Twenty years of Ultimate Fighting Championship® competition evolution: increasing fight duration and shift from knockouts to decisions

Veinte años de evolución competitiva en el Ultimate Fighting Championship®: aumento de la duración de los combates y transición de nocauts a decisiones

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Abstract

Background: The Ultimate Fighting Championship (UFC) has evolved into a global sports leader, experiencing significant changes in its competitive and strategic landscapes over the past two decades.
Objectives: This study aimed to analyze and compare the temporal characteristics of UFC male bouts by examining fight duration, number of rounds, and outcome distribution across three distinct two-year periods: 2003-2004 (Period 1, n=77), 2013-2014 (Period 2, n=823), and 2023-2024 (Period 3, n=835). A sensitivity analysis was conducted on 3-round fights (n=1,660) to control for potential confounding effects of 5-round bouts.
Results: Significant differences were found in both total fight duration (F=6.477, p=0.002) and number of rounds (F=6.627, p=0.001). Fights in Period 1 were significantly shorter (495.8±362.0 s) and had fewer rounds (1.97±0.01) than those in Period 2 (636.5±358.2 s, 2.4±1.0 rounds) and Period 3 (650.1±361.9 s, 2.4±1.0 rounds). A significant association was found between period and fight outcomes (χ^2=12.845, p=0.046). Post-hoc analysis revealed that Period 1 had a higher proportion of knockouts/technical knockouts (KO/TKO – 45.5%) and differed significantly from Periods 2 (p=0.008) and 3 (p=0.014). The sensitivity analysis confirmed these findings, with an even stronger association for outcomes in 3-round fights (χ^2=75.67, p<0.001).
Conclusion: UFC fights have become longer and more frequently decided by judges' decisions over the past 20 years. The greatest change occurred between the early 2000s and the 2010s, with the last two decades reflecting a state of competitive balance.

Keywords

Martial arts; athletic performance; time factors; competitive behavior; sports.

Resumen

Contexto: El *Ultimate Fighting Championship* (UFC) se ha consolidado como un líder deportivo global, experimentando cambios significativos en sus escenarios competitivos y estratégicos durante las últimas dos décadas.
Objetivos: Este estudio tuvo como objetivo analizar y comparar las características temporales de los combates masculinos del UFC, examinando la duración de las peleas, el número de asaltos y la distribución de los resultados en tres períodos bien definidos de dos años: 2003-2004 (Período 1, n=77), 2013-2014 (Período 2, n=823) y 2023-2024 (Período 3, n=835). Se realizó un análisis de sensibilidad considerando únicamente peleas de 3 asaltos (n=1,660) para controlar posibles efectos de confusión derivados de los combates de 5 asaltos.
Resultados: Se encontraron diferencias significativas tanto en la duración total del combate (F=6.477, p=0.002) como en el número de asaltos (F=6.627, p=0.001). Las peleas del Período 1 fueron significativamente más cortas (495.8±362.0 s) y tuvieron menos asaltos (1.97±1.01) que las del Período 2 (636.5±358.2 s, 2.4±1.0 asaltos) y el Período 3 (650.1±361.9 s, 2.4±1.0 asaltos). Se observó una asociación significativa entre el período y los resultados de los combates (χ^2 = 12.845, p = 0.046). El análisis post hoc reveló que el Período 1 presentó una mayor proporción de nocaut/nocaut técnico (KO/TKO – 45.5%) y difirió significativamente de los Períodos 2 (p=0.008) y 3 (p=0.014). El análisis de sensibilidad confirmó estos hallazgos, mostrando una asociación aún más fuerte para los resultados en peleas de 3 asaltos (χ^2=75.67, p<0.001).
Conclusión: En los últimos 20 años, los combates del UFC se han vuelto más largos y con mayor frecuencia son decididos por los jueces. El cambio más pronunciado ocurrió entre principios de los años 2000 y la década de 2010, mientras que las dos últimas décadas reflejan un estado de equilibrio competitivo.

Palabras clave

Artes marciales; rendimiento atlético; factores de tiempo; comportamiento competitivo; deportes.

