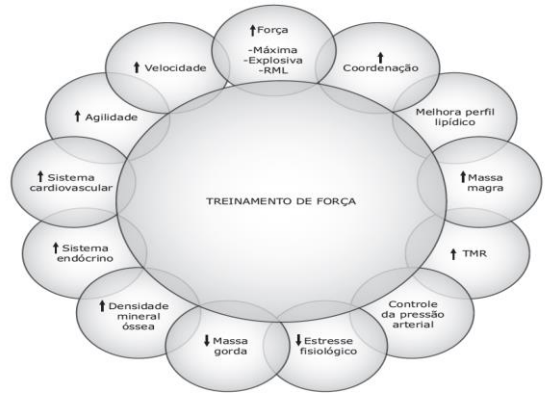
PROGRAMA DE PÓS-GRADUAÇÃO
STRICTO SENSU – EDUCAÇÃO FÍSICA

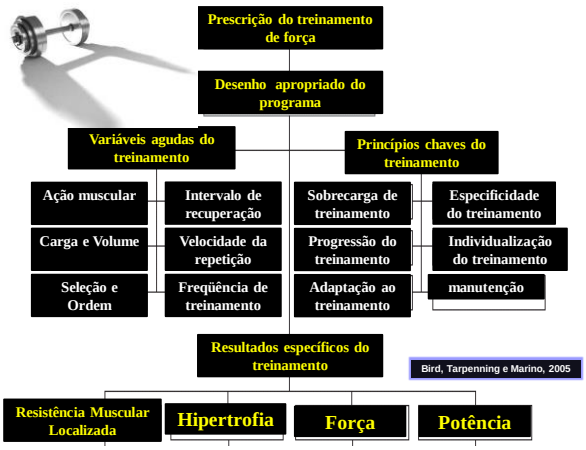
Universidade Católica de Brasília

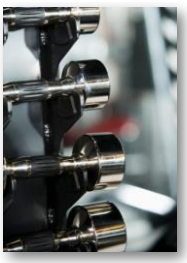
FISIOLOGIA NEUROMUSCULAR: APLICAÇÕES CLÍNICAS

PROF. DR. JONATO PRESTES



Prestes, J; Fschini, D; Marchetti, P; Charro, M. Prescrição e Periodização do TF em academias. São Paulo: Manole, 2010.





VOLUME

Geralmente é estimado pelo número total de séries e repetições realizados durante uma sessão de treinamento

INTENSIDADE

Pode ser definida em relação a 1RM (%), em número de repetições máximas (ex.12 RM) ou zona de repetições máximas.

CLASSIFICAÇÃO DO NÍVEL DE APTIDÃO FÍSICA NO TREINAMENTO DE FORÇA

Destreinados: sem experiência em TF

Treinados ou intermediários: 6 meses de TF consistente

Avançados: anos de experiência em TF que alcançaram ganhos significativos de força

Elite: atingiram nível competitivo

ACSM, 2002

CARGA MÁXIMA OU REPETIÇÕES MÁXIMAS?

NÚMERO DE REPETIÇÕES EM 60, 80 E 90% DE 1RM

	60%	80%	90%
DESTREINADOS			
Agachamento posterior	35,9 ± 13,4*#	11,8 ± 1,8*	6,5 ± 1,8#
Supino	21,6 ± 4,2#	9,1 ± 2,7	6,0 ± 1,5
Rosca	17,2 ± 3,7	8,9 ± 3,9	3,9 ± 2,1

Shimano et al. (2006). Relationship between the number of repetitions and selected percentages of one repetitions maximum in free weight exercise in trained and untrained men. Journal of Strength and Conditioning Research. 20: 819-823.

NÚMERO DE REPETIÇÕES EM 60, 80 E 90% DE 1RM

	60%	80%	90%
TREINADOS			
Agachamento posterior	29,9 ± 7,4*#	12,3 ± 2,5*	5,8 ± 2,3*
Supino	21,7 ± 3,8#	9,2 ± 1,6	4,0 ± 1,3
Rosca	19,0 ± 2,9	9,1 ± 2,8	4,4 ± 1,9

Shimano et al. (2006). Relationship between the number of repetitions and selected percentages of one repetitions maximum in free weight exercise in trained and untrained men. Journal of Strength and Conditioning Research. 20: 819-823.

Percentual de 1RM - Repetições respectivas

Nº de repetições	% da carga máxima
1	100%
2	95%
3	93%
4	90%
5	87%
6	85%
7	83%
8	80%
9	77%
10	75%
11	70%
12	67%
15	65%

BAECHLE e EARLE, 2000

Relação entre RM (repetições máximas) e porcentagem da carga máxima

Nº de repetições	% da carga máxima
1RM	100%
2RM	95%(± 2)
3RM	90%(± 3)
4RM	82%(± 4)
5RM	78%(± 5)
6RM	74%(± 6)
7RM	70%(± 7)
8RM	65%(± 8)
9RM	61%(± 9)
10RM	61%(± 10)
11RM	57%(± 11)
12RM	53%(± 12)

