40 - ACUTE CHANGES ON MAXIMUM STRENGTH, STANDING HORIZONTAL JUMP AND THIGH CIRCUMFERENCE, FRONT OF A STRENGTH TRAINING PERFORMED WITH DIFFERENT EXECUTION SPEEDS

DENISE MIRANDA DE CARVALHO
DIANA MIRANDA CARVALHO
AMANDA CARDOZO PRODÓCIMO
PATRÍCIA ALVAREGA SANTINI
WAGNER ZEFERINO FREITAS
South Minas Gerais Federal Institute of Education, Science and Technology, Muzambinho, Minas Gerais, Brazil
wagnerzf@yahoo.com.br

INTRODUCTION

We developed a model of classroom practice, which uses the weight room and some assessment features. To illustrate to students of Physical Education, one of the themes that a scarcity of published work, and provides discussion and controversy with the discipline of bodybuilding: manipulation of execution speed and magnitude of micro cell damage and adaptations that they can cause.

We realize that students have their "explanations" largely because of his experiences as frequenting gyms, and in most cases, there is a discourse that reflects the explanation of the professionals who come in physical activities (ANTUNES NETO et al ., 2006). The "hypothesis" that appears most frequently is that exercise performed at low speed of execution, induces cellular micro damage in greater magnitude, and consequently greater hypertrophic response.

However, some studies were published as Chapman et al. (2006), demonstrating that the fast execution speed protocol observed has higher plasma concentrations of creatine kinase (CK), which may infer that the incidence of adaptive micro trauma (MTA).Farthing and Chiliberck (2003) point out that the hypertrophic response was higher compared to the higher execution speed in the eccentric phase.

According to Ide, Lopes and Sarraipa (2010), the conclusion one can draw on the results of Farthing and Chiliberck (2003) studies, is that "if the eccentric actions are performed with greater speed, seem to lead to a higher incidence of MTA and therefore a higher signal muscle repair".

Considering this problem, we developed a model of classroom practice that uses two protocols with different speeds of implementation, to monitor the possible changes that the acute specific protocol could generate to the variables analyzed. The objective of this study therefore was to monitor the behavior of strength, power and right thigh circumference in individuals beginners to resistance exercise in the weight room before and after a protocol classified as fast and slow execution speed of movements in concentric-eccentric cycle, given that the review carried out in national and international journals on the variable speed of execution, only to find scientific results of highly trained people.

3 METHODOLOGY

3.1 Sample

Participated in the proposed experiment, four male student volunteers, who were randomly selected and formed two distinct groups as follows: - a group of two individuals, with age = 26.50±6.36 years old, body mass = 83.15±0.64 kg, height = 177.00±1.41 cm, which carried out the training with fast execution speed (FEG) - and another group also comprised of two individuals, with age = 35.00±2.83 years old, body mass = 76.70±14.42 kg and mean height = 175.00±7.07 cm, which carried out the training with slow execution speed (SEG). We used bioelectrical impedance scale (Tanita Ironman) and height scale (Filizola). Everyone involved are Physical Education students at the South Minas Gerais Federal Institute of Education, Science and Technology - Campus Muzambinho (IFSULDEMINAS), have a history of physical activity, but are beginners to strength training. Subjects were instructed to keep their daily habits of feeding, time of rest, routine work and studies, further undertake not to make any kind of extra physical activity during the course of experimental research.

Prior to the study, all participants were informed about the procedures used in the experiment, their risks and benefits, and its shares gave their written consent. This study met the Standards for Conducting Research on Human Beings, Resolution 196/96 of the National Health Council, 10/10/1996 (BRAZIL, 1996).

3.2 Experimental procedure

3.2.1 Choice of exercises

The groups tested performed two exercises: leg press and leg extension 90° (only right side), using Physicus brand machines. It is noteworthy that these exercises were chosen because they are very popular among practitioners of exercises with weights and cover large muscle groups.

