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Brazilian Jiu Jitsu Training as an Alternative Method to Improve Maximal Strength of Upper Limbs in Beginners

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ABSTRACT

Queiroz JL, Sales MM, Sousa CV, Neto IV, Asano RY, Moraes JFVN, França NM. Brazilian Jiu Jitsu Training as an Alternative Method to Improve Maximal Strength of Upper Limbs in Beginners. **JEPonline** 2015;18(2):45-51. The purpose of this study was to determine the effects of 4 wks of Brazilian Jiu Jitsu (BJJ) training on the maximum strength of the upper limbs (UL) in beginners. Thirty-eight untrained individuals were divided equally into two groups: control group (CG; n = 19; 24 ± 5.4 yrs; 24.2 ± 2.7 kg·m^{-2} of body mass index, BMI) and experimental group (EG; n = 19; 23.2 ± 7.1 yrs; 25.2 ± 3.1 kg·m^{-2} of BMI). The EG underwent 4 wks of BJJ training, 3 times·wk^{-1}, 90 min·session^{-1}. Subjects' neuromuscular performance was assessed by testing the 1 RM on the following exercises: bench press and seated row, performed before and after the training period in both groups. The results indicate that the EG showed a significant increase (P<0.05) in the absolute load (kg) of 1 RM for both exercises while the CG showed no increase. Four weeks of BJJ training is sufficient to promote a significant increase in muscle strength in beginners.

Key Words: Martial Arts, Muscle Strength, Physical Exercise

INTRODUCTION

While there are several theories about the origin of Jiu Jitsu, it is most accepted that it originated in India and developed in Japan. In Brazil, Jiu Jitsu was introduced in 1908 by Mistuyo Maeda who was popularly known as Conde Koma. In Brazil, the fight was developed more on the ground, which led to Brazilian Jiu Jitsu (BJJ) that is classified as a fight of short distance. The fight uses the system levers knowledge to make projections, immobilizations, and disarticulations (3).

Andreato (1) indicates that several physical qualities are trainable through this martial art, such as: strength, speed, flexibility, agility, aerobic, and anaerobic power. This suggests that BJJ is an excellent combat sport and a self-defense system that develops most of the physical qualities related to health maintenance, including muscle strength of which, if not satisfactory developed, is closely related to the development of chronic diseases (5).

It is estimated that this sport has over 12 million practitioners worldwide, which demonstrates the high impact that BJJ can have on public health. In fact, in regards to strength development and health, BJJ has long been considered as a promising intervention for improving muscle structure, lean muscle mass, and strength. Yet, despite this understanding and appreciation for the value of sports oriented strength development, the scientific findings on BJJ are still scarce. There is a lack of information about several healthcare aspects, especially the role of BJJ in the prevention or treatment of disease in beginners. To our knowledge, there are no studies that have investigated the effects of BJJ training on muscle strength. Thus, the purpose of this study was to determine the effects of 4 wks of BJJ training on maximal strength development of the upper limb (UL) muscles in beginners.

METHODS

Subjects

Thirty-eight young men and women who: (a) were free of bone, muscle, and joint impairments; (b) were without cardiovascular disease history; and (c) were not using drugs or medications participated in this study. The subjects were divided into two groups: experimental (EG) and control (CG). The EG consisted of 19 subjects (14 men and 5 women); all were beginners in the practice of BJJ. The GC also had 19 subjects (14 men and 5 women) who were untrained and physically inactive (i.e., the subjects were not involved in other physical training programs). The descriptive characteristics of the sample are presented in Table 1.

All subjects signed a consent form and were informed of the risks and benefits of the procedures adopted. The experimental protocol followed the Resolution 466 of the Brazilian National Health Council and the Declaration of Helsinki in 1964, revised in 2008. Moreover, research procedures were approved by the Ethics Committee of the Catholic University of Brasília (protocol number 126/10).

Procedures

The exercises selected for the tests were machine bench press (Cybex®) and the Seated Row (Taurus®). These exercises were chosen because they have similarities to the movements that the upper limbs (UL) perform during the practice of BJJ.

