & Chamari, K. (2014). Physiological responses and performance analysis difference between official and simulated karate combat conditions. *Asian Journal of Sports Medicine*, 5(1), 21–29.

Challis, D., Scruton, A., Cole, M., & Callan, M. (2015). A time-motion analysis of lightweight women's judo in the 2010 World Championships. *International Journal of Sports Science & Coaching*, 10(2–3), 479–486. https://doi.org/10.1260/1747-9541.10.2-3.479

Coco, M., Buscemi, A., Tušak, M., Perciavalle, V., Nifosì, A., Cavallari, P., Di Corrado, D., & Perciavalle, V. (2022). Attentive processes and blood lactate in the Sambo. *International Journal of Environmental Research and Public Health*, 19(3), 1113. https://doi.org/10.3390/ijerph19031113

Coratella, G., Beato, M., Milanese, C., Longo, S., Limonta, E., Rampichini, S., Ce, E., Bisconti, A. V., Schena, F., & Esposito, F. (2018). Specific adaptations in performance and muscle architecture after weighted jump-squat vs. body mass squat jump training in recreational soccer players. *Journal of Strength and Conditioning Research*, 32(4), 921–929. https://doi.org/10.1519/JSC.0000000000002463

Coswig, V. S., Gentil, P., Bueno, J. C. A., Follmer, B., Marques, V. A., & Del Vecchio, F. B. (2018). Physical fitness predicts technical-tactical and time-motion profile in simulated judo and Brazilian jiu-jitsu matches. PeerJ. https://doi.org/10.7717/peerj.4851

Courel, J., Franchini, E., Femia, P., Stankovic, N., & Escobar-Molina, R. (2014). Effects of kumi-kata grip laterality and throwing side on attack effectiveness and combat result in elite judo athletes. International Journal of Performance Analysis in Sport, 14(1), 138–147.

Del Vecchio, F. B., Gondim, D. F., & Arruda, A. C. (2016). Functional movement screening performance of Brazilian Jiu-Jitsu athletes from Brazil: Differences considering practice time and combat style. Journal of Strength and Conditioning Research, 30(8), 2341–2347. https://doi.org/10.1519/JSC.0000000000001324

Dos Santos, M. A. F., Soto, D. A. S., de Brito, M. A., Brito, C. J., Aedo-Muñoz, E., Slimani, M., Bragazzi, N. L., Znazen, H., & Miarka, B. (2023). Effects of weight divisions in time-motion of female high-level Brazilian jiu-jitsu combat behaviors. Frontiers in Psychology, 14, 1048642. https://doi.org/10.3389/fpsyg.2023.1048642

Fernández, M. M., Brito, C. J., Miarka, B., & Díaz-de-Durana, A. L. (2020). Anxiety and emotional intelligence: Comparisons between combat sports, gender, and levels using the trait meta-mood scale and the inventory of situations and anxiety response. Frontiers in Psychology, 11, 130. https://doi.org/10.3389/fpsyg.2020.00130

Fogarty, A. E., Guay, C. S., Simoneau, G., Colorado, B. S., Segal, G. R., Werner, J. K. J., & Ellenbogen, J. M. (2019). Head motion predicts transient loss of consciousness in human head trauma: A case-control study of mixed martial artists. American Journal of Physical Medicine & Rehabilitation, 98(10), 859–865. https://doi.org/10.1097/PHM.0000000000001205

Franchini, E., & da Silva, J. P. L. (2019). Performance, rating of perceived exertion, and physiological responses during a Brazilian jiu-jitsu match: Comparisons between winning and losing athletes. Sports Science and Health, 15(1), 229–235. https://doi.org/10.1007/s11356-018-1789-4

Helm, N., Prieske, O., Muehlbauer, T., Kruger, T., & Granacher, U. (2018). Effects of judo-specific resistance training on kinetic and electromyographic parameters of pulling exercises in judo athletes. Sport, 32(2), 134–142. https://doi.org/10.1055/s-0043-122781