3.2.2 Assessments

Assessments are presented below in the sequence they were performed.

3.2.2.1 Standing Horizontal Jump (SHJ) determination

To determine the SHJ performance with arms help, we used a Western brand scale tape, following the Fernandes Filho (2003) protocol. Three attempts were made with 45 second pause between them, considering only the best mark achieved for analysis (BOMPA, 2004).

3.2.2.2 Right Thigh Circumference (TC)

In the present study, we measured only the right TC of individuals, in the medial point, every day of assessments. To this extent, we used a Sanny anthropometric tape measure to the nearest 0.1 cm (FERNANDES FILHO, 2003).

The measurement performed with such equipment can provide very precise information about the body structure (LEME, 2008).

In this location, the marking was done with pen around the whole thigh circumference, and remained the same for all days of assessments, to avoid the standardization error of the measurement site on other days of analysis (QUEIROGA, 2005).

According to Leme (2008), with standardization of the measurement site, for all days of data collection, is possible to

assess whether there were changes in thigh circumference (muscle hypertrophy), as the "edema" or "swelling" would represent a response as one of the hypertrophic effects of this training.

3.2.2.3 Maximum load determination

We chose to perform the one maximum repetition test (1RM), since according to Reynolds et al. (2006), despite its limitations, this is a direct method for accurate and reliable assessment of the maximum force that can be applied to healthy individuals trained and untrained, which the latter group of individuals who fit our study.

To determine the maximum load, we used the protocol described by Graves, Pollock and Bryant (2003), leg press 90° exercises and leg extension. In all 1RM tests subjects started the movement from the concentric contraction, consisting of three attempts to lift the heaviest load possible increases or decreases the load when necessary, with 3 minutes intervals between attempts, so that energy reserves were restored (SAKAMOTO; SINCLAIR, 2006).

A week before the experiment, all subjects underwent weeks of familiarization with the 1RM test, and is an approximate value of 1RM for each individual.

3.3 Experimental design

5 assessments were performed at different times. The first assessment was conducted one week before the experiment and the other 4 were performed at times considered as post training stimulus, as follows: 0 (immediately after the experiment), 24, 48 and 72 hours after the experiment.

3.3.1 Experimental design description

a)1st day of the experiment (eight steps):

(1st) Heating of 5 minutes on a treadmill at a speed of 7 km/h (2nd) 5 minute passive break; (3rd) measured the right thigh circumference, (4th) SHJ, (5th) 3 minute passive pause, (6th) 1RM leg press 90°, (7th) 3 minutes with passive interruption, (8th) and finally, it was determined the subject's 1RM in leg extension.

b)2nd day of the experiment (training day):

Our experimental design was built for only one day of training against resistance: two individuals carried out the training with fast execution speed (FEG) with 1.5 seconds for each repetition, 0.75 seconds for the concentric phase, and 0.75 seconds for the eccentric phase of movement. The second group consists of 2 individual training performed with a slow execution speed (SEG), with 6 seconds for each repetition, 3 seconds for the concentric phase, and 3 seconds for the eccentric phase of movement. The rate of the repetitions was established by a metronome.

To avoid unwanted responses in our study, subjects were asked to perform repetitions without stopping at the end of the concentric and eccentric phases, avoiding interruptions between contractions, so that does not feature a predominance of isometric work, which was not objective of this experiment.

Prior to the practice followed by the routine below:

- Heating overall 5 minutes on a treadmill at a speed of 7 km/h followed by a passive interruption of 5 minutes, the subject shifted to the leg press 90° where they performed a specific warm-up with 12 repetitions using 50% of 1RM load found on the 1st day of experiment, new 3 minutes rest with passive interruption, the training consisted of three sets of 12 maximum repetitions (12RMs) for both groups FEG and SEG, 50 seconds of rest between sets and 2 minutes between leg press and leg extension exercises, respectively.

