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The Relationship Between Relative Impact Force and Jumping Performance in Taekwondo Athletes

STUDY PROTOCOL

Study Design

This study was designed as a cross-sectional observational study aimed at evaluating the relationship between countermovement jump (CMJ) height, relative impact power, and kick impact performance in elite Taekwondo athletes. Additionally, the study examined whether these performance parameters differ according to gender and weight categories. Ethical approval was obtained from the Bayburt University Ethics Committee (24.11.2025-326451).

Participants

A total of 32 elite Taekwondo athletes with international competition experience participated in the study. Participants were categorized based on gender (male and female) and weight classes (flyweight, welterweight, heavyweight).

Inclusion criteria included:

- International competition experience
- Regular training (minimum 6 sessions per week)
- No lower extremity injury in the last 6 months
- Written informed consent

Participants followed standardized pre-test instructions including controlled diet, avoidance of strenuous exercise, and abstinence from ergogenic aids 48 hours prior to testing.

Interventions

No clinical or therapeutic intervention was applied. Participants underwent a standardized performance assessment protocol including anthropometric measurements, countermovement jump testing, and sport-specific kicking tests (Roundhouse Kick and Side Kick). All assessments were conducted under controlled laboratory conditions.

Control Group

No control group was included in this study, as all participants were evaluated within a single-group observational design.

Outcome Measures

Primary Outcome

- Countermovement Jump (CMJ) height (cm), assessed using the OptoJump photoelectric system as an indicator of lower-limb explosive power.

Secondary Outcomes

- Kick impact power (watts) for Roundhouse Kick and Side Kick using the PowerKube device
- Relative impact power calculated using entropy-based weighting and normalized to body mass

Statistical Analysis
Descriptive statistics were presented as mean ± standard deviation within a 95% confidence interval. Normality was assessed using Shapiro-Wilk test and skewness/kurtosis values.

Pearson or Spearman correlation analyses were conducted depending on data distribution. Group comparisons were performed using One-Way ANOVA for normally distributed variables and Mann-Whitney U or Kruskal-Wallis tests for non-parametric data. Bonferroni post-hoc tests were applied where necessary. Statistical significance was set at $p < 0.05$.

Randomization & Blinding
No randomization or blinding procedures were applied, as the study followed a single-group observational design.

Safety & Monitoring
The study involved non-invasive performance testing procedures with minimal risk. Participants were monitored throughout testing sessions, and sufficient rest intervals were provided to prevent fatigue-related injuries.

Ethics & Data Management
The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to participation.

All collected data were anonymized and used solely for scientific research purposes. Data were securely stored and were not shared publicly in identifiable form.