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CORRELATION BETWEEN FAT PERCENTAGE AND HANDGRIP STRENGTH IN CHILDREN PARTICIPATING IN THE LUTA QUE TRANSFORMA PROJECT

CORRELAÇÃO ENTRE PERCENTUAL DE GORDURA E FORÇA DE PREENSÃO MANUAL EM CRIANÇAS PARTICIPANTES DO PROJETO LUTA QUE TRANSFORMA

CORRELACIÓN ENTRE EL PORCENTAJE DE GRASA Y LA FUERZA DE PRENSIÓN DE LA MANO EN NIÑOS PARTICIPANTES EN EL PROYECTO LUTA QUE TRANSFORMA

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ABSTRACT

Judo is a sport that requires handgrip strength (HGS) for the efficient execution of techniques, and this ability is fundamental for controlling the opponent. The aim of this study was to check the correlation between fat percentage and handgrip strength among participants in the “Luta que Transforma” extension project. Eighteen 4th grade elementary school students took part (9 boys and 9 girls), with an average age of 10.13 years. Height, body mass, %G (using a multi-frequency bioimpedanciometer) and PMF (using manual dynamometry) were assessed. The results showed an average %G of 17.31 ± 11.24, with 50% of the participants classified as “normal”. The average MPF was 17.67 ± 6.69 kgf, which is lower than that reported in the literature for judokas in the same age group. Statistical analysis, using the *Spearman* coefficient, showed a very weak correlation between %G and HGS (r: 0.06; 95% CI: -0.52 to 0.43; p: 0.825), diverging from studies that associate higher %G with lower HGS. It can be concluded that although the majority of participants have adequate %G, their HGS is lower than expected, suggesting the need for specific interventions to improve this capacity. Continuous monitoring of students is essential to promote improvements in sports performance and physical development, as well as ensuring health benefits and quality of life.

Keywords: Handgrip strength. Fat Percentage. Judo. Children.

RESUMO

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O judô é uma modalidade esportiva que demanda força de preensão manual (FPM) para a execução eficiente de técnicas, sendo esta capacidade fundamental para o controle do adversário. O objetivo do estudo foi verificar a correlação entre o percentual de gordura e a força de preensão manual dos participantes do projeto de extensão “Luta que Transforma”. Participaram 18 alunos do 4° ano do Ensino Fundamental (9 meninos e 9 meninas), com idade média de 10,13 anos. Foram avaliados a estatura, massa corporal, %G (por bioimpedanciômetro multifrequencial) e FPM (por dinamometria manual). Os resultados revelaram %G médio de 17,31 ± 11,24, com 50% dos participantes classificados como "normal". A FPM média foi de 17,67 ± 6,69 kgf, valor inferior ao reportado na literatura para judocas da mesma faixa etária. A análise estatística, utilizando o coeficiente de *Spearman*, mostrou correlação muito fraca entre %G e FPM (r: 0,06; IC 95%: -0,52 a 0,43; p: 0,825), divergindo de estudos que associam maior %G a menor FPM. Conclui-se que, embora a maioria dos participantes apresente %G adequado, a FPM está abaixo do esperado, sugerindo a necessidade de intervenções específicas para aprimorar essa capacidade. O acompanhamento contínuo dos alunos é essencial para promover melhorias no desempenho esportivo e no desenvolvimento físico, além de garantir benefícios à saúde e à qualidade de vida.

Palavras-chave: Força de Preensão Manual. Percentual de Gordura. Judô. Crianças.

RESUMEN

El judo es un deporte que requiere fuerza en la empuñadura (FMA) para la ejecución eficiente de las técnicas, siendo esta habilidad fundamental para el control del adversario. El objetivo de este estudio fue comprobar la correlación entre el porcentaje de grasa y la fuerza de prensión de manos entre los participantes del proyecto de extensión «Luta que Transforma». Participaron 18 alumnos de 4º de primaria (9 niños y 9 niñas), con una edad media de 10,13 años. Se evaluaron la estatura, la masa corporal, el %G (utilizando un bioimpedanciómetro multifrecuencia) y la PMF (utilizando dinamometría manual). Los resultados mostraron un %G medio de 17,31 ± 11,24, con un 50% de los participantes clasificados como «normales». La MPF media fue de 17,67 ± 6,69 kgf, inferior a la registrada en la literatura para judokas del mismo grupo de edad. El análisis estadístico utilizando el coeficiente *Spearman* mostró una correlación muy débil entre %G y HGS (r: 0,06; IC 95%: -0,52 a 0,43; p: 0,825), divergiendo de los estudios que asocian mayor %G con menor HGS. Se puede concluir que, aunque la mayoría de los participantes tienen un %G adecuado, su HGS es inferior a lo esperado, lo que sugiere la necesidad de intervenciones específicas para mejorar esta capacidad. El seguimiento continuado de los alumnos es esencial para promover mejoras en el rendimiento deportivo y en el desarrollo físico, así como para garantizar los beneficios para la salud y la calidad de vida.