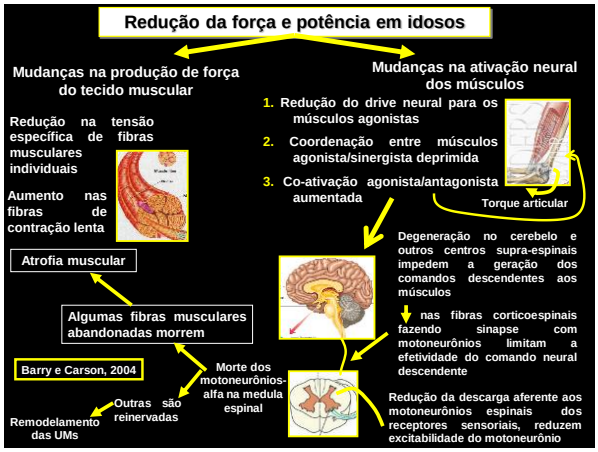
BROWN e WEIR, 2001

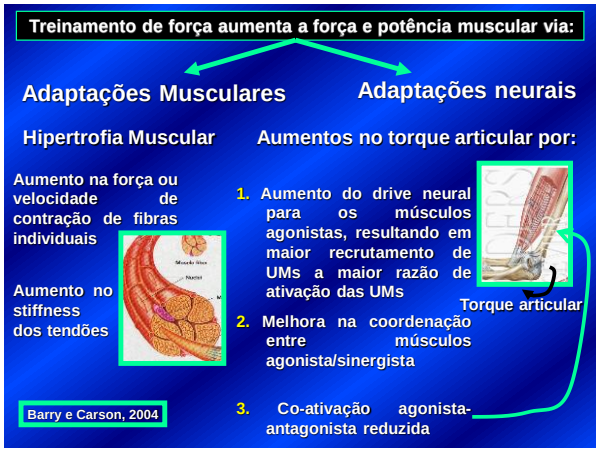
Foschini D; Prestes, P. Prescrição do Treinamento de Força. In: Prestes, J; Foschini, D; Marchetti, P; Charro, M. Prescrição e Periodização do TF em academias. São Paulo: Manole, 2010.

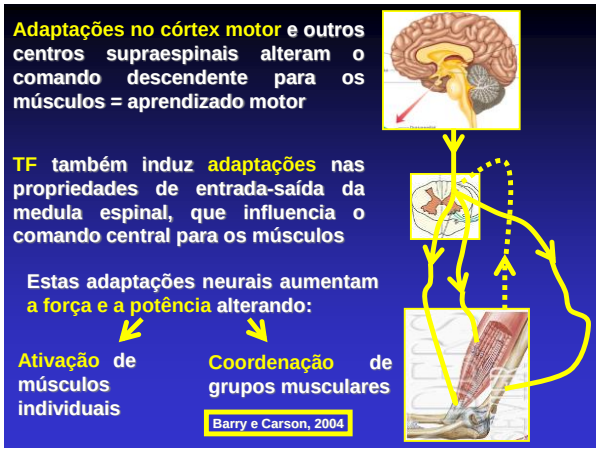
INTENSIDADE DO TREINAMENTO DE FORÇA

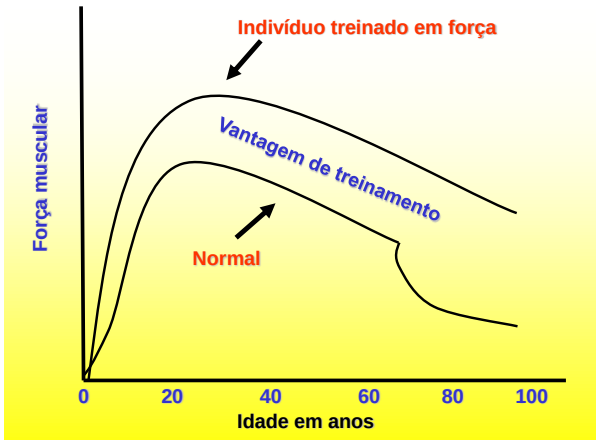
- **12-15RM =** Intensidade leve e volume alto
- **8-10RM =** Intensidade moderada e volume alto
- **4-6RM =** Intensidade alta e volume moderado
- **1-3RM =** Intensidade muito alta e volume baixo
- **1-6RM =** Dias de potência
- **20-23RM =** Intensidade muito baixa e volume muito baixo
- **Microciclo de descanso ativo ou descanso completo**

Adaptado de Kraemer e Fleck, 2009

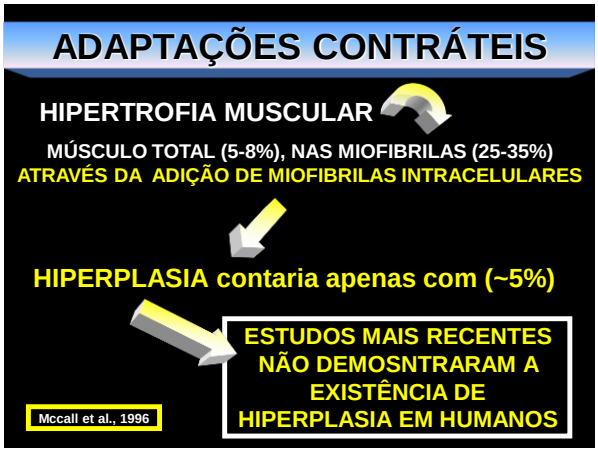

Redução da força e potência em idosos
Mudanças na produção de força do tecido muscular
Mudanças na ativação neural dos músculos
Redução na tensão específica de fibras musculares individuais
Aumento nas fibras de contração lenta
1. Redução do drive neural para os músculos agonistas
2. Coordenação entre músculos agonista/sinergista deprimida
3. Co-ativação agonista/antagonista aumentada
Torque articular
Atrofia muscular
Degeneração no cerebelo e outros centros supra-espinais impedem a geração dos comandos descendentes aos músculos
nas fibras corticoespinais fazendo sinapse com motoneurônios limitam a efetividade do comando neural descendente
Algumas fibras musculares abandonadas morrem
Barry e Carson, 2004
Morte dos motoneurônios-alfa na medula espinal
Outras são reinervadas
Remodelamento das UMs
Redução da descarga aferente aos motoneurônios espinais dos receptores sensoriais, reduzem excitabilidade do motoneurônio