Janiszewska, K., & Przybylowicz, K. E. (2020). Pre-competition weight loss models in taekwondo: Identification, characteristics and risk of dehydration. Nutrients, 12(9), 2793. https://doi.org/10.3390/nu12092793

Eustaquio, J. M., Borges, A. M.F., Vilela, L. S., Gouveia, M. P.C., Rabelo, A. L., Kaleka, C. C., Debieux, P., & Barbosa Neto, O. (2021). Does the fight profile interfere with orthopedic injuries in Brazilian Jiu-Jitsu? Open Access Journal of Sports Medicine, 12, 171–178. https://doi.org/10.2147/OAJSM.S337912

Kajmovic, H., Karpljuk, D., Kapo, S., & Simenko, J. (2022). Comparison of individual penalties according to gender and weight categories of elite judo athletes from four World Championships. Biology, 11(9), 1284. https://doi.org/10.3390/biol11091284

Kirk, C., Malone, J. J., & Angell, P. J. (2023). Intra-unit reliability and movement variability of submission grappling external load as measured by torso mounted accelerometry. Biology of Sport, 40(2), 457–464.

Lima, P. O., Lima, A. A., Coelho, A. C., Lima, Y. L., Almeida, G. P., Bezerra, M. A., & de Oliveira, R. R. (2017). Biomechanical differences in Brazilian Jiu-Jitsu athletes: The role of combat style. International Journal of Sports Physical Therapy, 12(1), 67–74.

Lip, R. W., Fong, S. S., Ng, S. S., Liu, K. P., & Guo, X. (2015). Effects of Ving Tsun Chinese martial art training on musculoskeletal health, balance performance, and self-efficacy in community-dwelling older adults. Journal of Physical Therapy Science, 27(3), 667–672. https://doi.org/10.1589/jpts.27.667

Magno, A. P., Andreato, L. V., Honorato, R. C., Del Vecchio, F. B., & Coswig, V. S. (2022). Brazilian jiu-jitsu specific training model highly emulates simulated match demands. Science & Sports, 37(8), 766–775. https://doi.org/10.1016/j.scispo.2021.10.004

Merino-Fernández, M., Giráldez-Costas, V., González-García, J., Gutiérrez-Hellín, J., González-Millán, C., Matos-Duarte, M., & Ruiz-Moreno, C. (2022). Effects of 3 mg/kg body mass of caffeine on the performance of jiu-jitsu elite athletes. Nutrients, 14(3), 675. https://doi.org/10.3390/nu14030675

Miarka, B., Hayashida, C. R., Julio, U. F., Calmet, M., & Franchini, E. (2011). Objectivity of FRAMI-software for judo match analysis. International Journal of Performance Analysis in Sport, 11(2), 254–266.

Miarka, B., Cury, R., Julianetti, R., Battazza, R., Julio, U. F., Calmet, M., & Franchini, E. (2014). A comparison of time-motion and technical-tactical variables between age groups of female judo matches. Journal of Sports Sciences, 32(16), 1529–1538. https://doi.org/10.1080/02640414.2014.903335

Mok, K. M., Lau, I. Y. H., Louie, L., & Shu Hang Yung, P. (2020). Biomechanical risks of knee injury in mixed martial arts: A video-based notation analysis. British Journal of Sports Medicine, 54(Suppl 1), A55-A55.

Moreira, A., Franchini, E., de Freitas, C. G., Schultz de Arruda, A. F., de Moura, N. R., Costa, E. C., & Aoki, M. S. (2012). Salivary cortisol and immunoglobulin A responses to simulated and official jiu-jitsu matches. Journal of Strength and Conditioning Research, 26(8), 2185–2191. https://doi.org/10.1519/JSC.0b013e31823b8702

Øvretveit, K. (2018). Acute physiological and perceptual responses to Brazilian Jiu-Jitsu sparring: The role of maximal oxygen uptake. International Journal of Performance Analysis in Sport, 18(3), 481–494.