Palabras clave: Fuerza de agarre. Porcentaje de grasa. Judo. Niños.

INTRODUCTION

Judo is recognized as a highly competitive combat sport and is, fundamentally, characterized by a rigorous and dynamic fight that revolves around the critical aspects of contact and grip control, which, in turn, comprises a significant part, approximately 50%, of the entire duration of the fight (Miarka *et al*., 2012; Franchini *et al*., 2013; Sterkowicz-Przybycień *et al*., 2017).

The grip contest in judogi, the specialized garment designed specifically for judo, plays an indispensable role in ensuring effective control over the competition and facilitates not only the execution of offensive maneuvers, but also serves as a defensive mechanism against counterattacks, while promoting the disruption of the opponent's balance (Calmet *et al*., 2010; Sterkowicz *et al*., 2016).

Handgrip strength is directly linked to one of the most important fundamentals of judo, the *Kumi-kata* (grip in judogi), which is the foundation responsible for helping to maintain control of the opponent in the application of the most varied techniques, being a differential and indicative for performance in judo (Engwerda *et al*., 2020). Judokas have higher handgrip strength than non-judo athletes, in all age groups (Bala; Drid, 2010).

Increased volume of muscle mass can substantially increase strength, power, proficiency in motor skills, improvements in speed, the advancement of physical education methodologies, and the mitigation of injury risk during the developmental stage of puberty (Kanehisa *et al*., 1995; Stricker *et al*., 2020). It is imperative to recognize that children and adolescents classified as overweight have comparatively reduced relative muscle strength in contrast to their eutrophic counterparts (Tibana *et al*., 2013).

As postulated by Philippaerts *et al*. (2006), Malina and Bouchard (2009) and Ramos *et al*. (2021), fluctuations in strength, power, speed, endurance, and overall physical capabilities occur incessantly and can reveal optimal methodologies for talent identification, disease prevention, training regimens, and performance enhancement. It is worth noting that in adults, lower handgrip strength is associated with mortality risk (Lee; Gong, 2020; Wu *et al*., 2022). In addition, compelling associations have been established between reduced handgrip strength and increased likelihood of premature mortality among younger populations (Ortega *et al*., 2012).

Iermakov, Podrigalo and Jagiello (2016) established that handgrip strength constitutes a critical determinant of the success of martial arts practitioners, particularly those whose techniques involve throws and blows directed at the opponent's physique. Gonçalves, Benassi and Oliveira (2012) indicate that a reference value for male judokas aged between 10 and 13 years is quantified at 20.55±5.15 kg/f.

Junior *et al*. (2024) found that the correlation between lean mass and handgrip strength is high for both sexes. In addition, they observed a moderate correlation between body fat percentage and handgrip strength. The study also highlights that body composition significantly affects performance in judo.

In view of the above, it is important to evaluate anthropometric factors and muscle strength both for the child's maturational development and for the improvement of physical performance. However, there is a lack of Brazilian studies that study children and adolescents who practice judo and that analyze the percentage of fat and its relationship with handgrip strength. Thus, the objective of the present study was to verify the correlation between fat percentage and handgrip strength of children participating in the Luta que Transforma Project.

METHODOLOGY

This study was approved by the Research Ethics Committee of UNIFAA, according to Resolution CNS 466/2012, under CAAE number: 67147723.0.0000.5246. All the parents or guardians of the participants in this study signed the Informed Consent Form (ICF). As an inclusion criterion, individuals should be participants in the "Struggle that Transforms" Project. The exclusion criteria were: the presence of physical disabilities (permanent or temporary) that made the evaluations impossible; use of pacemakers; use of medications that could interfere with body composition or physical capacities; non-agreement of parents or students.

Anthropometric measurements of body mass and height were performed according to Lohman, Roche and Martorell (1988). Height was measured in centimeters using a portable stadiometer (Portable Stadiometer 210, Wiso, Florianópolis, Brazil), with a precision of 0.1 cm. Body mass and body composition were analyzed using a segmental multifrequency bioimpedance scale (Inbody 270, Biospace Co, Seoul, Korea).