To measure the maximum load (1 RM), the exercises were evaluated on separate days and in random order following the recommendations of the American Society of Exercise Physiology (2). Throughout all assessments, two evaluators provided a safe environment and ensured the correct execution of the exercises. As suggested by McNair et al. (10) standardized verbal incentives were used. All tests were supervised by the same evaluator.

After the assessment of 1 RM, the subjects were divided into two groups: the experimental group (EG) and the control group (CG). Then, the subjects in the EG underwent a 4 wks of training in BJJ that was performed 3 times·wk^{-1} for 90 min·session^{-1}.

Subjects in the GC were advised not to perform any kind of exercise or physical activity that could influence the results of the study. At the end of the 4-wk intervention, the subjects in both groups (experimental and control) were again subjected to the 1 RM tests in order to evaluate the influence of BJJ training on muscle strength.

Table 1. Descriptive Characteristics of the Sample.

	Control Group (n = 19)	Experimental Group (n = 19)
Age (yrs)	24.8 ± 5.4	23.2 ± 7.1
Body Weight (kg)	71.1 ± 16.9	78.8 ± 14.4
Height (cm)	170.0 ± 13.0	176.2 ± 10.2
BMI (kg·m^{-2})	24.2 ± 2.7	25.2 ± 3.1

BMI = body mass index; Data are expressed in mean and ± standard deviation.

Brazilian Jiu Jitsu (BJJ) Training

The treatment intervention consisted of applying BJJ training for 4 wks, 3 times·wk^{-1}. Each 90-min·session^{-1} was divided into: (a) 5 min of initial stretching, 20 min of warm-up with active stretching and strength exercises; (b) 3 min of recovery and rehydration (water only); (c) 30 min of BJJ training that included unbalancing (Takedowns and Throws), submissions, and positions adequate to the skill level of this sample (beginners); (d) 4, 6-min fights with 2-min intervals between each 2 fights (recovery and rehydration); and (e) 4 min of stretching for relaxation. The frequency of subject participation in the training sessions was above 83% (10 of 12 sessions).

Control Group

During the 4-wk treatment period, the subjects in the CG were instructed not to perform any type of exercise until the end of the experiment. After 4 wks, the subjects were again submitted to 1 RM test for reassessment.

Statistical Analysis

To verify the normality and homogeneity of variances, the Shapiro-Wilk and Levene tests were applied, respectively. For comparison between and within groups, a Split-Plot ANOVA followed by Tukey's *post-hoc* was applied. Furthermore, the sphericity of the data was tested using Mauchly's test and when the test was violated, the Greenhouse-Geisser epsilon was used for F statistics. Since the Split-Plot ANOVA points only whether there were or not intra-group statistical differences and does not indicate specifically where the difference occurred (because there were only two groups) it was necessary to perform parallel tests, called pairwise comparisons. Thus, the paired sample *t* test was also carried out. For the sample size calculation, the statistical power (Power) a priori (1-β), using the comparison analysis employed (Split-Plot ANOVA), an Effect Size of $f = 0.25$, two groups (EG and CG), two repetitions (before and after) and an alpha error of 5% was applied. Using these data, the statistical power conferred for this sample was 85% (Power = 0.85). Data were expressed as mean ± standard deviation. The significance level was 5% ($P<0.05$). All procedures were performed with the help of the software Statistical Package for Social Sciences 18.0 and Gpower 3.1.9.2.

RESULTS

The results indicate that short term BJJ training (4 wks) seems to promote an increase in the strength of the upper limb muscles in beginner subjects. The experimental group showed an increase in absolute load of 1 RM in both exercises investigated ($P<0.05$). The improvement was 12.1% for the bench press exercise and 8.8% for the seated row exercise (Table 2).

Table 2. Absolute Loads (kg), Absolute Change [Δ (kg)] and Relative Change [Δ (%)] for 1 RM Tests Performed Before and After Brazilian Jiu-Jitsu Training.