Introduction

The Ultimate Fighting Championship (UFC) has undergone a monumental transformation from a controversial, niche spectacle into a global sports behemoth (Robbins & Zemanek Jr, 2017). Since its acquisition by Zuffa in 2001, the organization has seen its revenue skyrocket from an estimated $45 million to a record-breaking $1.3 billion in 2023, with its enterprise value now exceeding $12 billion (Sherwood, Kerr, Thompson, & Nicholson, 2015). This explosive growth has not only cemented the UFC's status as the premier mixed martial arts (MMA) promotion, but has also created unprecedented financial opportunities for its athletes (Júnior, Sonoda-Nunes, & Capraro, 2025; Lenartowicz, Dobrzycki, & Cynarski, 2025). The UFC now represents a viable and potentially lucrative professional career for elite fighters, with performance bonuses and high-profile contracts turning top contenders and champions into international stars (Júnior et al., 2025). This commercial success has driven professionalization of the sport, attracting a deeper and more diverse talent pool and intensifying the competitive landscape (Lenartowicz et al., 2025).

Concurrent with its commercial expansion, evolution of the sport's regulatory framework has been crucial for its mainstream acceptance and the long-term health of its athletes (Hamdan, Rath, Sayoc, & Park, 2022; Zachovajevas, Engebretsen, Moatshe, Zachovajevas, & Røise, 2025). Moving away from its chaotic "no-holds-barred" origins, the sport adopted the Unified Rules of MMA, which established a standardized set of regulations aimed at ensuring fighter safety and fair competition (Zachovajevas et al., 2025). Key developments, such as implementing weight classes, prohibiting dangerous techniques (i.e. headbutts, groin strikes), and the mandatory use of protective equipment like open-fingered gloves, have fundamentally altered the nature of the sport (Hamdan et al., 2022). The increasing professionalization and regulatory structure of MMA have underscored the importance of sophisticated technical-tactical analysis for achieving competitive success (Antoniettô et al., 2023; Miarka, Coswig, & Amtmann, 2019). As the general skill level of athletes has risen, victory is no longer solely dependent on raw physical attributes, but increasingly on strategic preparation and in-fight adaptability (Al Hamdani, Abbas, & Ghadhban, 2025; Fernandes, de Brito, Brito, Aedo-Munoz, & Miarka, 2022; Miarka, Nascimento de Carvalho, Ignácio Valenzuela Pérez, Aedo-Muñoz, & José Brito, 2021). Technical-tactical analysis allows coaches and athletes to deconstruct the complex dynamics of a bout, identifying patterns in striking (Al Hamdani et al., 2025), grappling (dos Santos et al., 2025), and pacing to formulate effective game plans and contextualized training programs (Antoniettô et al., 2023; Dos Santos et al., 2019). By studying opponent tendencies and understanding the demands of different fight scenarios, athletes can enhance their "fight IQ", improve their decision-making under pressure, and optimize their performance (Fernandes et al., 2022; Miarka, Aedo-Munoz, Vanenzuela Perez, Guimaraes Teixeira, & Brito, 2020; Miarka et al., 2021). Therefore, analyzing the evolution of combat characteristics over time is essential for understanding the current strategic landscape of the sport and anticipating its future trajectory (Antoniettô et al., 2023; Bueno, Faro, Lenetsky, Gonçalves, Dias, Ribeiro, da Silva, Filho, de Vasconcelos, & Serrão, 2022; Dos Santos et al., 2019).

While foundational research has tracked the evolution of MMA, notable gaps persist in literature. Studies such as Poel, Reed, & Munce (2022) have demonstrated a broad, long-term shift towards safer outcomes, with a 51.3% increase in decisions post-Unified Rules. Likewise, James, Sweeting, Kelly, & Robertson (2019) highlighted the dynamic nature of combat, noting a diversification of styles post-2008. However, these analyses often treat the modern era as a single block or use continuous longitudinal models, which may obscure significant shifts occurring between more recent, discrete periods of competition. It remains unclear whether the evolutionary trends identified in the post-Unified Rules era have continued at the same pace or have reached a plateau in the highly professionalized landscape of the last decade. Understanding these temporal patterns is not only critical for documenting the sport's history, but also for comprehending the athletic and competitive evolution of MMA, including changes in training methodologies, fighter skill development, and strategic approaches which have shaped the modern game. In this context, our protocol addresses this gap by adopting a cross-sectional approach with three distinct time points separated by 10-year intervals. The main objective was to compare fight outcomes (duration, rounds, and outcome type) between 2003-2004, 2013-2014, and 2023-2024 periods. A sensitivity analysis was conducted to ensure the robustness of our findings by excluding 5-round bouts and analyzing only standard 3-round fights, thereby controlling for potential confounding effects introduced by championship and main event contests. It was hypothesized that while the 2003-2004