Body mass and body composition were analyzed using a segmental multifrequency bioimpedance meter. The system is a tetrapolar with 08 (eight) electrodes, emitting frequencies of 20kHz and 100 kHz, of the Inbody brand and model 270. The values of relative fat percentage, skeletal muscle mass and hydration level were verified. The students were instructed about the collection protocols before and 24 hours before the tests. The pre-test protocols were in accordance with the recommendations of Heyward (2013).

- Fasting from food and beverages in the 04 hours prior to the exam time.
- Drink two glasses of water (500ml) two hours before the test.

- Do not consume alcoholic beverages 48 hours before the exam.
- Avoid excessive consumption of caffeine-rich foods (chocolates, dark teas, and coffee) the day before the exam.
- In the 12 hours prior to the exam, do not perform moderate or intense physical exercise.
- Not being on your period.
- Not be feverish on test day.
- Urinate at least 30 minutes before the exam.

Based on data from Jebb *et al*. (2004) established the criterion for the interpretation of %F in boys and girls, respectively.

To evaluate the handgrip strength (HGS), a manual dynamometer was used, which consists of a hydraulic gauging system. As the participant presses the bars, they cause an alteration of the gauges, being directly proportional to the force exerted on the bars. The participants performed this handgrip for 03 (three) seconds, with the greatest possible force, sitting in a chair with their feet resting on the floor and the lumbar back resting on the back of the chair. The shoulders were adjusted so that they were close to the torso, the elbows flexed at 90º. The participant had three opportunities to perform with the dominant member. The highest measure among the executions was noted.

All evaluations of students of both sexes were supervised by at least two people inside the evaluation room to avoid embarrassment or anything of the kind. The presence of the person in charge was also allowed to monitor the evaluations, if he deemed it necessary. The costumes for the boys' evaluation were short. The girls wore a blouse and shorts or similar two-piece attire.

RESULTS

Statistical analysis was performed using the SPSS software (v.27, Chicago, IL). The normality of the data was verified by the *Shapiro-Wilk* test ($p > 0.05$). Normally distributed data were expressed as mean and standard deviation; Data that were not normally distributed were presented as median and interquartile range. The correlations between Fat Percentage and Handgrip Strength were evaluated using *Pearson*'s coefficient, if both variables had normal distribution; otherwise, Spearman's coefficient was used. A significance level of $p < 0.05$ was adopted for all analyses.

18 students from the 4th year of Elementary School of CIEP Luciano Gomes Ribeiro in the city of Valença/RJ participated in this research, 09 females and 09 males. Data regarding

age, height, body mass, % Fat and handgrip strength are described in Table 1, considering the year of schooling. It is noteworthy that age and height presented non-normal distributions, so their values were expressed as median. The other data, on the other hand, as they presented normal distributions, were presented as mean and standard deviation.

Table 1 – Results of the variables age, height, %Fat, body mass, sitting height, handgrip strength.

Variables	Average ± SD
Age (years)	10,13 [9,99; 10,35]
Stature	143.53 (±7.27)
Body Mass (Kg)	36,90[29,50; 41,90]
% Fat	17.31 (±11.24)
Manual Grip Force(Kgf)	17.67 (±6.69)

Legend: Kg=kilogram; Kgf=kilogram force; cm=centimeters.

The individuals were 10.13 [9.99; 10.35] years old, 143.53±7.27 cm tall, body mass 36.90 [29.50; 41.90] kg and BF% 17.31 (17.31±11.24). It is observed that the handgrip strength obtained a value of 17.67±6.69 Kgf.

Regarding the percentage of fat, 11.1% of the sample was classified as having a low percentage for age, 50% as normal, 5.6% as overweight and 33.3% as obese. Thus, it was evidenced that the majority (50.0%) of the members of the Fight that Transforms Project have a normal fat percentage (Table 2).

Table 2 – Results of the %Fat classification.

% Fat Rating	Quantity	%
Low	2	11,3
Normal	9	50,0
Overweight	1	5,6
Obesity	6	33,3
Total	18	100,0

Legend: %=percentage.

Although the variables fat percentage and handgrip strength had a normal distribution, we chose to use *Spearman'*s correlation to evaluate the association between these variables, due to its greater robustness in the face of possible deviations from normality. *Spearman*'s correlation indicated a very weak correlation between fat percentage and handgrip strength (r: 0.06; 95% CI: -0.52 to 0.43; p: 0.825). Although a positive trend was observed between the variables, this relationship did not reach statistical significance.

