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Isometric strength of lower limbs and lumbar region in consecutive fights in Jiu-Jitsu athletes

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ABSTRACT : The aim of the study was to evaluate the change in strength of the lower limbs and lumbar in consecutive fights in BJJ athletes. The sample consisted of 18 male subjects, aged between 22 and 50 years, height 165 to 194 cm, body mass between 67 and 88 kg, and body mass index (BMI) between 21.9 and 30.9 kg / m². All subjects maintained a regular workout frequency (2-5 times weekly), graded between blue and black belt. The assessment of the level of the lumbar and inferior strength members was accomplished with a mechanical dynamometer. The testing protocol consisted of 3 consecutive fights with the maximum possible performance. The first data collection strength occurred at the beginning of the first fight, then the interval between the first and second range in the second and third, and finally the end of the third fight. Data analysis was taken from the descriptive statistics with mean, standard deviation, minimum and maximum and inferential statistics with ANOVA for repeated measures, with a significance level of $\alpha<0.05$. In reviewing the results of the lower limbs, no significant difference in the level of force between fights ($p>0.05$). For the results of lumbar traction tests, no significant difference were observed in the level of force between fights, ie, the level of force was not a high decrease between a fight and another. Thus, it was observed that the strength levels of the subjects evaluated did not show a significant difference. Both force values for lower limbs and for the muscles of the lumbar region, the difference observed was low, could be a result of a high level of fitness of the muscle group assessed the participating athletes.

KEYWORDS - Brazilian Jiu Jitsu, Dynamometry, Force level.

I. INTRODUCTION

Brazilian Jiu-Jitsu is a martial art created based on self-defense techniques, which uses takedowns, immobilizations, and leverage systems through joint movements of the human body. Today, Jiu-Jitsu has a very popular concept in Brazil and around the world, making it necessary to develop studies involving the modality. Currently, studies have emerged evaluating everything from the physical fitness of adolescents (Gehre et al. 2010) to the strength levels of high-performance athletes (Neto 2010; Nascimento, 2011). The use of force during the fight is very important for the athlete to be able to dominate their opponent, applying and escaping blows. Practitioners with better physical conditioning, more time practicing the modality and/or experience, can maintain the same strength levels, or decrease them to a less significant level. The modality itself requires athletes to have greater muscular endurance in specific regions of the human body to achieve success in the results of each fight. The use of strength from the muscles of the lower limbs and lumbar region is highly demanded (Terreri et al. 2010).Another study (Borges et al., 2009) compared the use of isometric strength in different modalities such as rowing, judo, aikido, and Jiu-Jitsu. The Jiu-Jitsu modality showed the highest values of maximum strength due to the specificities of the fight, where the use of isometric strength is greater.In championships of this modality, it may occur that the athlete fights consecutively and in short periods of time intervals, therefore the objective of the study was to evaluate the changes in strength in consecutive fights. Fights in which the athlete remains under the opponent, attempting to pass the guard or make their opponent get off their body, using strikes and movements, will require the muscles of the lower limbs and lumbar region to be recruited with greater intensity.

II. METHOD

The study was approved according to the standards established by the Ethics and Research Committee (COMEP), of the Central-West State University (UNICENTRO) of Paraná. The sample selection was carried out for the convenience of those evaluated, where they previously signed an Informed Consent Form (TCLE). A questionnaire was applied to record data on body mass (kg), height (cm), age (years), practice time (years) and weekly training frequency (repetitions). To measure isometric strength, lower limb dynamometry and lumbar traction were used. Data collection was through consecutive fights, where the athlete was evaluated before, during breaks and at the end of the fights.

The sample consisted of 18 male individuals, aged 30 years ± 7, height 177.1cm ± 6.4, body mass 82 kg ± 5.6, BMI 26.2 kg/m² ± 2.4, practice time 5.4 years ± 3.7 and weekly training frequency 3.6 times a week ± 0.9. All individuals were Jiu-Jitsu athletes, ranging from blue belt to black belt.The material used was a Crown Dynamometer, with a capacity of 200 kgf and a resolution of 1000 gf. Those evaluated were subjected to two dynamometry tests, lower limb traction and lumbar traction. In the lower limb test, the participant positioned himself on the equipment platform, with his knees flexed at approximately 90º and his spine erect. The bar was held with dorsal grip of both hands and elbows fully extended. He was instructed that he should try to apply greater strength to his lower limbs, in an attempt to extend his knees (Guedes, 2006). For the lumbar traction test, the subject was positioned on the equipment platform, with the knees fully extended and the trunk slightly bent forward. The bar was held with the grip reversed in one hand, and the elbows were fully extended. The participant was instructed to seek the greatest application of muscular strength in the muscles of the lower back, trying to keep the trunk erect (Guedes, 2006).The subjects were subjected to three consecutive fights. Each fight lasted five minutes, and between each fight there was a five-minute break. At the beginning of the first fight, everyone performed dynamometry tests. And successively, at the end of each fight, new data was collected, until the end of the third fight. The athletes were instructed to fight with the maximum possible performance, simulating a competition-level fight.Descriptive statistics analysis was performed with minimum, maximum, mean and standard deviation values. For inferential data analysis, repeated measures ANOVA was used with a significance level of $p<0.05$. The statistical program adopted was SPSS version 18.