From this point forward followed the same procedures and assessments conducted in Phase 3 of the 1st day of the experiment.

Importantly, the only variable that changed was the speed of execution.

c)3rd, 4th and 5th day of the experiment:

In the 3rd, 4th and 5th day of the experiment, there was no training, only repeated the procedures and assessments conducted on the 1st day of the experiment, to monitor possible changes that the acute specific protocol could generate the variables analyzed. "This makes it possible to observe the physiological responses in a short period of time for the two groups analyzed, and their differences" (LEME, 2008).

3.4 Data Analysis

We used descriptive statistics to characterize the sample in function of selected variables: mean and standard deviation.

4 RESULTS

4.1 Right Thigh Circumference

Figure 1 and Table 1 presents the results of the percentage change (%) increase in the right thigh circumference, from the baseline to subsequent assessments 0, 24, 48and 72 hours after the execution of the training protocols in groups FEG and SEG.

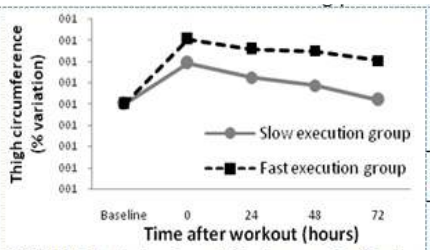

FIGURE 1: Behavior of % change in thigh circumference of men beginners to resistance training.

TABLE 1: Results of % increase variation in thigh circumference, from the baseline to subsequent assessments 0, 24, 48 and 72 hours after the training protocols execution for FEG and SEG groups

Group	Hours after workout			
	0	24	48	72
SEG (increase%)	1,94	1,26	0,87	0,19
FEG (increase%)	3,05	2,59	2,50	2,04

4.2 Standing Horizontal Jump determination

Figure 2 and Table 2 presents the results of the percentage change (%) of SHJ, from the baseline to subsequent assessments 0, 24, 48 and 72 hours after the execution of training protocols in FEG and SEG groups.

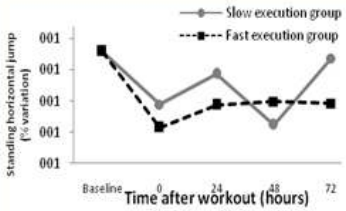

FIGURE 2: change% behavior of SHJ men beginners to resistance training.

TABLE 2: Results of change % in SHJ, from the baseline to subsequent assessments 0, 24, 48 and 72 hours after the execution of training protocol for FEG and SEG groups.

Group	Time after workout			
	0	24	48	72
SEG (decrease %)	8,55	3,63	11,78	1,1
FEG (decrease %)	12,27	8,63	8,12	8,3

4.3 Maximum Load determination

Figures 3 and 4 and Tables 3 and 4 show the results of the percentage change (%) of drop in performance shown by the 1RM tests in the leg press and the leg extension exercises, from the baseline to subsequent assessments 0, 24 , 48 and 72 hours after the execution of training protocols in FEG and SEG groups.

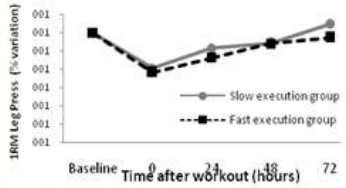

Figure 3: Behavior of % variation in drop of performance, presented by the 1RM test in leg press exercise for men beginners to resistance training.

TABLE 3: Results of % variation in drop of performance shown by the 1RM test in leg press and leg extension exercises, from the baseline to subsequent assessments 0, 24, 48 and 72 hours after the execution training protocol in FEG and SEG groups.

Group	Hours after workout			
	0	24	48	72
SEG (decrease %)	9,72	4,17	2,78	-2,50
FEG (decrease %)	10,81	6,76	2,97	1,35

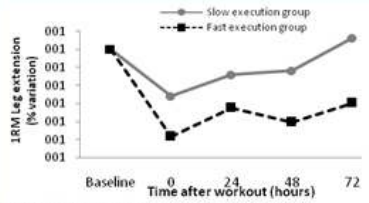

Figure 4: Behavior of % variation in drop of performance, presented by the 1RM test in the leg extension exercise for men beginners to resistance training.

