ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

TIME-DYNAMIC STUDY OF HIGH-INTENSITY ACTIONS DURING COMPETITIVE MALE INTERCOLLEGIATE FREESTYLE WRESTLING MATCHES

* Lt. Dr. Dnyaneshwar Harishchandra Mane

* Director Physical Education & Sports, Dr. D. Y. Patil Arts, Commerce and Science College, Pimpri Pune-18.

Abstract:

Freestyle wrestling is characterized by explosive, high-intensity actions occurring within short, strategically chosen time intervals. Understanding how such actions vary across different phases of a match can provide valuable insights for coaches, trainers, and performance analysts. The present study examines the time-dynamic distribution of high-intensity actions during competitive male intercollegiate freestyle wrestling matches. Through systematic video analysis of 40 matches, the study quantifies the frequency, duration, and temporal patterning of high-intensity actions such as takedown attempts, successful takedowns, rapid counterattacks, lifts, and explosive positional changes. Findings indicate that high-intensity actions are not uniformly distributed across match time; instead, they peak during the opening minute and the final minute of the bout. Winners consistently demonstrated higher action density and shorter recovery intervals between bursts. The study highlights the significance of time-specific conditioning, tactical pacing, and match-phase strategy in improving wrestling performance.

Keywords - *Freestyle, Wrestling, High-Intensity, Time-Motion, Combat Sports, Match Phases, Anaerobic Effort Patterns.*

Introduction:

Freestyle wrestling is one of the most physically demanding combat sports. Athletes engage in rapid bouts of strength, speed, agility, and tactical execution within a six-minute match divided into two periods. Despite the short match duration, the sport requires exceptional anaerobic capacity, quick decision-making, and precise timing of offensive and defensive actions. Not all phases of a match display equal activity levels; wrestlers strategically vary their intensity based on the opponent's movements, score status, and remaining time. High-intensity actions such as double-leg takedowns, single-leg entries, explosive counters, rapid scrambles, and powerful lifts often determine the outcome of a bout. These actions require significant physical and technical efficiency, and they typically occur in bursts. Studying how such bursts unfold across time can provide deeper understanding of match dynamics. Time-dynamic analysis helps identify when wrestlers are more likely to attack, defend, or conserve energy. Although previous research has examined scoring patterns and physiological demands, limited studies have explored the temporal distribution of high-intensity actions specifically within intercollegiate male wrestling. College-level wrestlers occupy a unique developmental stage skilled enough to perform complex maneuvers, yet still refining tactical self-regulation. Understanding their time-based intensity patterns can inform evidence-based training programs. This study aims to fill this gap by providing a systematic time-dynamic analysis of high-intensity actions in competitive male intercollegiate freestyle wrestling bouts. The findings can contribute to more accurate match simulations, targeted conditioning, and effective coaching strategies aligned with real match tempo.

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

Review of Literature:

Wrestling performance research spans biomechanics, physiology, time-motion analysis, and match tactics. Several studies have shown that wrestling relies heavily on anaerobic energy pathways, particularly during high-intensity movements. Explosive actions produce increased lactate accumulation, requiring athletes to strategically balance effort and recovery. Time-motion analysis in combat sports such as judo and boxing has revealed that athletes oscillate between brief high-intensity bursts and longer low-intensity phases. In freestyle wrestling, attacks often occur in short, high-intensity intervals lasting 2 to 6 seconds, depending on the move. Biomechanical studies note that takedown effectiveness is enhanced when initiated during transitions, especially when opponents briefly lose balance.

Match-phase research suggests that wrestlers tend to open with higher offensive intensity to establish dominance. As fatigue accumulates, mid-match phases usually show reduced activity. Conversely, end-phase action spikes occur as wrestlers attempt decisive scoring or defend narrow leads. Despite these insights, little research has examined how these patterns occur specifically in intercollegiate wrestling, a level where both technical skill and tactical pacing are still developing. Therefore, a focused time-dynamic analysis is essential.