period would show a higher rate of finishes and shorter fight durations, the differences between the 2013-2014 and 2023-2024 periods would be minimal, reflecting a stabilization of competitive dynamics in the modern era.

Method

Experimental approach

This study employed a descriptive, observational research design to analyze temporal trends in the UFC. All data were collected from publicly available sources, specifically by viewing official fight recordings on the UFC Fight Pass digital streaming service (https://welcome.ufcfightpass.com). As the study did not involve direct human experimentation or the use of private or confidential participant information, it was exempt from review by an institutional ethics committee. The study was conducted in accordance with the principles of the Declaration of Helsinki for research involving publicly accessible data.

Combat selection and analysis

A total of 1,735 professional male UFC bouts were selected for the primary analysis (Full Dataset). The data were collected and verified by a panel of three independent combat sports experts, each holding a master-level rank in their respective discipline (Kung-Fu, Judo, and Brazilian Jiu-Jitsu) and possessing extensive experience in MMA analysis. The experts reviewed the video footage of each bout to ensure the accuracy of the following recorded variables: total fight time, the round in which the fight concluded, and the official method of victory. The primary inclusion criterion was any professional male bout contested under the UFC banner during the specified time periods, with bouts ending in a "No Contest," "Disqualification," or "Majority Draw" being excluded from the final analysis to ensure the dataset consisted only of fights with a definitive outcome and a clear winner. A secondary sensitivity analysis was conducted on a filtered dataset (3-round fights dataset) which included only the 1,660 fights concluding within the standard 3-round format to address the potential confounding effect of 5-round bouts.

In turn, the selected bouts in both datasets were stratified into three distinct, non-overlapping groups to assess temporal changes, each representing a two-year period separated by a decade: Period 1, comprising 77 fights from 10 events held between February 28, 2003, and October 22, 2004; Period 2, comprising 823 fights from 79 events held between January 19, 2013, and December 20, 2014; and Period 3, comprising 835 fights from 86 events held between January 14, 2023, and December 15, 2024. This structure enabled a cross-sectional comparison of fight characteristics across three distinct eras in the sport's history.

Table 1. Sample characteristics for each analyzed period.

Periods	2003-2004	2013-2014	2023-2024	Total
All bouts (n)	77	823	835	1,735
Only 3 rounds bouts (n)	75	792	793	1,660
Events (n)	10	79	86	175
Date Range	Feb 28, 2003 – Oct 22, 2004	Jan 19, 2013 – Dec 20, 2014	Jan 14, 2023 – Dec 15, 2024	-