TABLE 4: Results of the % variation in drop of performance shown by the 1RM test on leg extension exercise, from the baseline to subsequent assessments 0, 24, 48 and 72 hours after the execution training protocol for FEG and SEG groups.

Group	Hours after workout			
	0	24	48	72
SEG (decrease %)	12,96	7,04	5,92	-3,10
FEG (decrease %)	24,20	16,22	20,21	14,89

5 DISCUSSION

As reported in the introduction, stands out among bodybuilders "hypothesis" that the exercise performed at low speed of execution, induces greater magnitude of micro cell damage, and consequently greater hypertrophic response.

However, in our study, with the figures and tables presented in the "RESULTS", we can analyze that, at all times 0, 24, 48 and 72 hours after application of the training protocol, there was a greater increase in the right thigh circumference for the FEG, followed by the largest drop in performance in SHJ, and greater fall in the 1RM in leg press and leg extension exercises when compared with the SEG.

These results corroborate the findings by Leme (2008), but in his research subjects were highly trained and the training protocol was characterized by a greater mechanical work performed than in our study. The Leme (2008) protocol was the leg press 5 series in leg press 45° and 5 series in the leg extension, with a 50 seconds pause between series and 2 minutes from one exercise to another. In our study, for caution, we use individuals beginners to weight training exercises, the training protocol consisted of a minor mechanical work, with 3 series in leg press 90° and 3 series in the one side leg extension, with a 50 seconds pause between series and 2 minutes between exercises, as imagined by the fact that this group is not experienced with weight training, could emerge a high cell trauma (MTA).

Leme (2008) cites that the muscle actions with fast execution speed protocol may be better suited to a different population. Beginners, sedentary people, or people who have no patience with strength training, possibly should take precautions if they are to apply this training model. This fact can be explained by the high incidence in the effects of MTAs and can cause more serious injuries in a population not prepared and familiar with strength training.

To justify the relevance of our findings, we tried a few published studies similar to ours, but with isokinetic devices. Chapman et al. (2006) have studied 12 individuals divided into two groups classified by the execution speed of movement for the elbow flexor muscles: fast speed group (FG, 120°/s) and slow group (SG, 30°/s). After two training sessions found that FG were observed in higher plasma concentrations of CK, and greater increases in arm circumference, which, according to Ide and Lopes (2010), we can infer that the MTA incidence was much higher in the fast execution speed protocol.

According to Leme (2008, p. 31), the impact of the MTA is characterized by 1) Break the extracellular matrix, basal lamina and the sarcolemma, 2) release into the bloodstream of intracellular protein as myoglobin and creatine kinase (CK) 3) myofibrillar structure disorganization, disruption, enlargement or extension of the line Z (the sarcomeres), 4) material damage to the contractile and cytoskeletal proteins, with a further commitment to the anchorage of thin filaments, and the connection of adjacent myofibrils, 5) decrease in the tension exerted by the fiber, and eventual death of them.

Proske and Allen (2005) reported that structural distortions (MTAs) lead to membrane damage, with interference the mechanisms of cross bridges formation, damage in exiting mechanisms, and will negatively influence the process of muscle contraction.

If we look at the research cited above, we can infer for the FEG of our experiment, when compared with those obtained

by SEG, the more likely that the drop in performance demonstrated by the horizontal jump, 1RM leg press and leg extension, in virtually all times after applying the training protocol (0, 24, 48 and 72 hours), in Figures 2, 3 and 4, due to high magnitude of tissue damage, generated by the stimulus, and consequently a major impact on ability to produce tension, the myofibrils, apart from possible disturbance of the integrity of the contractile tissue, resulting in greater thigh circumference, observed by muscle swelling (edema) (LEME, 2008).