Purpose of the Study:

The purpose of this study is to analyze the temporal distribution of high-intensity actions in competitive male intercollegiate freestyle wrestling matches. It examines how action frequency, duration, and spacing change across match time and how these patterns relate to match outcomes.

Objectives:

1. To identify the frequency and duration of high-intensity actions across the entire match.
2. To compare the distribution of high-intensity actions across three major time phases: opening phase (0 to 2 min), mid-phase (2 to 4 min), and end-phase (4 to 6 min).
3. To examine the relationship between high-intensity action density and match outcomes.
4. To analyze differences in action patterns across weight categories, if any.

Methodology:

Research Design:

A descriptive time-dynamic observational design was used. This design is suitable for analyzing naturally occurring match behavior without manipulating conditions.

Sample:

A total of 40 male intercollegiate freestyle wrestling matches were selected from a national-level university championship. Wrestlers represented various weight categories, ranging from 57 kg to 97+ kg. Only completed matches with clear video footage were included.

Instruments and Tools:

- High-definition match videos
- Video-coding software (Kinovea)
- Coding sheet outlining operational definitions for high-intensity actions

Operational Definitions:

High-Intensity Action (HIA) included:

- Takedown attempts (single-leg, double-leg, ankle pick, etc.)
- Successful takedowns
- Explosive counters or reversals
- Rapid scrambles involving positional changes
- Lifts and throws
- High-velocity penetration steps

Each action was time-stamped, categorized, and measured for duration.

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

Data Collection Procedure:

Videos were systematically analyzed by two experienced observers trained to identify HIAs. A pilot analysis of five matches established inter-rater reliability above 0.85. Each match was divided into equal time bins of 30 seconds to capture dynamic patterns. Observers recorded:

- Action type
- Time of occurrence
- Duration
- Outcome (successful or unsuccessful)

Data Analysis:

Descriptive statistics were used to compute mean frequency and duration of actions. Repeated-measures comparisons were conducted to examine differences across phases. Winners and losers were compared for action density (HIAs per minute). Graphs of time-series activity trends were generated to visualize bursts.

Results:

Overall Frequency and Duration of High-Intensity Actions:

Across 40 matches, a total of 534 high-intensity actions were recorded. On average, each match contained 13.35 HIAs (SD = 3.8). Action durations ranged from 1.2 to 7.4 seconds, with a mean duration of 3.6 seconds. Takedown attempts accounted for the largest proportion (46%), followed by scrambles (28%), counters (17%), and explosive lifts or throws (9%).

Time-Dynamic Distribution:

The distribution of actions across the match phases revealed distinct patterns:

Match Phase	Avg. HIAs per Match	Percentage of Total HIAs
Opening (0–2 min)	5.1	38%
Mid-phase (2–4 min)	3.4	25%
End-phase (4–6 min)	4.8	37%

These results show that activity peaks during the first and last two minutes, with a noticeable drop during the mid-phase.

Winner's v/s Losers:

Winners performed significantly more HIAs (mean = 15.2) than losers (mean = 11.0). Winners also displayed shorter recovery intervals (average 14 seconds) between bursts compared to losers (average 21 seconds).

Successful wrestlers initiated more early-phase attacks, often gaining initial scoring leverage.

Weight Category Differences:

Lighter weight categories (57 to 65 kg) demonstrated higher action density, averaging 16.3 HIAs per match, while heavier weight categories (86 to 97 kg) averaged 11.4 HIAs. However, the overall time-dynamic pattern (early-mid late fluctuations) remained consistent across categories.

