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ORIGINAL ARTICLE

Is the handgrip strength performance better in judokas than in non-judokas?

La performance de la force de préhension est-elle meilleure chez les judokas que chez les non-judokas?

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Hand strength;
Maximal isometric force;
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Summary
Objectives. — The aim of this study was to compare the handgrip strength performance between judokas and non-judokas.
Equipment and methods. — Twenty-two highly trained Brazilian judokas, all black belts, participating in the Brazil Trophy of Judo, and 18 non-judokas, both men, participated in the study. The handgrip strength was measured in both hands (dominant and non-dominant) during 10 s using a handgrip dynamometer and force-time parameters were obtained. The effects of judo practice and hand dominance on the force curve parameters were calculated.
Results. — No effects of judo practice and hand dominance on the peak grip force ($P > 0.05$), time to peak ($P > 0.05$) and impulse ($P > 0.05$) were found. The effect of judo practice on the fatigue rate ($F = 4.253$; $P = 0.046$; $\eta^2 = 0.101$) was found, but no effect of the dominance was detected.
Conclusion. — The results indicate that the judokas were not stronger than the non-judokas in absolute terms (peak grip force), but the judokas were more resistant to fatigue. This difference of fatigue resistance between judokas and non-judokas can be related to the characteristics of the judo practice, especially regarding the prolonged maintenance of the handgrip.

MOTS CLÉS
Force de préhension ;
Force isométrique

Résumé
Objectifs. — Comparer la performance de la force de préhension entre les judokas et les non-judokas.
Matériel et méthodes. — Vingt-deux judokas et 18 non-judokas ont participé à l'étude. La force de préhension était mesurée sur les côtés dominant et non-dominant pendant 10 s à l'aide d'un

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dynamomètre. Les effets de la pratique du judo et de la prédominance de la main sur les paramètres de la courbe force ont été calculés.
Résultats. — Aucun effet de la pratique du judo et de la prédominance de la main sur le pic de la courbe ($p > 0,05$), ni sur le temps de montée ($p > 0,05$) ni de l'impulsion ($p > 0,05$) n'a été trouvé. Un effet de la pratique du judo sur la résistance à la fatigue musculaire a été retrouvé ($F = 4,253$, $p = 0,046$; $\eta^2 = 0,101$), mais sans effet du côté dominant.
Conclusion. — Les résultats indiquent que les judokas ne sont pas plus forts que les non-judokas en termes absolus, mais les judokas étaient plus résistants à la fatigue. Cette différence de résistance à la fatigue entre les judokas et les non-judokas peut être liée aux caractéristiques de la pratique du judo, en particulier en ce qui concerne le maintien prolongé de la préhension.

1. Introduction

Usually the evaluation of the handgrip strength (HGS) is utilized in the clinic and occupational practice, performing an important role in the determination of the clinical effects of surgeries, in the control of the rehabilitation process [1—3], providing practical information regarding the muscles, nerves, articular [4] and cardiac diseases [5], being also utilized in the study of the ergonomics of hand held tools [6], in admission tests of various types of work [7,8] and in the sports field [9—16]. Occupational and sports activities require a sufficient level of grip strength to maximize control and performance, and to minimize the risk of injuries. Some of the factors that are considered during these activities include the absolute level of strength necessary to perform the tasks, as well as the resistance to fatigue of the muscles responsible for these movements [17].

Judo is a combat sport where the balance control is the fundamental principle. However, during the fight judokas spend a considerable amount of time grasping the *Judogi* of the adversary (using the *Kumi-Kata*). The *Kumi-Kata* is the first contact between two athletes in the fight and provides the basic support for the execution of other techniques. Therefore, the ability of maintaining the grip force for long periods of time might be an important aspect of this technique.

Even though there are no evidences to affirm that the HGS is related to the performance of the athlete, due to the importance of the *Kumi-Kata*, it has been investigated in studies that evaluate the general physical fitness of judokas [18,19], searching for reference values for group comparison and for the training control. In judo, the same way as it happens with the falling technique (the *Ukemi*), where the athletes, unlike the non-judokas, adjust their body posture to attenuate the fall [20], it can be expected that the athlete has a greater ability also in other tasks or tests that are similar to the movements used by the judokas during the fight. This can be especially true for the HGS, considering that the *Kumi-Kata* is performed constantly.

Based on the few studies that investigate the difference between judokas and non-judokas, there is no agreement among the authors concerning the evaluation of the peak grip force. Borges Junior et al. [15] found no differences between male judokas and non-judokas and Leyk et al. [13] found differences between female judokas and non-judokas. However, the HGS was not yet investigated through HGS force curves, which may provide other parameters about the handgrip performance besides the peak grip force, to verify differences between highly trained male judokas and non-judokas.

For a better understanding of the HGS performance in judokas, the purpose of the present study was to compare the performance of the HGS between professional judo athletes and non-judokas, using force curves.

2. Method

2.1. Participants

Twenty-two highly trained male Brazilian judokas, all black belts, competing in the Brazil Trophy of Judo, and 18 male non-athletes participated in the study (Table 1). The non-judoka group was composed by healthy physical education students that did not practice any martial art or sport modality regularly. None of the participants reported any upper limb musculoskeletal injury that occurred in the 6 months prior to the study. All participants were right handed by self-report. They gave informed consent as approved by the Local Ethics Committee in compliance with the Helsinki Declaration.

2.2. Apparatus

The maximum isometric HGS was collected with a strain-gauge (Kyowa® Electronic Instruments, Japan) dynamometer (measuring range: 1 up to 1000 N; accuracy: 0.1%, Fig. 1) at a sampling frequency of 1000 Hz. The data collection was performed 2 h before the tournament.

2.3. Experimental setup

The participants sat with their trunk upright, feet flat on the floor, and arm with their shoulder next to the trunk in a slightly adducted position; elbow flexed to 90°, and forearm in neutral position [21] as recommended by the American Society of Hand Therapists (ASHT). The grip span distance of the dynamometer was equivalent to 55 mm, which is the optimum grip span for males [22]. The dynamometer was held by the evaluator.