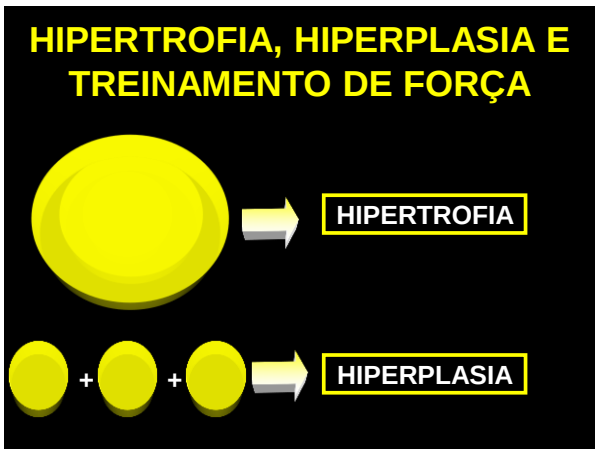

Treinamento de força aumenta a força e potência muscular via:
Adaptações Musculares
Adaptações neurais
Hipertrofia Muscular
Aumentos no torque articular por:
Aumento na força ou velocidade de contração de fibras individuais
Aumento no stiffness dos tendões
1. Aumento do drive neural para os músculos agonistas, resultando em maior recrutamento de UMs a maior razão de ativação das UMs
Torque articular
2. Melhora na coordenação entre músculos agonista/sinergista
Barry e Carson, 2004
3. Co-ativação agonista-antagonista reduzida

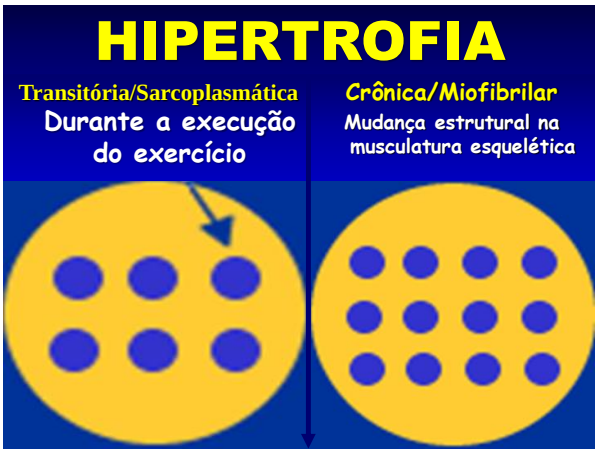

Adaptações no córtex motor e outros centros supraespinais alteram o comando descendente para os músculos = aprendizado motor
TF também induz adaptações nas propriedades de entrada-saída da medula espinal, que influencia o comando central para os músculos
Estas adaptações neurais aumentam a força e a potência alterando:
Ativação de músculos individuais
Coordenação de grupos musculares
Barry e Carson, 2004


Indivíduo treinado em força
Vantagem de treinamento
Normal
Força muscular
0
20
40
60
80
100
Idade em anos


CONCEITO DE HIPERTROFIA
Aumento no tamanho muscular
Aumento na área de secção transversal do músculo esquelético
Duncan e MacDougall, 2006

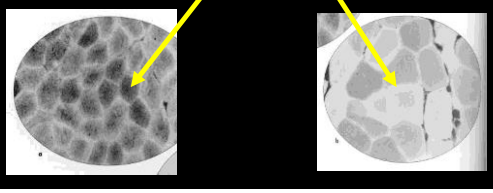

ADAPTAÇÕES CONTRÁTEIS
HIPERTROFIA MUSCULAR
MÚSCULO TOTAL (5-8%), NAS MIOFIBRILAS (25-35%)
ATRAVÉS DA ADIÇÃO DE MIOFIBRILAS INTRACELULARES
HIPERPLASIA contaria apenas com (~5%)
ESTUDOS MAIS RECENTES NÃO DEMOSNTRARAM A EXISTÊNCIA DE HIPERPLASIA EM HUMANOS
Mccall et al., 1996


HIPERTROFIA, HIPERPLASIA E TREINAMENTO DE FORÇA
HIPERTROFIA
+
+
HIPERPLASIA


HIPERTROFIA
Transitória/Sarcoplasmática
Durante a execução do exercício
Crônica/Miofibrilar
Mudança estrutural na musculatura esquelética

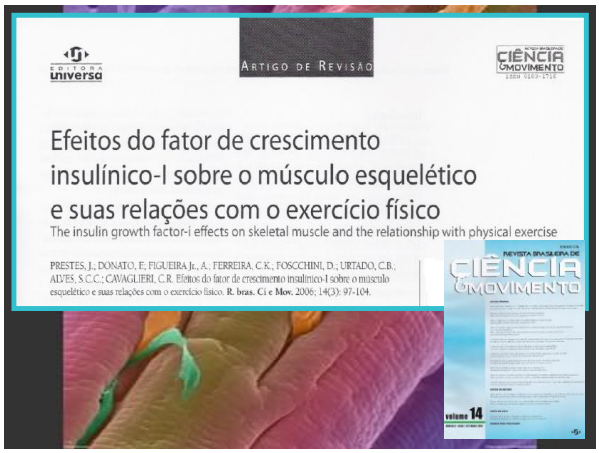
6 MESES DE TREINAMENTO DINÂMICO DE FORÇA