Statistical analysis

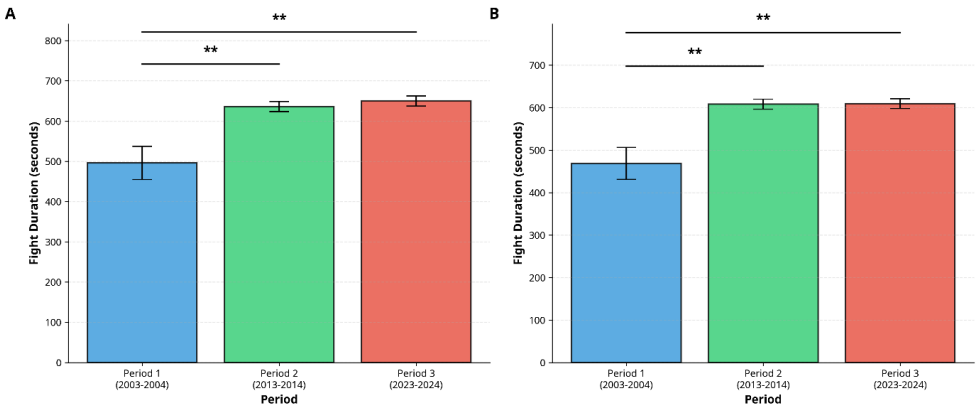
All statistical analyses were conducted independently on both the full dataset and the 3-round fights dataset using Python (version 3.11) with the pandas, scipy, and statsmodels libraries, and the significance level (alpha) was set at $p < 0.05$ for all tests. Descriptive statistics (mean and standard deviation) were calculated for continuous variables: fight duration (seconds) and number of rounds, across the three periods (2003–2004, 2013–2014, and 2023–2024). A one-way ANOVA was performed after assessing normality with the Shapiro–Wilk test and homogeneity of variances with Levene's test to compare the variables between periods. Despite minor deviations from normality, ANOVA was considered appropriate given its robustness in large samples. Tukey's HSD post-hoc test was applied when significant differences emerged, and effect sizes were computed using eta-squared (η^2). Fight outcomes were classified into four primary categories for categorical outcome variables: KO/TKO (including doctor

stoppages), Submission, Unanimous Decision, and Split Decision. A chi-squared (χ^2) test of independence was conducted to examine the association between period and fight outcome distribution. Given the significant result of the overall chi-squared test, post-hoc analyses were performed to identify the specific sources of the association. This involved conducting pairwise chi-squared tests between the periods with a Bonferroni correction applied to the alpha level ($\alpha = 0.05 / 3 = 0.0167$) to control type I errors. Additionally, standardized residuals were analyzed to determine which specific cells in the contingency table contributed most to the significant result. The effect size for the chi-squared tests was calculated using Cramér's V.

Results

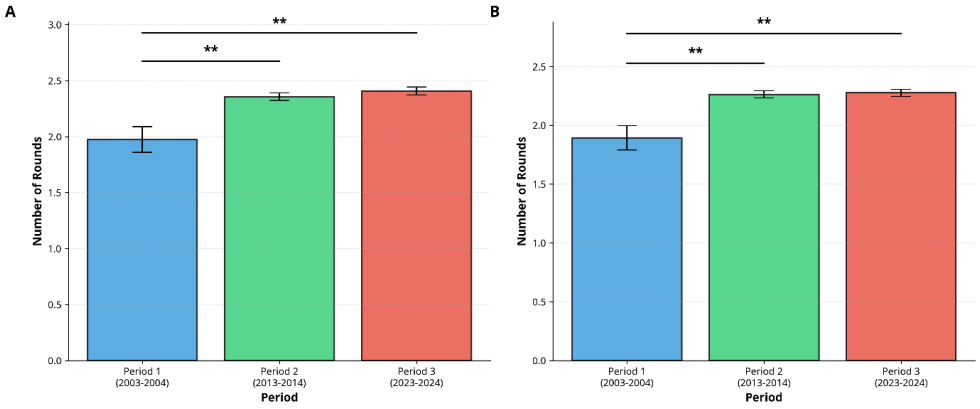
Analysis of the full dataset (n=1,735) revealed a statistically significant difference in mean fight duration across the three periods ($F_{2, 1731} = 6.477$, $p = 0.002$, $\eta^2 = 0.007$). As shown in Figure 1A, post-hoc analysis indicated that Period 1 (495.75 ± 361.98 s) was significantly shorter than both Period 2 (636.53 ± 358.22 s; $p = 0.003$) and Period 3 (650.14 ± 361.94 s; $p = 0.001$). Similar results were obtained on the 3-round fights dataset (n=1,660). The result remained robust, with a significant difference still observed ($F_{2, 1657} = 6.610$, $p = 0.001$, $\eta^2 = 0.008$). The pattern of Period 1 was significantly shorter than the subsequent period, and similar periods were maintained, as illustrated in Figure 1B.

Figure 1. Mean fight duration (in seconds) with standard error bars for each period. (A) shows the analysis for the full dataset (n=1,735). (B) shows the analysis for the 3-round fights dataset (n=1,660). Asterisks (**) denote a significant difference ($p < 0.01$) compared to Period 1.