Antunes Neto et al. (2006) report that this condition of swelling seems to have developed because of an accumulation of interstitial or intracellular fluid, resulting as effect of the breakdown of muscle ultrastructure (STAUBER, 1990), can cause stress and strain on the connective tissue elements, that tend to affect afferent receptors located close to the myotendinous unit, and provide important stimulus to the sense of disorder and proprioceptive neuromuscular performance (SAXTON, 1995).

Corroborating with study by Leme (2008), we also get satisfactory results in controlling the execution speed of movement, using conventional equipment and metronome, compared with isokinetic devices. Therefore, we emphasize that the use of this can contribute to beneficial effects on training adaptations.

CONCLUSION

Thus, we can say that training in this study with FEG generates largermicro muscle damage, thereby increasing the thigh circumference and fall in yield and ultimate strength tests SHJ when compared to the group that conducted the training protocol with SEG. And that the use of conventional equipment and metronome can contribute satisfactorily to control execution speed of movement, and thus have beneficial effects on adaptations to strength training.

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Contato: Denise Miranda de Carvalho
Rua Euclides da Cunha, 170 – Centro – Muzambinho – MG
Telefone: (35) 8404-2885
e-mail: efdenise@yahoo.com.br

ACUTE CHANGES ON MAXIMUM STRENGTH, STANDING HORIZONTAL JUMP AND THIGH CIRCUMFERENCE, FRONT OF A STRENGTH TRAINING PERFORMED WITH DIFFERENT EXECUTION SPEEDS

ABSTRACT

In most fitness gyms, is common sense that the exercise performed at low execution speed induces greater hypertrophic response. The objective of this study was to monitor the behavior of strength, power and right thigh circumference, in individuals beginners to resistance exercise in the weight training room before and after protocol classified as a fast and slow execution speed of movements in concentric-eccentric cycles. The sample consisted of four healthy male volunteers with low levels of strength training. The subjects were divided into two groups, with the first, 2 individuals aged = 26.50±6.36 years old, called the Fast Execution Group (FEG), who performed mechanical actions with a time of 1.5 seconds for each repetition. The second group consisted of 2 individuals aged = 35.00±2.83 years old, called Slow Execution Group (SEG), which held at 6 seconds per repetition. The tests used were: 1RM leg press and leg extension 90° (also used for training), thigh circumference (TC), standing horizontal jump (SHJ), total body mass and height. The tests were performed the day before and 3 days after the intervention. At the end of this study, noted that the training protocol with fast execution speed generated larger responses in tests of percentage falls in the leg press 1RM (0 hours = 10.81%, 6.76% = 24 hours, 48 hours = 2.97% , and 72 hours = 1.35%) in the leg extension chair (0 hours = 24.20%, 16.22% = 24 hours, 48 hours = 20.21% and 14.89% = 72 hours), SHJ (0 hours = 12, 27%, 8.63% = 24 hours, 48 hours = 8.12% and 8.38% = 72 hours) and increase in TC (0 hours = 3.05%, 2.59% = 24 hours, 48 hours =

2.50% , and 72 hours = 2.04). Thus, we can say that in this study, training with FEG generates larger micro muscle damage, thereby increasing the thigh circumference and fall in yield and ultimate strength tests SHJ when compared to the SEG group.