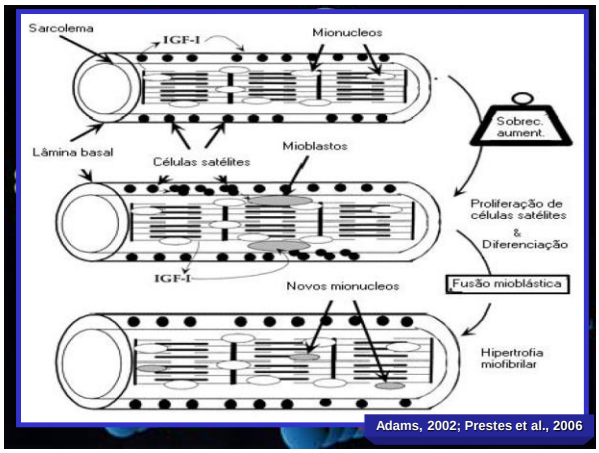
Diâmetro da fibra pré e pós treinamento

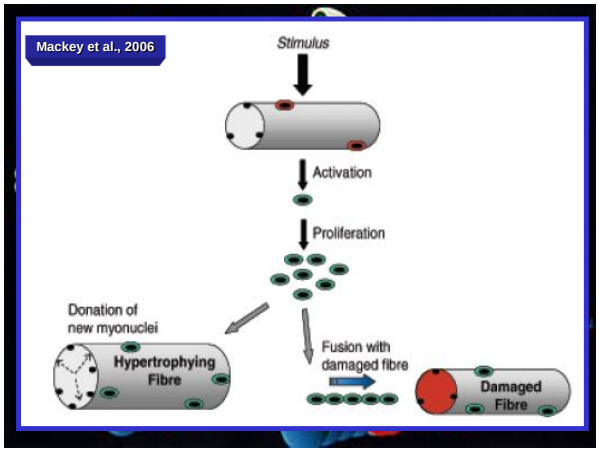


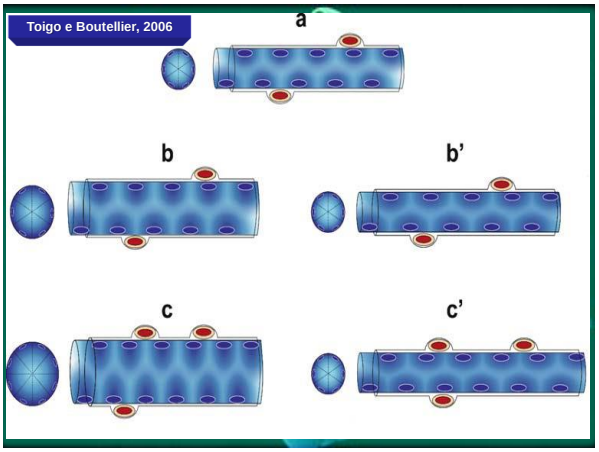
É um processo simples?

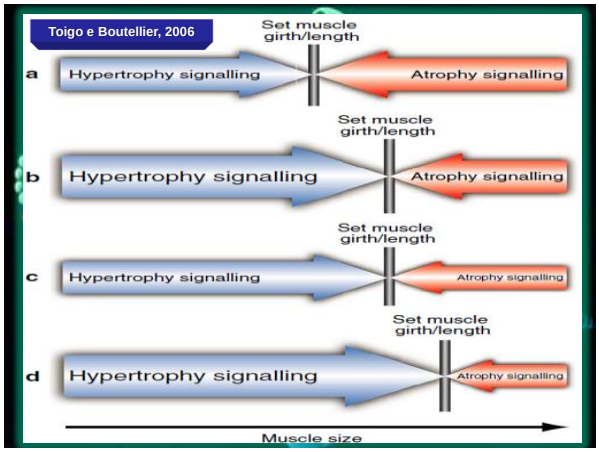
Quais são os fatores dependentes?

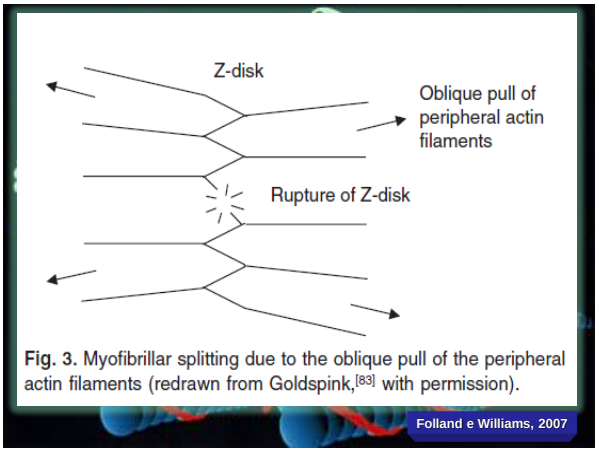





Mackey et al., 2006
Stimulus
Activation
Proliferation
Donation of new myonuclei
Hypertrophying Fibre
Fusion with damaged fibre
Damaged Fibre


Toigo e Boutellier, 2006
a
b
b'
c
c'


Toigo e Boutellier, 2006
Set muscle girth/length
a
Hypertrophy signalling
Atrophy signalling
b
c
d
Muscle size


Z-disk
Oblique pull of peripheral actin filaments
Rupture of Z-disk
Fig. 3. Myofibrillar splitting due to the oblique pull of the peripheral actin filaments (redrawn from Goldspink,[83] with permission).
Folland e Williams, 2007

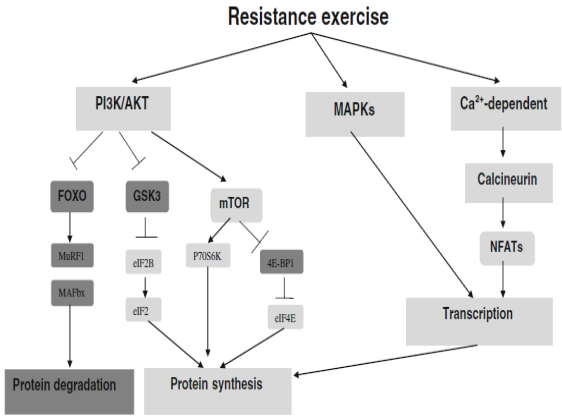
Sports Med (2013) 43:179–194
DOI 10.1007/s40279-013-0017-1

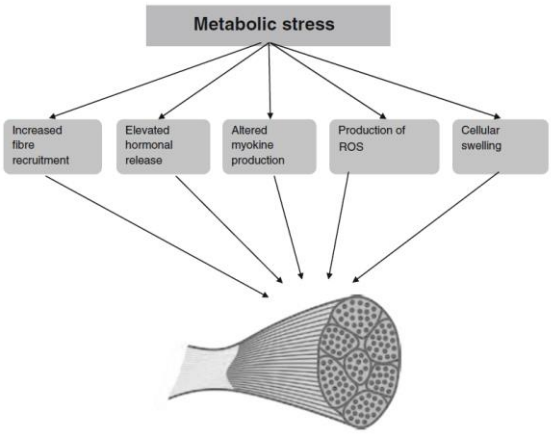
REVIEW ARTICLE

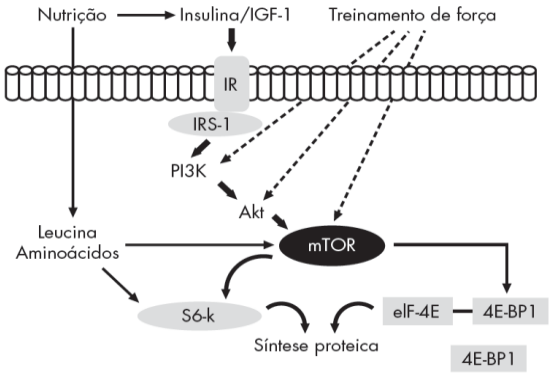
Potential Mechanisms for a Role of Metabolic Stress in Hypertrophic Adaptations to Resistance Training

Brad J. Schoenfeld

POTENCIAIS MECANISMOS SOBRE O PAPEL DO ESTRESSE METABÓLICO NAS ADAPTAÇÕES HIPERTRÓFICAS AO TF







Prestes, J; Foschini, D; Marchetti, P; Charro, M. Prescrição e Periodização do TF em academias. São Paulo: Manole, 2010.