	Control Group				Experimental Group			
	Pre	Post	Δ (kg)	Δ (%)	Pre	Post	Δ (kg)	Δ (%)
Bench Press	45.4	46.0	0.6	2.1	47.0	52.3	5.3	12.1
(± SD)	(± 20.0)	(± 20.2)	(± 1.7)	(± 4.8)	(± 18.9)	(± 19.0)*†	(± 2.3)	(± 7.6)
Rowing Sitting	77.4	77.4	0.0	0.4	79.0	85.6	6.6	8.8
(± SD)	(± 25.7)	(± 24.9)	(± 1.5)	(± 2.4)	(± 25.7)	(± 25.8)*†	(± 4.4)	(± 6.8)

CG, control group; EG, experimental group; Δ**,** change**;** *- $P<0.01$ compared to pre; † - $P<0.01$ compared to CG; Data expressed as mean and ± standard deviation (SD).

DISCUSSION

The results of the present study indicate that the 4-wk period of BJJ training seems to be sufficient to promote significant gains in muscle strength of the upper limbs. It is noteworthy that this is the first study to examine the effects of BJJ training on maximal strength of the upper limbs in beginner subjects.

For comparison purposes, Pereira and colleages (11) examined a 12-wk program of Tai Chi Chuan Yang (i.e., a branch of Chinese martial art) style of 24 movements with a frequency of 3 times·wk^{-1} in 38 adult women. They reported a 17.8% increase in maximum strength of the muscles of the lower limbs. It is apparent that the martial arts result in promoting health with the potential clinical benefits of muscle strengthening.

Hunter (7) reported an increase of 11.9% of maximum strength performed in the bench press exercise after a period of 10 wks of resistance training (RT) in young adults of both sexes. Here again, improvement in the present study was 12.1% for the bench press exercise and 8.8% for the seated row exercise. These findings demonstrate that BJJ training is the essentially the equivalent of muscular work required of RT. But, note that the results were realized across a much shorter period of time (4 wks).

Dias and colleagues (4) evaluated 38 subjects of both sexes (23 men and 15 women) who were engaged in 8 wks of RT that required 3 sets of 10 exercises with alternating body segments and a relative load between 8 to 12 repetitions. They reported an improvement of ~11% in maximal muscle strength in the bench press exercise. Again, the intervention protocol in the present study was 4 wks, but with similar results. This suggests that the practice of BJJ can be an excellent alternative method to RT in acquiring muscle strength in a much shorter period of time.

The mechanisms related to the initial strength gains were not investigated in the present study. On the other hand, previous observations show that the changes in muscle strength for short periods of training seem to be due to the improvement in intra and intermuscular neural adjustments during movement execution. It is believed that such adaptations are linked to an increase in the number of motor units recruited, and a better synchronization and firing frequency of motor units, as well as a minor co-activation of the antagonist muscles, thus, contributing to greater force production during the early stages of training (9).

Hakkinen et al. (6) used electromyographic analysis to understand the activation and the co-activation of agonist and antagonist muscles of men and women during 24 wks of RT. The results indicated that only 8 wks of weight training seemed to be enough to significantly increase the total muscle activation, together with the reduction in the co-activation of antagonistic muscles, causing a marked increase in the level of muscle strength.

Although the initial increase in muscle strength is commonly associated with neural adaptations, studies have shown important changes in muscle structure as well in just 2 wks of training (8,13). In particular, there is an increase in the concentration of heavy chain myosin in type IIa muscle fibers that suggests the morphological changes within skeletal muscle tissue may occur within the first 2 wks of weight training.

Seynnes et al. (12) reported on 7 healthy young subjects (5 men and 2 women) who participated in 35 d of RT designed to develop the knee extensors of the lower limbs. The subjects trained 3

times·wk^{-1} for 20 d, which promoted a significant increase in strength, muscle hypertrophy, and electrical activity of the quadriceps. Thus, the increase in strength can also be explained by the early onset of muscle hypertrophy.

Finally, it appears that BJJ training is an interesting alternative to improving the levels of muscle strength in beginner subjects. This finding is particularly important since RT is seen by some young adults as a dull and inflexible practice. Based on the exercises used, BJJ becomes a pleasurable option, providing greater adherence to exercise programs, favoring the adoption of an active and healthy lifestyle and reducing the early onset of chronic diseases, which are closely related to lower levels muscle strength (5).

CONCLUSIONS

The results of the present study indicate that 4 wks of BJJ training was sufficient to promote a significant increase in muscle strength in the bench press and seated row exercises in beginners. Additional studies are needed to investigate other body segments, different populations, and the mechanisms by which this increase is realized.

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