COMPARISON OF PHYSIOLOGICAL RESPONSES TO DIFFERENT WEIGHT CATEGORIES IN KURASH COMPETITIONS

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Abstract. This study compared the physiological responses of Kurash athletes competing in different weight categories during official matches. Thirty elite male athletes from lightweight (≤66 kg), middleweight (67–81 kg), and heavyweight (≥82 kg) divisions were monitored for heart rate (HR), blood lactate concentration (BLa), and rating of perceived exertion (RPE). Results showed significantly higher BLa and RPE in lighter categories, while heavyweight athletes exhibited lower relative HR responses. These findings indicate that weight category influences metabolic and cardiovascular demands in Kurash, emphasizing the importance of category-specific conditioning strategies to optimize performance and recovery.

Keywords: Kurash, physiological responses, weight categories, heart rate, blood lactate, RPE, combat sports.

Introduction. Kurash is a traditional grappling martial art of Uzbekistan characterized by **dynamic throwing techniques, intense grip fighting, and explosive movements**. Competition bouts typically involve short-duration maximal efforts interspersed with brief recovery periods, resulting in significant physiological stress.

Physiological demands in combat sports.

Studies in judo, wrestling, and taekwondo have demonstrated that combat sports are metabolically taxing, requiring both anaerobic and aerobic energy systems. Key physiological markers include:

Heart rate (HR): Indicator of cardiovascular load

Blood lactate (BLa): Reflects anaerobic glycolytic contribution

Rating of perceived exertion (RPE): Subjective assessment of effort and fatigue (Franchini et al., 2011).

Weight categories and performance.

Kurash competitions divide athletes into weight categories to ensure fair contests. However, weight class influences:

Movement demands: Lighter athletes rely on speed, agility, and rapid attack sequences.

Strength and mass: Heavyweight athletes emphasize leverage, grip control, and absolute force.

Literature gap.

While judo and wrestling have established **category-specific physiological profiles** (Franchini et al., 2011; Callister et al., 1991), no studies have systematically examined such differences in Kurash competitions. Understanding these can guide **individualized conditioning, recovery, and weight management strategies.**

Aim of the study.

To compare **heart rate, blood lactate concentration, and rating of perceived exertion** across lightweight, middleweight, and heavyweight Kurash athletes during official matches. It was hypothesized that lighter athletes would exhibit higher relative physiological demands due to increased movement frequency.

2. Methods

2.1 Participants

Thirty elite male Kurash athletes competing in the **National Kurash Championships 2025** participated:

Lightweight (≤66 kg, n=10)

Middleweight (67–81 kg, n=10)

Heavyweight (≥82 kg, n=10).

Participant characteristics (Table 1).

Group	Age (years)	Height (cm)	Weight (kg)	Training experience (years)
Lightweight	21.3 ± 2.1	167.5 ± 4.3	63.2 ± 2.8	5.8 ± 1.2
Middleweight	22.0 ± 2.4	172.8 ± 5.0	75.4 ± 3.7	6.1 ± 1.4
Heavyweight	23.1 ± 2.8	177.2 ± 5.8	89.7 ± 6.3	6.5 ± 1.6

All were injury-free, with no cardiovascular or metabolic disorders, and provided informed consent. Ethical approval was obtained from Ferghana State University Research Ethics Committee (Approval No. FSU-REC-2025-09).

2.2 Measurements

During official competition matches:

Heart rate (HR):

Measured using Polar Team Pro system

Recorded continuously at 1-second intervals

Peak HR (HRpeak) and **%HRmax** were calculated (%HRmax = HRpeak / age-predicted HRmax × 100).

Blood lactate concentration (BLa):

Finger-prick samples via Lactate Scout+ analyzer

Collected within **2 minutes post-match** to capture peak lactate levels.

Rating of perceived exertion (RPE):

Borg CR-10 scale

Collected immediately post-match to assess subjective effort.

Only each athlete's **highest intensity match** was analyzed to standardize competitive load comparisons.

2.3 Statistical Analysis

Data were analyzed using SPSS v.26. Descriptive statistics (mean ± SD) were calculated. **One-way ANOVA** tested differences across weight categories, with **Tukey's post-hoc tests** for pairwise comparisons. Significance was set at $p < 0.05$. Effect sizes were calculated (η^2): small (0.01), medium (0.06), large (0.14).

3. Results

Table 2. Physiological Responses Across Weight Categories

Variable	Lightweight (Mean ± SD)	Middleweight (Mean ± SD)	Heavyweight (Mean ± SD)	p-value	Effect size (η^2)
HRpeak (bpm)	187.4 ± 5.6	181.3 ± 6.2	174.9 ± 7.1	<0.01	0.32 (large)
%HRmax	96.2 ± 2.8	92.7 ± 3.1	88.4 ± 3.7	<0.01	0.35 (large)
Blood Lactate (mmol/L)	12.3 ± 1.5	10.9 ± 1.3	9.4 ± 1.2	<0.01	0.38 (large)
RPE (CR-10)	8.2 ± 0.6	7.5 ± 0.7	6.9 ± 0.8	<0.01	0.29 (large)

Significant difference ($p < 0.05$)

Post-hoc analysis.

Lightweight significantly > heavyweight for all variables ($p < 0.01$).

Middleweight significantly > heavyweight for HRpeak and %HRmax ($p < 0.05$).

4. Discussion

This study revealed **significant physiological differences** across Kurash weight categories.

4.1 Cardiovascular responses.

Lightweight athletes showed **highest HRpeak and %HRmax**, suggesting greater cardiovascular strain relative to their maximal capacity. These findings align with judo literature indicating higher movement frequencies and attack rates in lighter categories (Franchini et al., 2011).

4.2 Metabolic demands.

Blood lactate concentrations were significantly elevated in lightweight athletes, indicating greater **anaerobic glycolytic contributions** due to explosive repeated efforts. Heavyweight athletes exhibited lower BLa, reflecting reliance on **strength-based techniques with less movement intensity.**

4.3 Perceived exertion.

RPE scores paralleled physiological data, with lighter athletes reporting higher subjective fatigue, supporting the need for enhanced **anaerobic conditioning and recovery protocols** in these divisions.

Comparison with other combat sports.

Similar trends are observed in wrestling and taekwondo, where lighter athletes perform **more dynamic movements**, while heavyweights rely on mass and grip control (Callister et al., 1991).

Practical applications.

Lightweight athletes: Focus on **anaerobic capacity, agility drills, and rapid recovery training**.

Middleweight athletes: Combine strength and anaerobic endurance conditioning.

Heavyweight athletes: Emphasize **maximal strength, isometric grip endurance, and injury prevention** due to higher joint loading.

Limitations.

Single tournament data; seasonal variation unaccounted.

Only male athletes analyzed; female physiological responses may differ.

No direct technical-tactical activity analysis alongside physiological data.

Future research.

Integrate **technical-tactical profiling** with physiological monitoring.

Conduct **longitudinal studies** across training cycles to assess adaptation.

Examine **psychological variables (confidence, anxiety)** interaction with physiological strain in different weight categories.

Conclusion

Weight category significantly influences physiological responses in Kurash competitions. Lighter athletes experience greater cardiovascular and metabolic strain, while heavyweights rely on strength with lower relative exertion. **Conditioning programs should be tailored** according to weight-specific demands to maximize performance and reduce injury risks in Kurash.

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Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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