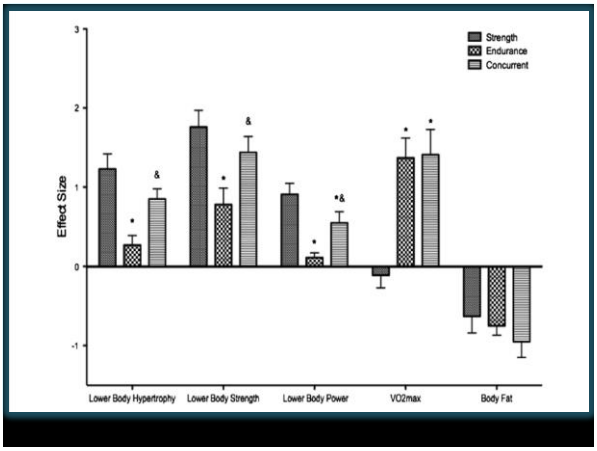

BRIEF REVIEW

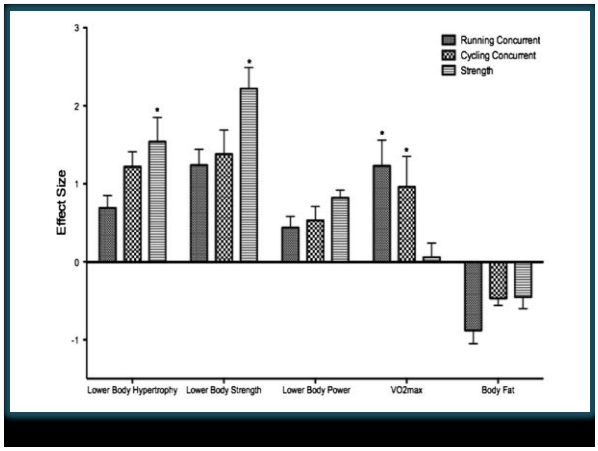
CONCURRENT TRAINING: A META-ANALYSIS EXAMINING INTERFERENCE OF AEROBIC AND RESISTANCE EXERCISES

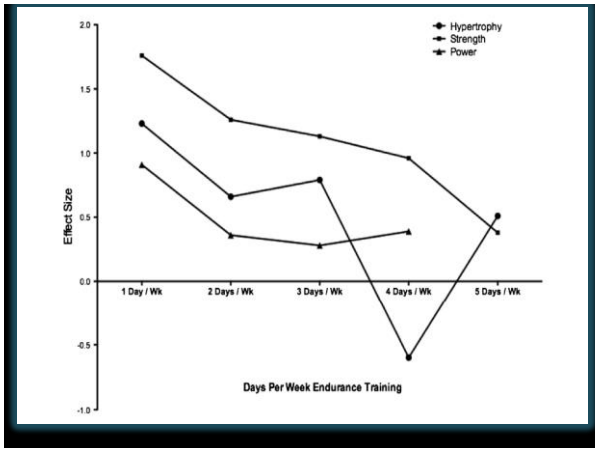
JACOB M. WILSON,[1] PEDRO J. MARIN,[2,3] MATTHEW R. RHEA,[4] STEPHANIE M.C. WILSON,[1] JEREMY P. LOENNEKE,[5] AND JODY C. ANDERSON[1]

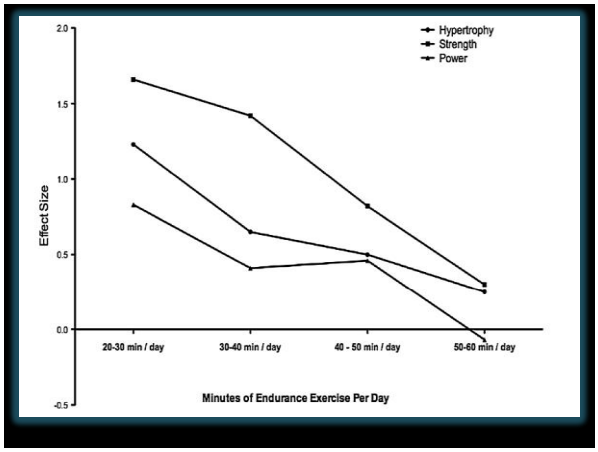
[1]Department of Health Sciences and Human Performance, The University of Tampa, Tampa, Florida; [2]Laboratory of Physiology, European University Miguel de Cervantes, Valladolid, Spain; [3]Research Center on Physical Disability, Valladolid, Spain; [4]Human Movement Program, A. T. Still University, Mesa, Arizona; [5]Department of Health and Exercise Science, The University of Oklahoma, Norman, Oklahoma

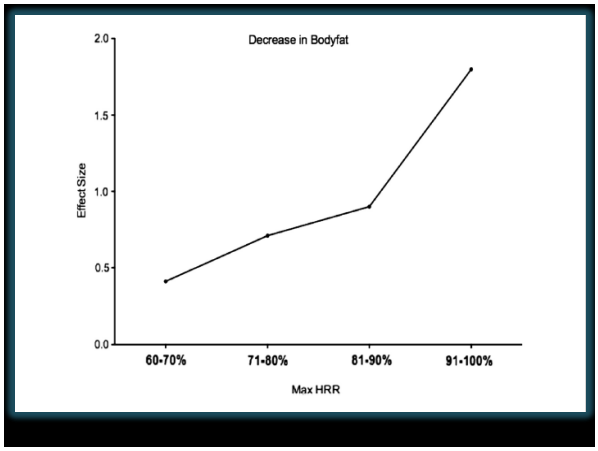
J Strength Cond Res 26(8): 2293–2307, 2012