III. RESULTS AND DISCUSSION

The anthropometric characteristics of the Jiu-Jitsu athletes are presented in Table 1. The large variations in body mass (82 ± 5.6 kg) and height (177.1 ± 6.4 cm) are mainly due to the different competitive categories of these athletes.

Table 1. Descriptive statistics of the Jiu-Jitsu athlete sample.

Variable	Minimum	Maximum	Mean	Standard Deviation
Age (years)	22	50	30	± 7
Body mass (kg)	67	88	82.0	± 5.6
Height (cm)	165	194	177.1	± 6.4
BMI (kg/m²)	21.9	30.9	26.2	± 2.4
Weekly training frequency (rep)	2	5	3.6	± 0.9
Practice time (years)	2	16	5.4	± 3.7

In the analysis of lower limb strength results, no significant differences were observed between the fights ($p>0.05$), Table 2. Between the first and second fights, the difference between the average strength was 9.23 Kgf. Between the second and third fights, the difference was 2.78 Kgf, and it remained practically the same between the value before and after the third fight (0.28 Kgf), that is, it can be said that the athletes did not have a significant decrease in strength. The fact that the reduction in strength was insignificant for the tests may be due to the good preparation of the athletes during the fight, taking into account the duration of the fights and the long interval between them, favoring a recovery in strength levels.

Table 2. Descriptive statistics and repeated measures ANOVA of the lower limb strength assessment of Jiu Jitsu athletes.

	1ª Assessment (Kgf)	2ª Assessment (Kgf)	3ª Assessment (Kgf)	4ª Assessment (Kgf)	p
Mean	159.6	150.3	153.1	153.4	0.600
Standard Deviation	± 27.2	± 31.5	± 28.6	± 31.0	

For the lumbar traction test results, no significant differences were observed between the fights, that is, the strength level did not decrease significantly between one fight and another (Table 3). The biggest difference

observed was the reduction between the measurement before the first fight and at the end of the third fight (7.22 Kgf), however, the strength did not decrease significantly ($p>0.05$). Between the first and second fights, the difference was 5.28 Kgf, and between the second and third fights, this difference was even smaller (0.84 Kgf).
As mentioned earlier, conditioning combined with good technique can help the athlete maintain the same strength levels between consecutive fights. In the lumbar dynamometry test, the athletes did not lose more than 5% of their strength, as well as in the lower limb dynamometry, which was not significant overall. In championship fights, the intervals between fights are usually longer, which may contribute to athletes experiencing an even smaller decrease compared to the study conducted.

Table 3. Descriptive statistics and repeated measures ANOVA of lumbar strength assessment of Jiu Jitsu athletes.

	1ª Assessment (Kgf)	2ª Assessment (Kgf)	3ª Assessment (Kgf)	4ª Assessment (Kgf)	p
Mean	155	149,7	150,6	147,8	0.086
Standard Deviation	± 24.2	± 21.9	± 25.5	± 22.0	

According to Blackwell et al. (1999), muscle fatigue can occur during strength assessment tests due to the influence of the shape and size of the equipment used. However, according to the procedures of the tests performed in this study, the determining factor for muscle fatigue capable of interfering with the results was the fight itself. The athletes who underwent the dynamometry test had contact with the equipment before performing the fights, to become familiar with the data collection. In contrast, the execution performance used can be influenced by strength training, aiming at muscle activations in order to save unnecessary energy expenditure for performing the test (Ribeiro, 2004). Another factor that can influence force production is the individual's muscle flexibility. Poderoso (2012) evaluated the level of flexibility of athletes during a championship, and cites the importance of flexibility during fights, and that it, in the hips and legs, allows the fighter to maintain a lower center of gravity for a defensive position.

According to Assis (2005), flexibility facilitates the improvement of techniques used in sports, increasing their mechanical capabilities (muscles and joints), allowing for greater energy efficiency, preventing possible injuries, and also providing better conditions for developing more agility, speed, and strength. Andreato (2011) cites different variables important for the performance of jiu-jitsu fighters. In addition to the isometric strength used, variables such as VO2max test, handgrip dynamometry, flexibility, and muscular endurance were evaluated. Jiu-jitsu athletes presented higher values compared to other studies cited in the research. Gehre et al. (2010) concluded that the modality contributes to the increase of physical capacities, including strength. According to the individual's practice time, these values are increased.