DISCUSSION

The objective of the present study was to verify the correlation between fat percentage and handgrip strength of children participating in the Luta que Transforma Project. It was found that there is a very weak correlation between fat percentage and handgrip strength (r: 0.06; 95% CI: -0.52 to 0.43; p: 0.825). Junior *et al*. (2024) indicate that lower handgrip strength is associated with higher percentages of body fat, especially in female judokas, where a strong inverse correlation was found. This suggests that as body fat increases, handgrip strength tends to decrease, which can affect judo performance. These findings justify the very weak correlation between fat percentage and handgrip strength observed in this study, since most of the study participants obtained normal %F, thus reflecting on the aforementioned correlation. It is conjectured that if the sample of this study had presented %F classified as obesity, there would have been a correlation between handgrip strength tending to lower HGS.

The evaluation of the BF% (17.31 ± 11.24) of the sample investigated in this study showed that most of the judokas who are part of the Luta que Transforma Project present, in their majority (50.0%), a percentage of normal fat. Pedraza *et al*. (2016) point out that anthropometric indices have been considered valid to generate sensitive indicators of nutritional status. In addition, the World Health Organization (2024) points out that many low- and middle-income countries face the so-called double burden of malnutrition, where it is common to find malnutrition and obesity coexisting in the same country. Tibana *et al*. (2013) showed that overweight children and adolescents have lower relative muscle strength when compared to eutrophic adolescents. This fact may be due to the difficulty of muscle agonist activation by overweight individuals, especially in young individuals, which impairs the muscle strength of the muscles responsible for handgrip (Tomlinson *et al.* 2016). In this sense, the findings of this study are contrary to the indications in the literature, in addition to the fact that they obtained a percentage of fat classified as normal corroborate the prospect of obtaining greater muscle strength.

Barroca (2023) identified that at 11 years of age there is no difference in the ability to produce handgrip strength between boys and girls. He also showed in his findings that at 12 years of age, boys and girls have the same ability to generate HGS. Thus, the value presented in this research refers to the average HGS for boys and girls of the Luta que Transforma Project. Also, Chen *et al*. (2018) found no significant difference between the sexes in the ability to generate HGS.

The prediction of sports performance, through motor tests, such as HGS evaluation, is important for judo coaches and physical trainers. Lima *et al*. (2014) suggest that the longer the time of sports practice in judo, the greater the handgrip strength. This guides the

possibility of a progressive increase in HGS related to the time of judo practice. Ribeiro *et al*. (2023) found that Brazilian coaches consider the technical ability of grip to be an important factor and indicator of sporting potential for the development of talented young judokas.

Ramos *et al*. (2021) pointed out that changes in strength, power, speed, endurance, and physical abilities occur continuously and can highlight the best strategies for identifying talent, preventing diseases, training, and increasing performance. In addition, with regard to generic talent characteristics (anthropometry and physical qualities) it is pointed out that they are able to discriminate success between sub-elite and elite judo athletes and those who have abandoned the sport (Norjali *et al*., 2017), as well as predict the current and future performance of young judokas (Lidor *et al*., 2005). In general, generic tests may have some value in assessing sporting potential, as well as, perhaps more importantly, orienting young people to the modalities (e.g., judo) that best suit their profile and monitoring the effects of training in a systematic way with a longitudinal approach to development (Miranda *et al.,* 2019; Norjali *et al*., 2017). Thus, another important aspect of the evidence of the data in this research is to guide the members of the Fight that Transforms Project regarding aspects related to sports talent and to direct them.

It should be noted that during puberty, boys can show increases of up to 20% in height and agility and 40% in body mass, in addition to a 50% reduction in fat percentage and gains of up to 50% in anaerobic power and 70% in aerobic endurance (Pearson *et al*., 2006). In addition, before the peak growth velocity in height (CVP), the athlete's selection should be related to the performance of motor skills (coordination), while physical fitness (strength, agility, speed and endurance) should be more valued after CVP (Fransen *et al.,* 2017). These data indicate that the use of the data evidenced in this study should be analyzed and used with caution, as it indicates the valorization of strength after PVC.

CONCLUSION

The results of this study suggest that the maintenance of body fat in the members of the Fight That Transforms Project is essential for the best progression of HGS and for their health and quality of life. Scientific evidence shows that overweight children and adolescents have lower muscle strength when compared to eutrophic adolescents. For Brazilian judo coaches, the technical ability of grip is an important factor and indicator of the sporting potential for the development of talented young judokas. Thus, the results of this research indicate the correlation between fat percentage and HGS in order to guide students from the point of view of sports performance and health.

Therefore, it is necessary to maintain the process of monitoring the students of the "Luta que Transforma" project, as the project tends to promote the teaching of judo, providing improvement in physical abilities, reducing the difference in scores between the children of the project and the population and judoka data, thus ensuring a better human, motor and affective development of them.

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