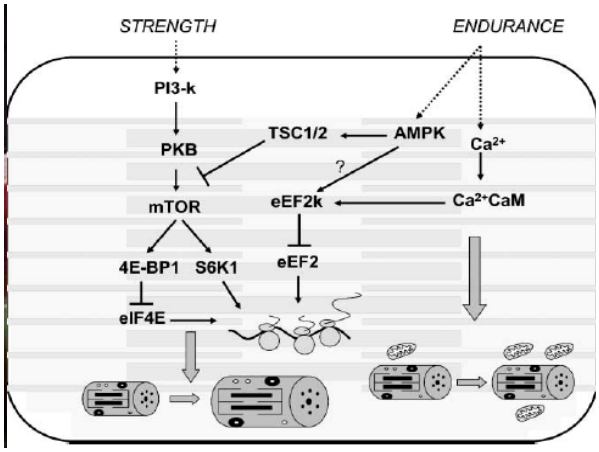


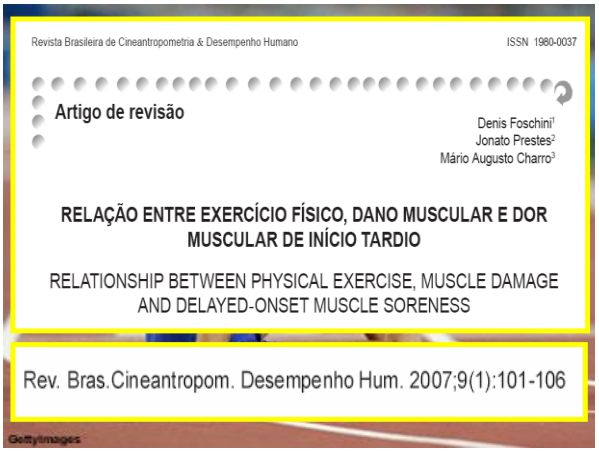
Concurrent Strength and Endurance Training: From Molecules to Man

GUSTAVO A. NADER

Research Center for Genetic Medicine, Children's National Medical Center, Washington, DC

NADER, G. A. Concurrent Strength and Endurance Training: From Molecules to Man. *Med. Sci. Sports Exerc.*, Vol. 38, No. 11, pp. 1965–1970, 2006.




Revista Brasileira de Cineantropometria & Desempenho Humano
ISSN 1980-0037
Artigo de revisão
Denis Foschini[1]
Jonato Prestes[2]
Mário Augusto Charro[3]

RELAÇÃO ENTRE EXERCÍCIO FÍSICO, DANO MUSCULAR E DOR MUSCULAR DE INÍCIO TARDIO

RELATIONSHIP BETWEEN PHYSICAL EXERCISE, MUSCLE DAMAGE AND DELAYED-ONSET MUSCLE SORENESS

Rev. Bras.Cineantropom. Desempenho Hum. 2007;9(1):101-106

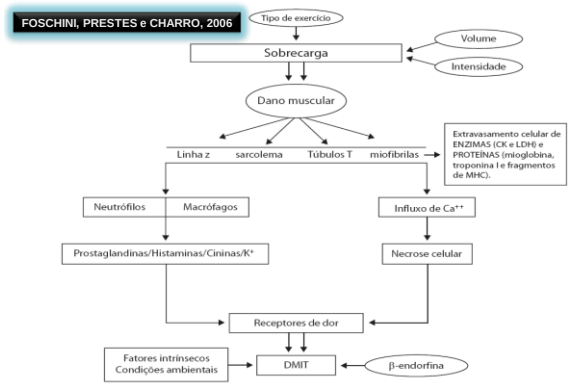
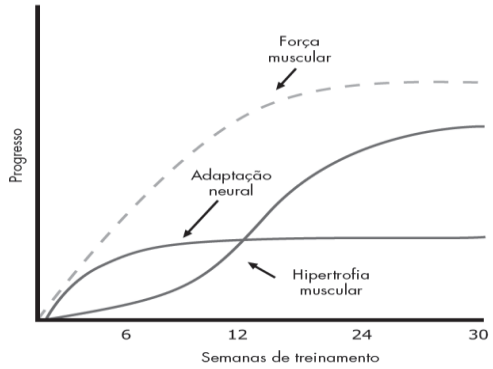


Figura 1. Representação teórica das relações entre o exercício, dano muscular e DMIT proposta por Foschini, Prestes e Charro. CK = creatina kinase, LDH = lactato desidrogenase, fragmentos de MHC = fragmentos de cadeia pesada de miosina, DMIT = dor muscular de início tardio.



- Aumento progressivo da força muscular decorrente das adaptações fisiológicas (neurais e hipertrofia muscular) ao treinamento de força. Adaptado de Sale[36].

J Appl Physiol 102: 368–373, 2007.
First published October 19, 2006; doi:10.1152/japplphysiol.00789.2006.

Early skeletal muscle hypertrophy and architectural changes in response to high-intensity resistance training

O. R. Seynnes, M. de Boer, and M. V. Narici
Institute for Biophysical and Clinical Research Into Human Movement, Manchester Metropolitan University, Alsager, United Kingdom

Hipertrofia antecipada e mudança na arquitetura muscular em resposta ao TF de alta intensidade

7 pessoas jovens fisicamente ativas

TREINAMENTO DE 35 DIAS:

Extensão dos joelhos bilateral 3 x semana

3 x 7 reps submáximas

4 x 7RM – 2 min. intervalo

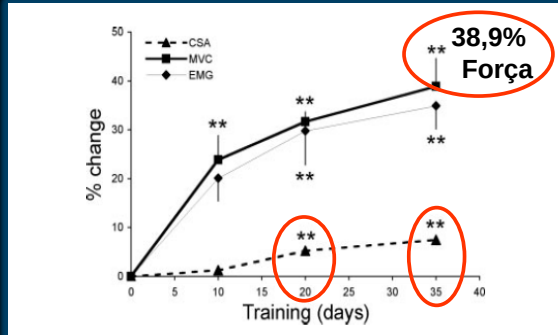


Fig. 2. Time course of changes in proximal quadriceps cross-sectional area (CSA), maximal voluntary contraction (MVC), and EMG activity. Values are means ± SE. $^{**}P < 0.01$ vs. baseline.