Reale, R., Slater, G., & Burke, L. M. (2018). Weight management practices of Australian Olympic combat sport athletes. International Journal of Sport Physiology and Performance, 13(4), 459–466. https://doi.org/10.1123/ijspp.2016-0553

Riquelme-Hernández, C. R., Reyes-Barría, J. P., Herrera-Valenzuela, T., Zapata-Lamana, R., Reyes Molina, D. E., & Cigarroa, I. (2022). Perfil del luchador de Jiu-Jitsu Brasileño, variables, técnicas e instrumentos para medir el rendimiento deportivo: Una revisión de alcance [Profile of the Brazilian Jiu-Jitsu fighter, variables, techniques and instruments for measuring sports performance: A scoping review]. *Retos, 45*, 351–363. https://doi.org/10.47197/retos.v45i0.91024

Shishime, Y., & Fujita, E. (2021). Effects of short-term icing of forearm muscles between exercises on the grip endurance of judo athletes. Research Journal of Budo, 2103.

Spanias, C., Kirk, C., & Øvretveit, K. (2022). Position before submission? Techniques and tactics in competitive no-gi Brazilian Jiu-Jitsu. Revista de Artes Marciales Asiáticas, 17(2), 130–139. https://doi.org/10.18002/rama.v17i2.7410

Stacey, B. S., Campbell, Z., & Bailey, D. M. (2021). Elevated cerebral perfusion and preserved cognition in elite Brazilian jiu-jitsu athletes: Evidence for neuroprotection. Scandinavian Journal of Medicine & Science in Sports, 31(11), 2115–2122. https://doi.org/10.1111/sms.14031

Sterkowicz-Przybycień, K., Miarka, B., & Fukuda, D. H. (2017). Sex and weight category differences in time-motion analysis of elite judo athletes: Implications for assessment and training. Journal of Strength and Conditioning Research, 31(3), 817–825. https://doi.org/10.1519/JSC.0000000000001597

Vieira Pereira, D., Forte, P., Bernardes Leite, L., Ribeiro, J., Cachada, M., Bolani, W., … Veneroso, C. E. (2025). Estrés térmico y respuestas fisiológicas en atletas de jiu-jitsu brasileño sometidos a peleas simuladas en un ambiente caluroso. *Retos, 67*, 95–106. https://doi.org/10.47197/retos.v67.111013

Wąsacz, W., & Pociecha, M. (2021). Differentiation of the somatic structure and the level of motor potential of athletes in mixed martial arts (MMA) and Brazilian jiu-jitsu (BJJ) sections. Health Promotion and Physical Activity, 14(1), 38–46. https://doi.org/10.2478/hppfa-2021-0016

Zadorozhna, O. R., Briskin, Y. A., Pityn, M. P., Bohuslavska, V. Y., & Hlukhov, I. G. (2021). Participation tactics of elite freestyle wrestlers in competition system in 2013-2016 Olympic cycle. Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports, 25(5), 275–285.1000–1004. https://doi.org/10.1123/ijspp.2017-0526.

Authors' and translators' details:

Marco Antônio Ferreira dos Santos	marcoferreiraufrj@gmail.com	Author
Clovis de Albuquerque Maurício	clovisnutesportiva@gmail.com	Author
Daniel Rodrigues Lopes	daniellopesjudo@hotmail.com	Author
Ciro José Brito	cirojbrito@gmail.com	Author
Esteban Aedo-Muñoz	estebanaedo@gmail.com	Author
Wesley Rodrigues Belo	wbeloufrj@gmail.com	Author
Rodrigo Cunha de Mello Pedreiro	rodrigocmp1@gmail.com	Author
Dany Alexis Sobarzo Soto	danysobarzo@santotomas.cl	Author
Emanuela Pierantozzi	emanuela.pierantozzi@gmail.com	Author
Bianca Miarka	miarkasport@hotmail.com	Author