INSPIREE: INDONESIAN SPORT INNOVATION REVIEW

ISSN 2746-6965 (Online), 2774-2520 (Print)
Journal Homepage: https://inspiree.review/index.php/inspiree

Original Research Articles OPEN ACCESS

Standardization of Lower Limb explosive Power and VO_2max inVolleyball Athletes Aged 17–21 Years

https://doi.org/10.53905/inspiree.v7i03.181

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ABSTRACT

The purpose of the study. This study aimed to analyze and standardize lower-limb explosive power and maximal oxygen uptake (VO_2max) in male volleyball athletes aged 17–21 years in East Java, Indonesia, in order to establish normative reference values for athlete selection, performance evaluation, and training program development.

Materials and methods. This study employed a descriptive quantitative research design involving 50 male volleyball athletes recruited from regional training centers and sports senior high schools in East Java. Lower-limb explosive power was assessed using the Standing Board Jump Test, while VO_2max was estimated using the Multistage Fitness Test (beep test). Data were analyzed using descriptive statistics (mean, standard deviation, minimum, and maximum), normality testing (Kolmogorov–Smirnov), and norm-referenced classification based on mean ± SD intervals using IBM SPSS Statistics.

Results. The results showed that lower-limb explosive power ranged from 2.19 to 2.82 m (mean ± SD: 2.54 ± 0.13 m), while VO_2max ranged from 29.9 to 53.3 ml·kg^{-1}·min^{-1} (mean ± SD: 38.28 ± 3.67 ml·kg^{-1}·min^{-1}). A five-tier norm classification system (Very Good, Good, Moderate, Poor, Very Poor) was successfully developed. The Moderate category was identified as the minimum performance standard, with values of 2.48–2.60 m for explosive power and 36.45–40.11 ml·kg^{-1}·min^{-1} for VO_2max.

Conclusions. This study provides standardized normative values for lower-limb explosive power and VO_2max in adolescent male volleyball athletes, offering an evidence-based framework for athlete selection, physical readiness assessment, and performance monitoring. These findings can support the development of more effective and objective training and talent identification systems in volleyball.

Keywords: explosive power; VO_2max; volleyball athletes; normative standards; physical fitness; performance evaluation.

ARTICLE INFO

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ARTICLE HISTORY
Received : January 13, 2026
Accepted : March 20, 2026.
Published: September 27, 2026.

CITATION

[abcde]Authors'Contribution: a-Study design; b-Data collection; c-Statistical analysis; d-Manuscript preparation; e-Funds collection.
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