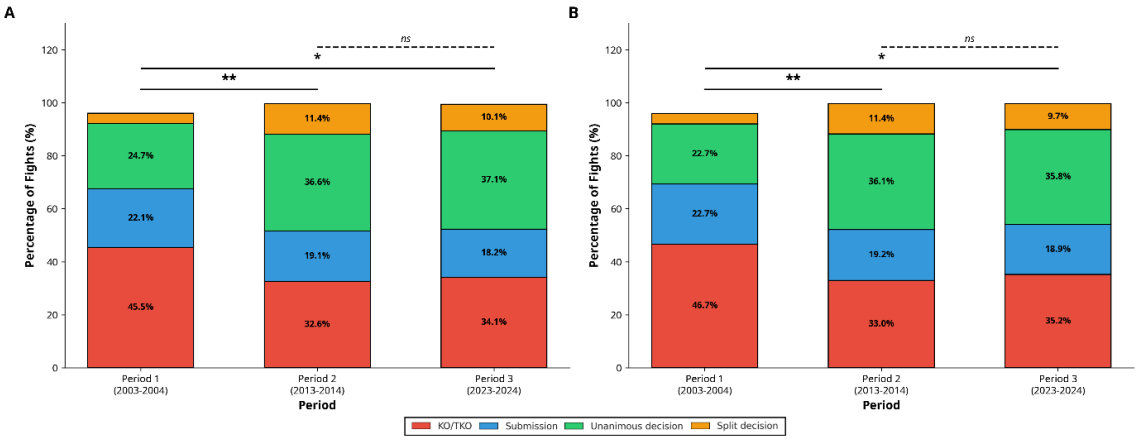
A significant difference was found in the analysis of the full dataset for the mean number of rounds ($F_{2, 1731} = 6.627$, $p = 0.001$, $\eta^2 = 0.008$). Fights in Period 1 (1.97 ± 1.01 rounds) were significantly shorter than in Period 2 (2.36 ± 0.99 rounds; $p = 0.004$) and Period 3 (2.41 ± 1.02 rounds; $p < 0.001$), as shown in Figure 2A. This finding was confirmed in the 3-round fights dataset, which also showed a significant difference ($F_{2, 1657} = 6.713$, $p = 0.001$, $\eta^2 = 0.008$). The temporal pattern of shorter fights in the earliest period persisted (Figure 2B), confirming the robustness of the result.

Figure 2. Mean number of rounds with standard error bars for each period. (A) shows the analysis for the full dataset (n=1,735). (B) shows the analysis for the 3-round fights dataset (n=1,660). Asterisks (**) denote a significant difference ($p < 0.01$) compared to Period 1.



A Chi-squared test in the full dataset revealed a significant association between period and fight outcome distribution ($\chi^2_6 = 12.845$, $p = 0.046$, Cramér's $V = 0.061$). Post-hoc tests confirmed that Period 1 was significantly different from Periods 2 and 3 ($p < 0.05$), which were not statistically different from each other. As shown in Figure 3A, Period 1 presented a higher proportion of KO/TKO outcomes (45.5%) and a lower proportion of Unanimous Decisions (24.7%) compared to Period 2 (32.6% and 36.6%, respectively) and Period 3 (34.1% and 37.1%, respectively). The association in the 3-round fights dataset was also significant and of a larger magnitude ($\chi^2_{10} = 75.670$, $p < 0.001$, Cramér's $V = 0.151$). The post-hoc analysis again showed that Period 1 was significantly different from Periods 2 and 3, which were not significantly different from each other. The proportional distributions for this dataset are shown in Figure 3B.

Figure 3. Percentage distribution of fight outcomes across three time periods. (A) shows the distribution for the full dataset (n=1,735). (B) shows the distribution for the 3-round fights dataset (n=1,660). Brackets indicate the results of post-hoc pairwise comparisons. (*p < 0.05; **p < 0.01; ns = not significant).