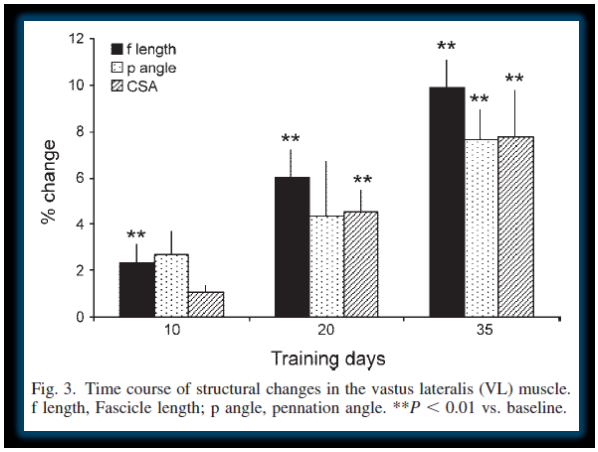
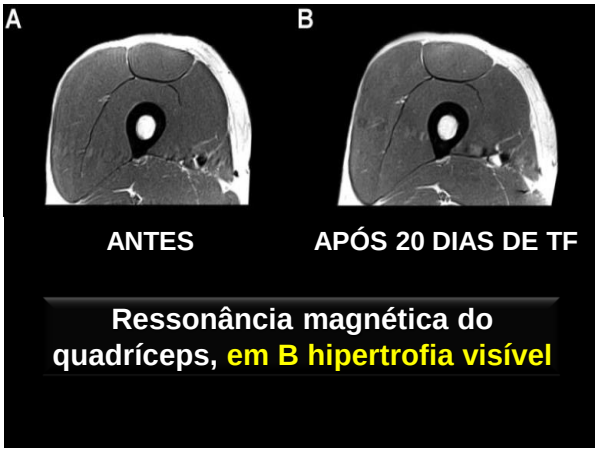


Fig. 3. Time course of structural changes in the vastus lateralis (VL) muscle. f length, Fascicle length; p angle, pennation angle. $^{**}P < 0.01$ vs. baseline.



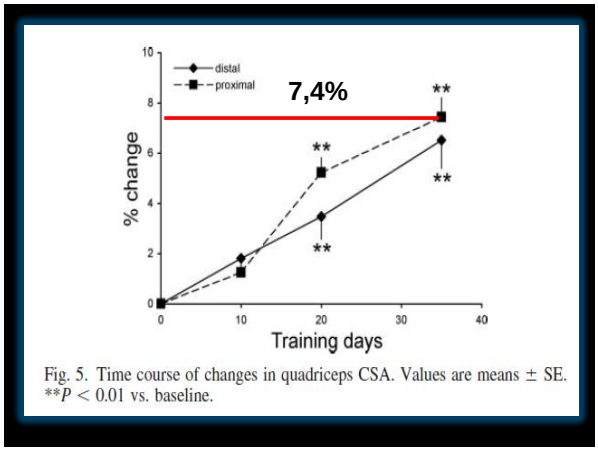


Fig. 5. Time course of changes in quadriceps CSA. Values are means ± SE. $^{**}P < 0.01$ vs. baseline.

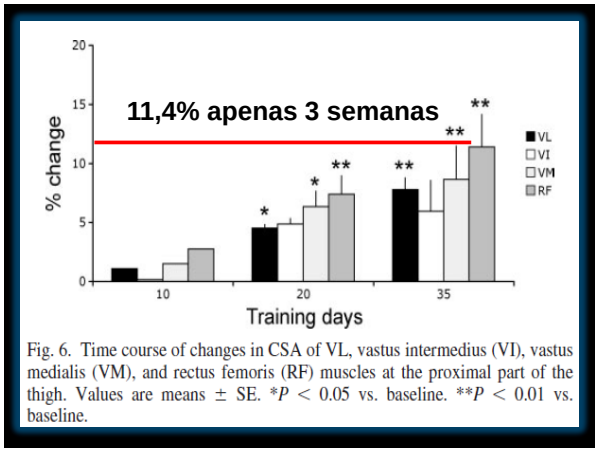
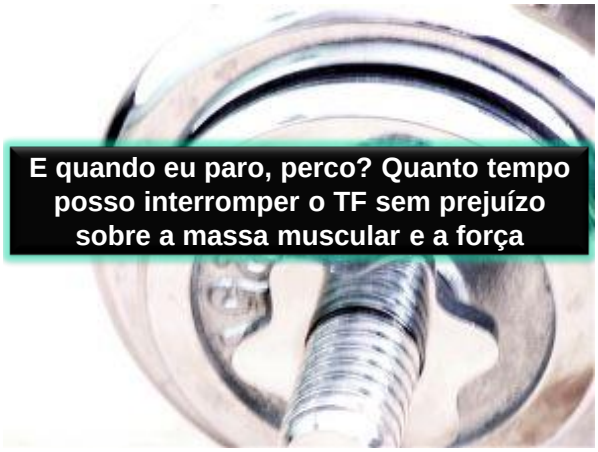


Fig. 6. Time course of changes in CSA of VL, vastus intermedius (VI), vastus medialis (VM), and rectus femoris (RF) muscles at the proximal part of the thigh. Values are means ± SE. *$P < 0.05$ vs. baseline. **$P < 0.01$ vs. baseline.



