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ARTICLE ORIGINAL

Comparison of body composition and physical fitness in elite and non-elite Brazilian jiu-jitsu athletes



Comparaison de la composition corporelle et de la condition physique des athlètes d'élite et non élite de jiu-jitsu brésiliens

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Received 2 September 2014; accepted 10 December 2015

Available online 27 January 2016

KEYWORDS

Combat sports;
Sports performance;
Physical assessment

Summary

Objective. – This study was designed to investigate whether there are differences in body composition, flexibility, muscle strength and endurance between elite and non-elite Brazilian jiu-jitsu athletes.

Methods. – Eighteen male brown and black belts Brazilian jiu-jitsu athletes were divided into two groups: elite group (EG) ($n=8$, 25 ± 2 years old, 76 ± 10 kg) and non-elite group (NEG) ($n=10$, 24 ± 4 years old, 72 ± 5 kg). The sample performed assessments to estimate the body composition via skinfold thickness; maximal strength via 1-RM tests in the bench press and squat exercises; abdominal and upper limb strength endurance using 1-min sit-up and 1-min push-up tests, respectively; and flexibility by sit-and-reach test. Independent Student *t* test was used to compare groups and Cohen's effect size (*d*) was also calculated.

Results. – Groups differed in the percentage of body fat (EG: $11.2 \pm 3.0\%$, NEG: $14.8 \pm 3.0\%$, $P=0.049$, $d=1.20$), bench press 1-RM (EG: 111 ± 6 kg, NEG: 98 ± 6 kg, $P<0.001$, $d=2.17$), 1-min sit-up test (EG: 46 ± 4 reps., NEG: 40 ± 3 reps., $P=0.007$, $d=1.70$), 1-min push-up test (EG: 41 ± 3 reps., NEG: 36 ± 3 reps., $P=0.018$, $d=1.67$) and sit-and-reach test (EG: 40 ± 3 cm,

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MOTS CLÉS

Sports de combat ;
Performance
sportive ;
Évaluation physique

NEG: 32 ± 3 cm, $P < 0.001$, $d = 2.67$). The groups did not differ for the absolute maximal strength in the squat (EG: 91 ± 8 kg, NEG: 88 ± 7 kg, $P = 0.410$, $d = 0.40$) and relative maximal strength in the bench press (EG: 1.46 ± 0.13 kg/kg, NEG: 1.36 ± 0.11 kg/kg, $P = 0.096$, $d = 0.40$) and squat (EG: 1.20 ± 0.13 kg/kg, NEG: 1.23 ± 0.13 kg/kg, $P = 0.700$, $d = 0.23$).

Conclusions. – The Brazilian jiu-jitsu elite athletes showed lower body fat percentage, higher abdominal and upper limb strength endurance, higher flexibility and absolute maximal strength in the bench press compared to non-elite athletes.

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Résumé

Objectif. – Cette étude a été conçue pour déterminer s'il existe des différences au niveau de la composition corporelle, la souplesse, la force et l'endurance musculaire entre des athlètes de jiu-jitsu brésiliens de niveau élite et non élite.

Méthodes. – Dix-huit athlètes males de jiu-jitsu brésiliens, de ceintures marron et noires ont été divisés en deux groupes : un groupe des élites (GE) ($n = 8$, 25 ± 2 ans, 76 ± 10 kg) et un groupe des non élites (GNE) ($n = 10$, 24 ± 4 ans, 72 ± 5 kg). Les athlètes ont effectué des évaluations pour estimer la composition corporelle par la mesure des plis cutanés ; la force maximale par le test de la répétition (rep.) maximale (1-RM) dans les exercices de développé couché et de squat ; l'endurance de force des muscles des abdominaux et des membres supérieurs par les tests de redressement assis et de pompes durant 1 min, respectivement ; et la souplesse par le redressement assis. Le test *t* de Student pour échantillons indépendants a été utilisé pour comparer les groupes et la valeur de la taille de l'effet de Cohen (*d*) a été aussi calculée.

Résultats. – Les groupes différaient en pourcentage de graisses (GE : $11,2 \pm 3,0$ %, GNE : $14,8 \pm 3,0$ %, $p = 0,049$, $d = 1,20$), le 1-RM dans le développé couché (GE : 111 ± 6 kg, GNE : 98 ± 6 kg, $p < 0,001$, $d = 2,17$), le test de redressement assis d'une minute (GE : 46 ± 4 rep., GNE : 40 ± 3 rep., $p = 0,007$, $d = 1,70$), le test de pompes d'une minute (GE : 41 ± 3 rep., GNE : 36 ± 3 rep., $p = 0,018$, $d = 1,67$) et le test de flexion avant du tronc (GE : 40 ± 3 cm, GNE : 32 ± 3 cm, $p < 0,001$, $d = 2,67$). Les groupes ne différaient pas au niveau de la force maximale absolue dans le test de squat (GE : 91 ± 8 kg, GNE : 88 ± 7 kg, $p = 0,410$, $d = 0,40$) et de la force maximale relative dans le développé couché (GE : $1,46 \pm 0,13$ kg/kg, GNE : $1,36 \pm 0,11$ kg/kg, $p = 0,096$, $d = 0,40$) et le squat (GE : $1,20 \pm 0,13$ kg/kg, GNE : $1,23 \pm 0,13$ kg/kg, $p = 0,700$, $d = 0,23$).

Conclusion. – Les athlètes élites de jiu-jitsu brésiliens ont montré un plus faible pourcentage de graisse corporelle, une plus grande endurance de force des muscles des abdominaux et des membres supérieurs, une plus grande souplesse et de force maximale absolue dans le développé couché en comparaison aux athlètes non élites.

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1. Introduction

Brazilian jiu-jitsu's main goal is the submission of the opponent through the application of a stranglehold or joint locks [1]. In this sport, athletes are categorized according to their grade (belt), which is usually associated with the training time and technical expertise, as well as according to their body mass [2].

The match duration in the official championships for adults graded as brown and black belt is 8 and 10 min, respectively. Scoring occurs through specific techniques (takedown, guard pass, mount, back mount, back control, knee on belly and sweep). The combat can end by submission, unconsciousness or by points when the established time ends [3].

Similarly to other combat sports, Brazilian jiu-jitsu is classified as acyclic, with intermittent short duration and high-intensity actions followed by moments of recovery [4]. Andreato et al. [4] verified in twenty-two Brazilian jiu-jitsu

fighters an average of 117s effort (blocks of 3s at high-intensity interspersed with 25s at low-intensity) and pauses of 33s. Due to the technical actions performed [4,5] and metabolic responses observed in combats [6–11], the aerobic pathway seems to be predominant in Brazilian jiu-jitsu matches, although the determinants techniques seem to be maintained by the anaerobic pathways.

The physical fitness of grapplers (e.g.: judo, wrestling and Brazilian jiu-jitsu athletes) are similar in different aspects and competitive levels. High-level wrestlers and judo athletes demonstrate superior levels of strength, aerobic fitness, power and endurance, with low body fat percentage and predominant mesomorphic component [12–14] compared to lower-level athletes. Vidal-Andreato et al. [15] reported an average aerobic power of 49 ± 4 ml/kg/min in eleven Brazilian jiu-jitsu athletes. Higher values were found in elite wrestlers ($n = 12$; 58 ± 10 ml/kg/min) [12], and in elite judo athletes ($n = 15$; 58 ± 11 ml/kg/min) [16], suggesting that these athletes have greater aerobic power, but

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