Discussion

The evolution of combat sports is often discussed (Bueno, Faro, Lenetsky, Gonçalves, Dias, Ribeiro, Da Silva, Filho, De Vasconcelos, Serrão, et al., 2022), but rarely quantified over extensive periods (James et al., 2019). The present study was therefore conducted to address this gap by systematically analyzing temporal trends in the UFC across three distinct eras: 2003-2004, 2013-2014, and 2023-2024. The objective was to ascertain whether key combat metrics, namely fight duration, round of termination, and outcome method, have significantly changed over the past two decades. A sensitivity analysis was conducted to ensure robustness of the findings by excluding 5-round bouts and only analyzing standard 3-round fights, thereby controlling potential confounding effects introduced by championship and main

event contests. The main findings indicate a definitive temporal shift in the nature of UFC contests. A qualitative assessment of the results shows that fights in the contemporary eras are of significantly longer duration and extend into later rounds more frequently than in the initial 2003-2004 period. Furthermore, a significant transformation in outcome patterns was identified, with a marked decline in the proportion of fights ending via KO/TKO and a concurrent rise in those culminating in judges' decision. The sensitivity analysis notably revealed that these trends were not merely artifacts of the inclusion of 5-round fights; in fact, the association between period and outcome distribution was even more pronounced when restricted to 3-round bouts, confirming that the observed evolution represents a fundamental change in combat dynamics. These results empirically document the sport's transition from an era of explosive, early finishes to one of more tactical and enduring engagements.

Despite the rules introducing 5-round fights having emerged in 2011 (Hamdan et al., 2022), two 5-round fights took place in period 1 (Matt Hughes vs. Sean Sherk – UFC 42, April 25, 2003 and Randy Couture vs. Tito Ortiz – UFC 44, September 26, 2003). However, even though there were more 5-round fights in periods 2 and 3, there was no significant increase in the total number of rounds fought (Figure 2), since the total number of combats that were scheduled to be fought in 5 rounds corresponded to 4.3% of the total. Together, our finding suggests that the evolution of this combat sport is not an artifact of fight format, but rather a fundamental change in how athletes compete, a transition from specialist-driven contests to battles between well-rounded, hybridized fighters (Kirk, Clark, Langan-Evans, & Morton, 2020). The modern MMA athlete is a generalist, proficient across striking, wrestling, and submission disciplines, being in stark contrast to the style-versus-style matchups of the sport's early days (Fernandes et al., 2022; Kirk et al., 2020). This shift is also evident in athlete development pathways. Whereas early UFC competitors often migrated to MMA after specializing in a single discipline like wrestling or kickboxing, it is now common for athletes to begin their training in dedicated MMA gyms from a young age, developing an integrated skill set from the outset (Ramirez, 2023; Shtefiuk et al., 2024). This integrated training approach fosters a more holistic understanding of combat, blending striking and grappling into a seamless, singular style rather than a collection of separate arts. This universalization of skills has elevated the defensive capabilities of fighters, making them harder to finish and extending the duration of contests (Fernandes et al., 2022; James et al., 2019; Miarka et al., 2020).

Our findings build upon and refine previous longitudinal research, while studies by Dos Santos et al. (2019) and James et al. (2019) identified a general trend towards longer fights and more decisions over broad timeframes. Our analysis of discrete, 10-year-interval blocks provides a more granular view and demonstrates that the most significant evolution occurred between the early 2000s and the 2010s, with a relative stabilization of these metrics between 2013-2014 and 2023-2024. This suggests that this combat reached a state of competitive equilibrium in the last decade, in which the strategic and physical profiles of athletes have become more standardized (Gonçalves et al., 2024). The increased fight duration and round count reflect a greater emphasis on tactical pacing and energy conservation, as athletes must now prepare for prolonged, high-intensity, intermittent efforts which challenge all three major energy systems; phosphagen, glycolytic, and oxidative (James, Haff, Kelly, & Beckman, 2016; Kozina et al., 2025).

From a practical standpoint, these results have significant implications for athlete preparation and coaching. The increased likelihood of fights going the distance underscores the critical importance of a highly developed aerobic energy system, which is crucial for recovery between high-intensity exchanges and for maintaining power output in later rounds (Kirk et al., 2020). This aligns with the findings of Kirk, Langan-Evans, Clark, & Morton (2021), who reported that MMA athletes endure considerable weekly training loads, with striking drills comprising the largest portion of training time (20-62%) and MMA sparring the least (2-8%). This distribution suggests that while technical skill development is prioritized, the ability to sustain performance over three full rounds is paramount (Andrade de Brito et al., 2025; Antoniettô et al., 2023).