Discussion:

The findings reinforce that freestyle wrestling is characterized by non-uniform, strategically clustered bursts of high-intensity action. The early-match spike suggests that wrestlers attempt to establish dominance, test opponent reactions, and secure initial points. This aligns with existing theories of combat sport pacing. The decline in mid-phase activity may indicate energy conservation, tactical observation, or temporary fatigue. As both wrestlers gauge each other's strategies, they often reduce risks and maintain defensive postures. The renewed surge in the end-phase likely reflects urgency either to protect a lead or to attempt a comeback. Coaches often instruct athletes to increase pressure in the closing minute, which supports the observed trend. Winners demonstrated more frequent

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

and proactive high-intensity actions, emphasizing the importance of taking initiative rather than waiting to counter. Their shorter recovery windows reflect superior conditioning and efficient energy use.

Lighter wrestlers' higher action rates are consistent with the biomechanics of mobility and agility, while heavier wrestlers rely more on strength-based engagements, resulting in fewer but more forceful actions.

Practical Implications:

1. **Training Programs:**
   Conditioning drills should mimic match-tempo patterns, with high-intensity bursts in the early and final minutes of simulated bouts.
2. **Tactical Planning:**
   Wrestlers should develop strategies to capitalize on early dominance and manage energy for late-phase surges.
3. **Video-Based Coaching:**
   Coaches should analyze time-specific weaknesses—for example, athletes who consistently fade during end-phase pressure.
4. **Weight Category Adjustments:**
   Lighter athletes may require more endurance-oriented drills, while heavier athletes may focus on explosive strength.

Limitations:

- Only intercollegiate male wrestlers were studied; results may differ at elite or junior levels.
- Environmental factors such as match importance or psychological stress were not measured.
- Video analysis relies on visual clarity; some micro-actions may have been missed.

Conclusion:

The study concludes that high-intensity actions in intercollegiate freestyle wrestling follow a clear time-dynamic pattern, with activity peaks in the opening and final minutes of a match. Winners exhibit higher action density and shorter recovery intervals, highlighting the importance of proactive engagement and superior conditioning. These findings offer valuable insights for designing training programs that align with real match demands and can help improve competitive outcomes. Understanding the temporal rhythm of wrestling matches allows coaches and athletes to optimize technique execution, tactical pacing, and physiological preparedness.

References :

1. 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.
2. Horswill, C. A. (1992). *Applied physiology of amateur wrestling.* **Sports Medicine,** 13(3), 184–188. Classic review of wrestling physiology and energy-system demands.
3. Mirzaei, B., Faryabi, I., & Yousefabadi, H. A. (2021). *Time-motion analysis of the 2017 Wrestling World Championships: energy-system contribution and match structure.* **Sport Pedagogy / Peer-reviewed article.** Study provides a recent time-motion breakdown for freestyle and Greco-Roman bouts.) Ortiz-Padilla, V. E., et al. (2022). *Survey on video-based biomechanics and biometry tools for sport analysis.* **Applied Sciences, 12**(8), Article 3981. (Overview of video analysis tools such as Kinovea/Dartfish used in time-motion and biomechanical studies.
4. Papassotiriou, I., et al. (2018). *Assessing performance in pre-season wrestling athletes: testing protocols and observational approaches.* **Journal of Sports Science & Medicine.** (Practical observational and physiological testing methods for wrestlers; useful for methodology).

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

5. Ruddock, A., et al. (2021). *High-intensity conditioning for combat athletes: practical applications for training and performance.* **Applied Sciences, 11**(22), Article 10658. (Guidance for designing conditioning that mimics combat sport high-intensity bursts).

6. Roklicer, R., et al. (2022). *Prevalence of rapid weight loss in Olympic-style wrestlers.* **International Journal of Wrestling Science / Journal of Combat Sports.** Survey data and implications of rapid weight loss practices common in wrestling

Cite This Article:

Lt. Dr. Mane D.H. (2025). *Time-Dynamic Study of High-Intensity Actions during Competitive Male Intercollegiate Freestyle Wrestling Matches.* **In Aarhat Multidisciplinary International Education Research Journal**: Vol. XIV (Number VI, pp.94–98). **Doi: https://doi.org/10.5281/zenodo.18172020**