IV. CONCLUSION

In this study, it was observed that the strength levels of the subjects evaluated did not show a significant difference ($p>0.05$). For both the strength values for the lower limbs and for the muscles of the lumbar region, the difference observed was low, which may be due to the interval used between fights. The duration of the fight followed the standard competition level, and the interval between fights was shorter, which could result in a greater reduction in strength levels compared to championships where the interval between fights is longer, allowing for greater recovery of physiological variables.Further studies involving this modality are necessary so that we can contribute scientifically to athletes and people involved, in order to maximize knowledge about strength training and its importance. New studies that evaluate other muscle groups, different types of tests for measuring strength, or even other variables that may add better performance to the athlete.

REFERENCES

[1] L. V. Andreato, S. M. F. Moraes, T. L. M. Gomes, J. V. D. C. Esteves, T. V. Andreato, and E. Franchini, Estimated aerobic power, muscular strength and flexibility in elite Brazilian Jiu-Jitsu athletes, Science & Sports, 26, 2011, 329-337.

[2] M. M. V. Assis, M. I. Gomes, and E. M. S. Carvalho, Avaliação isocinética de quadríceps e ísquios-tibiais nos atletas de jiu-jitsu, RBPS, 2, 2005, 85-89.

[3] J. R. Blackwell, K. W. Kornatz, and E. M. Heath, Effect of grip span on maximal grip force and fatigue of flexor digitorum superficialis, Applied Ergonomics, 30, 1999, 401-405.
[4] N. G. Borges, S. C. Domenech, A. C. Kulevicz da Silva, J. A. Dias, and Y. Sagawa Junior, Estudo comparativo de força de preensão isométrica máxima em diferentes modalidades esportivas, Revista Brasileira de Cineantropometria e Desempenho Humano, 11(3), 2009, 292-298.
[5] FPJJB, Livro de regras: regulamento geral de competições, Federação Paranaense de Jiu-Jitsu Brasileiro, 2013, disponível em: http://www.fpjjb.com.br/wp-content/uploads/2013/06/regrasibjjf-1aedicao.pdf, acessado em 25 de maio de 2013.
[6] J. A. V. Gehre, J. M. O. Coelho, W. Botelho Neto, J. L. Queiroz, and C. S. G. Campbell, Aptidão física de alunos do ensino-médio praticantes e não praticantes de Jiu-Jitsu, Revista Brasileira de Ciência e Movimento, 18(2), 2010, 76-83.
[7] J. F. Glagliano, Derrotado pelo joelho, Revista Gracie Magazine, 1999, 25-42.
[8] R. S. Gonçalves and J. P. Pinheiro, Co-ativação dos músculos flexores e extensores da articulação do joelho em condições isocinéticas, Revista Portuguesa de Ciências do Desporto, 2(V), 2005, 215-223.
[9] D. P. Guedes and J. E. R. P. Guedes, Manual prático para avaliação em educação física, Manole, Barueri, SP, 2006.
[10] F. Gurgel, Brazilian Jiu-Jitsu: manual pessoal do Jiu-Jitsu, Axcel Books, São Paulo, 2007.
[11] A. P. C. Nascimento, Potencialização da pós-ativação na força através do treinamento funcional em atletas de Jiu-Jitsu, Revista Hórus, 5(10), 2011, 262-269.
[12] A. S. Neto, Efeito de treinamento de resistência anaeróbica específicos para atletas de Jiu-Jitsu quanto à força de preensão manual e potência muscular, Revista Hórus, 4(2), 2010, 188-207.
[13] A. C. G. Poderoso and R. Poderoso, Análise da flexibilidade dos atletas de jiu-jitsu do estado do Paraná, EFDeportes.com, Revista Digital, 17(167), 2012.
[14] G. Rabita, C. Pérot, and G. Lensel-Corbeil, Differential effect on knee extension isometric training on the different muscles of the quadriceps femoralis in humans, European Journal of Applied Physiology, 83, 2000, 531-538.
[15] S. R. Ribeiro, Atividade enzimática e alterações eletromiográficas de atletas de judô submetidos ao estresse da competição, Univap, São José dos Campos, 2004.
[16] R. A. Sandoval, R. S. Canto, and M. A. Baraúna, Dinamômetro analógico adaptado: um dispositivo para medir o torque muscular, EFDeportes.com, Revista Digital, 10(76), 2004.