Importantly, the stabilization of fight characteristics observed between Periods 2 and 3 reflects a maturation of the sport's coaching and strategic landscape (Yearby et al., 2024). As coaches have gained deeper understanding of the demands of MMA and absorbed the technical-tactical nuances of the Unified Rules, training methodologies have become more standardized and optimized (Huldi & Cisar, 2023; Yearby et al., 2024). This collective knowledge base has resulted in a more homogeneous competitive

environment, in which athletes are prepared to similar standards and employ comparable strategic approaches, thereby reducing the variability in fight outcomes observed in earlier eras (Huldi & Cisar, 2023; Yearby et al., 2024; Zhuravel, 2025). Therefore, training regimens should not only prioritize explosive power and anaerobic capacity, but also robust cardiovascular endurance. High-intensity interval training (HIIT) and sport-specific conditioning circuits that mimic the work-to-rest ratios of a modern MMA fight are essential (James et al., 2016; Shtefiuk et al., 2024; Yearby et al., 2024). Furthermore, tactical preparation must evolve beyond simply pursuing a finish. As demonstrated by Dal Bello, Brito, Amtmann, & Miarka (2019), there is a large specificity in the type of grappling attack according to the intended outcome, with decision-based victories often involving a higher frequency of takedown attempts. This implies that coaches and athletes must develop strategies for winning rounds on the judges' scorecards, focusing on metrics such as significant strike volume, takedown success, and positional control, which have become increasingly decisive.

This study is not without its limitations. The analysis was restricted to male athletes, as the dataset did not include female bouts, which were introduced to the UFC in 2013 (Hasegawa et al., 2024) and represent a distinct competitive evolution that warrants its own investigation. Furthermore, the data were not stratified by weight division, which could mask different temporal trends, as lighter divisions often exhibit a different pace and fight dynamic than heavier ones (Uthoff et al., 2023). However, the study's major strength is its chronic, 20-year observational period with distinct 10-year intervals, providing a unique and robust snapshot of the sport's long-term evolution. Future research should aim to replicate this analysis on female competition to determine if similar temporal patterns exist. Additionally, future studies could investigate the influence of weight categories on these trends and analyze more specific in-fight metrics, such as striking volume, takedown success rates, and positional control time, to provide deeper understanding of the specific technical and tactical changes driving this evolution.

Practical application

The findings of this study offer practical guidance for optimizing training in modern MMA, where fights have become longer and more frequently decided by judges. Athletes should prioritize aerobic conditioning through HIIT protocols that replicate round duration and incorporate sport-specific drills to sustain performance across multiple rounds. Given the predominance of decision outcomes, training must emphasize strategies to win rounds, such as increasing striking volume, improving grappling control, and enhancing positional dominance, while sparring should simulate scoring scenarios to develop tactical awareness. Integrated skill development remains essential, with athletes required to effectively transition between striking, clinch, and ground phases and maintain strong defensive proficiency to avoid fight-ending situations. Structured periodization is necessary to manage high training loads, balancing technical volume, conditioning, and tactical work while also using tools like sRPE and HRV for individualized monitoring. In an increasingly homogeneous competitive environment, marginal gains achieved through video analysis, biomechanical assessments, and data-driven game planning can provide meaningful advantages and help differentiate athletes at the highest level.

Conclusions

This study demonstrates a clear temporal shift in professional male UFC bouts over the past 20 years: fights have become longer, more frequently reaching later rounds, and increasingly decided by judges rather than by knockouts or submissions. These trends remained robust after sensitivity analyses, with standard 3-round bouts showing an even stronger movement toward decision outcomes, reinforcing the idea of a more universalized and tactically oriented skill set among athletes. Overall, the UFC has transitioned from an era of early explosive finishes to more strategic, endurance-based contests. These findings offer practical insights for coaches and athletes, highlighting the growing importance of cardiovascular conditioning, energy management, and round-winning tactics in modern MMA.

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