KEYWORDS: strength training with beginners, speed of execution, acute effect

CHANGEMENTSAIGU SURLA FORCE MAXIMALE,SAUTHORIZONTALET LA CIRCONFERENCE DELA CUISSE,AVANTD'UNACCROISSEMENT DE LA FORCEAVECEFFECTUÉVITESSES D'EXECUTIONDIFFÉRENTES

RÉSUMÉ

Dans la plupart des gymnases de fitness est de bon sens chez les étudiants que l'exercice effectué à faible vitesse d'exécution, induit une plus grande réaction hypertrophique. L'objectif de cette étude était de surveiller le comportement de force, la puissance et la circonférence de la cuisse droite, de nouvelles personnes à des exercices de résistance dans la salle de poids avant et après le protocole classée comme une vitesse rapide et lente exécution des mouvements dans concentriques-excentriques cycles. L'échantillon se composait de quatre hommes volontaires sains à faible niveau de formation de force. Les sujets ont été divisés en deux groupes, avec la première, les individus âgés de 2 = 26,50 6,36 années, appelée la vitesse de groupe Quick (GVR), qui a effectué des actions mécaniques, avec un temps de 1,5 secondes pour chaque répétition. Le deuxième groupe se composait d'individus âgés de 2 = 35,00 2,83 années, appelé Groupe de vitesse lente (GVL), qui détenait ces actions à 6 secondes par répétition. Les tests utilisés étaient: presse jambes 1RM et leg extension (également utilisé pour la formation), la cuisse circonférence (PC), saut horizontal (SH), la masse totale du corps et de stature. Les tests ont été effectués le jour avant et trois jours après l'achèvement de l'intervention. A la fin de cette recherche, a noté que les exécutions protocole de formation avec la vitesse rapide généré plus des réponses aux tests de pourcentage tombe à la jambe de presse 1RM (0horas = 10,81%, 6,76% = 24 heures, 48 heures = 2,97% , et 72 heures = 1,35%) occupe le fauteuil extenseurs (0horas = 24,20%, 16,22% = 24 heures, 48 heures = 20,21% et 14,89% = 72 heures), SH (0horas = 12, 27%, 8,63% = 24 heures, 48 heures = 8,12% et 8,38% = 72 heures) et l'augmentation des PC (0horas = 3,05%, 2,59% = 24 heures, 48 heures = 2,50% , et 72 heures = 2,04). Ainsi, nous pouvons dire que la formation de cette étude avec GVR micro grandes génère des dommages musculaires, augmentant ainsi la circonférence de la cuisse et chute du rendement et des tests de résistance ultime SH par rapport au groupe qui a effectué le protocole de formation avec la GVL.

MOTS-CLÉS: formation de force avec des débutants, la rapidité d'exécution; effet aigu

LOS CAMBIOS AGUDOSSOBRE LA FUERZA MÁXIMA, SALTO ENHORIZONTALY LA CIRCUNFERENCIA DELOS MUSLOS,FRENTE A UNENTRENAMIENTO DE FUERZAREALIZADOSCON VELOCIDADES DE EJECUCIÓNDIFERENTES

RESUMEN

La mayoría de los gimnasios es de sentido común entre los estudiantes que el ejercicio realizado a baja velocidad de ejecución, induce una mayor respuesta hipertrófica. El objetivo de este estudio fue monitorear el comportamiento de la fuerza, el poder y la circunferencia del muslo derecho, las personas nuevas a los ejercicios de resistencia en el gimnasio antes y después del protocolo de clasificarse como una velocidad rápida y lenta ejecución de los movimientos en concéntrica-excéntrica ciclos. La muestra estuvo conformada por cuatro voluntarios sanos de sexo masculino con bajos niveles de entrenamiento de fuerza. Los sujetos fueron divididos en dos grupos, con los primeros individuos, con edades entre 2 = 26,50±6,36 años, llamada velocidad de grupo rápida (GVR), que llevó a cabo las acciones mecánicas, con un tiempo de 1,5 segundos por cada repetición. El segundo grupo formado por personas de entre 2 = 35,00±2,83 años, llamado Grupo de velocidad lenta (GVL), que celebró dichas acciones a los 6 segundos por repetición. Las pruebas utilizadas fueron: la prensa de piernas 1RM y extensión de la pierna 90º (también se utiliza para la formación), la circunferencia del muslo (PC), salto horizontal (SH), la masa corporal total y la estatura. Las pruebas se realizaron el día antes y 3 días después de la finalización de la intervención. Al final de esta investigación, señaló que las ejecuciones protocolo de entrenamiento con alta velocidad genera más respuestas en las pruebas de porcentaje se reduce en la prensa de piernas 1RM (0horas = 10,81%, 6,76% = 24 horas, 48 horas = 2,97% , y 72 horas = 1,35%) en la silla de extensión (0horas = 24,20%, 16,22% = 24 horas, 48 horas = 20.21% y 14.89% = 72 horas), SH (0horas = 12, 27%, 8,63% = 24 horas, 48 horas = 8,12% y 8,38% = 72 horas) y el aumento de la PC (0horas = 3,05%, 2,59% = 24 horas, 48 horas = 2,50% , y 72 horas = 2,04). Por lo tanto, podemos decir que la formación en este estudio con mayor GVR micro genera daño a los músculos, lo que aumenta la circunferencia del muslo y la caída en el rendimiento y las pruebas de resistencia máxima SH, en comparación con el grupo que llevó a cabo el protocolo de entrenamiento con GVL.

PALABRAS CLAVE: entrenamiento de fuerza con los principiantes, la velocidad de ejecución, los efectos agudos

MODIFICAÇÕES AGUDAS NA FORÇA MÁXIMA, SALTO HORIZONTAL E CIRCUNFERÊNCIA DE COXA, FRENTE UMA SESSÃO DE TREINAMENTO DE FORÇA REALIZADO COM DIFERENTES VELOCIDADES DE EXECUÇÃO

RESUMO

Na maioria das academias de musculação é senso comum entre os alunos que o exercício físico realizado em baixa velocidade de execução, induz a uma maior resposta hipertrófica. O objetivo do presente estudo foi o de acompanhar o comportamento da força, potência e da circunferência da coxa direita, de indivíduos iniciantes em exercícios contra resistência na sala de musculação, antes e após um protocolo classificado como velocidade rápida e lenta de execução dos movimentos no ciclo concêntrico-excêntrico. A amostra foi composta por 4 voluntários do sexo masculino saudáveis, com baixo nível de treinamento de força. Os sujeitos foram divididos em dois grupos, sendo que o primeiro, 2 indivíduos com idade $\bar{X}$=26,50+6,36anos, chamado de Grupo Velocidade Rápida(GVR), que executou ações mecânicas com tempo de 1,5 segundo para cada repetição. O segundo grupo foi composto por 2 indivíduos com idade =35,00+2,83anos, chamado de Grupo Velocidade Lenta(GVL), que realizou tais ações com 6 segundos por repetição. Os testes utilizados foram: 1RM no leg press 90º e cadeira extensora (utilizados também para o treinamento), perimetria da coxa (PC), salto horizontal parado (SHP), massa corporal total e estatura. Os testes foram realizados no dia anterior e nos 3 dias seguintes a realização da intervenção. Ao término dessa pesquisa, observou que o protocolo de treinamento com execuções de velocidade rápida gerou maiores respostas de quedas percentuais nos testes de 1RM no leg press (0horas=10,81%; 24horas=6,76%; 48horas=2,97%; e 72horas=1,35%), na cadeira extensora (0horas=24,20%; 24horas=16,22%; 48horas=20,21%; e 72horas=14,89%), SHP (0horas=12,27%; 24horas=8,63%; 48horas=8,12%; e 72horas=8,38%) e aumento na PC (0horas=3,05%; 24horas=2,59%; 48horas=2,50%; e 72horas=2,04). Dessa forma, podemos afirmar que neste estudo o treinamento com GVR gera maiores micro lesões musculares, aumentando assim a circunferência da coxa e queda de rendimento nos testes de força máxima e SHP, quando comparado ao grupo que realizou o protocolo de treinamento com GVL.

PALAVRAS CHAVE: treinamento de força com iniciantes; velocidade de execução; efeito agudo