E quando eu paro, perco? Quanto tempo posso interromper o TF sem prejuízo sobre a massa muscular e a força

Eur J Appl Physiol
DOI 10.1007/s00421-012-2511-9

ORIGINAL ARTICLE

Comparison of muscle hypertrophy following 6-month of continuous and periodic strength training

Riki Ogasawara · Tomohiro Yasuda · Naokata Ishii · Takashi Abe

Eur J Appl Physiol. 2013 Apr;113(4):975-85.

Comparação da hipertrofia muscular após 6 meses de TF contínuo versus periódico

14 HOMENS JOVENS DETREINADOS

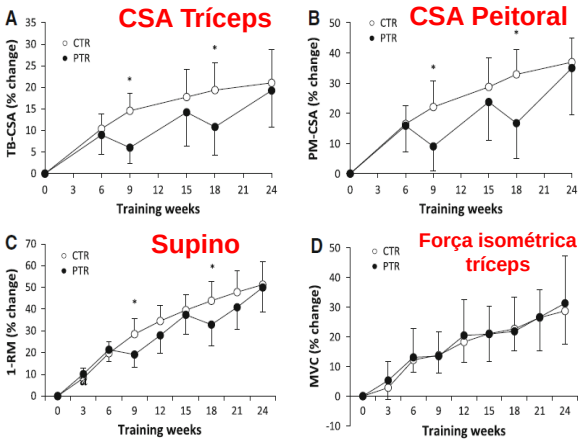
TREINAMENTO DE FORÇA

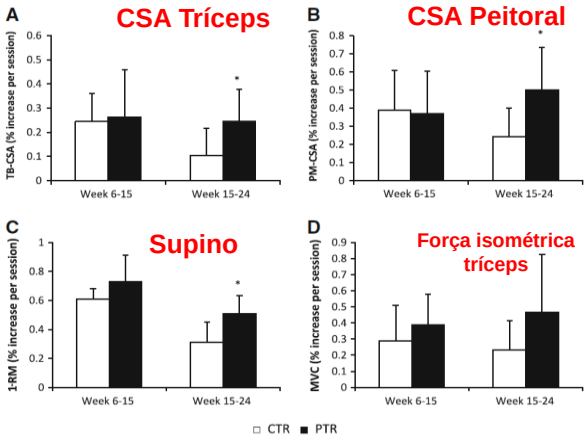
3 x semana supino

3 x 10 reps a 75% de 1RM (reaferida a cada 3 semanas) c/ 2-3 minutos de intervalo

Contínuo: 24 semanas

Periódico: 6 semanas treino + dois ciclos de 3 semanas de destreino / 6 retreino





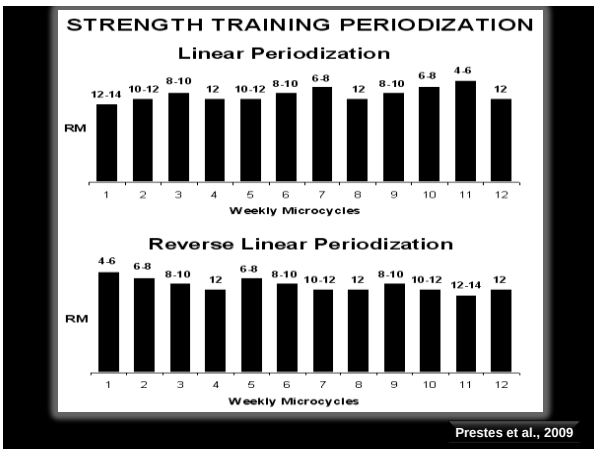
COMPARISON OF LINEAR AND REVERSE LINEAR PERIODIZATION EFFECTS ON MAXIMAL STRENGTH AND BODY COMPOSITION

JONATO PRESTES,[1] CRISTIANE DE LIMA,[2] ANELENA B. FROLLINI,[2] FELIPE F. DONATTO,[2] AND MARCELO CONTE[3]

[1]Physiological Sciences Department, Exercise Physiology Laboratory, Federal University of São Carlos, São Paulo, Brazil; [2]Health Sciences Department, Physical Education Post-Graduation Program, Methodist University of Piracicaba, Piracicaba, São Paulo, Brazil; and [3]Superior School of Physical Education, Jundiaí, São Paulo, Brazil

J Strength Cond Res 23(1): 266–274, 2009

Comparação dos efeitos da periodização linear e linear reversa sobre a força máxima e a composição corporal



STRENGTH TRAINING PROGRAM

Performed exercises	
Training A	Training B
1. Bench press	1. Back squat
2. Inclined chest fly	2. Leg extension
3. Dumbbell shoulder press	3. Leg curl
4. Lateral raise	4. Glute kickbacks
5. Standing arm curl	5. Hip abduction
6. Biceps preacher curl	6. Hip adduction
7. Triceps extension	7. Standing calf raise
8. Close-grip bench press	8. Lat pull-down
	9. Seated row

Series X Repetitions	Rest interval
3 X 12 - 14 repetitions	45s
3 X 10 - 12 repetitions	1min
3 X 8 - 10 repetitions	1min and 20s
3 X 6 - 8 repetitions	1min and 40s
3 X 4 - 6 repetitions	2min

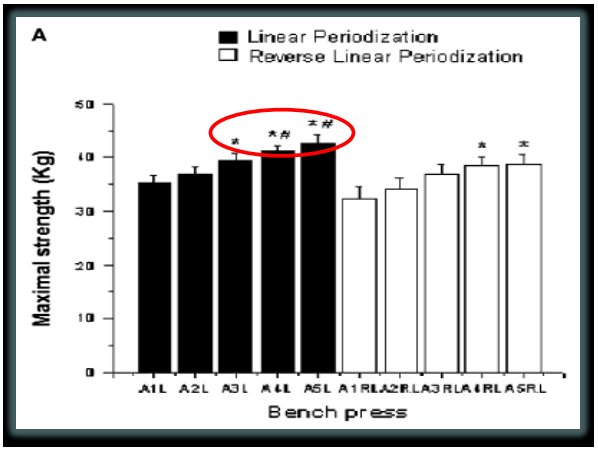
Prestes et al., 2009

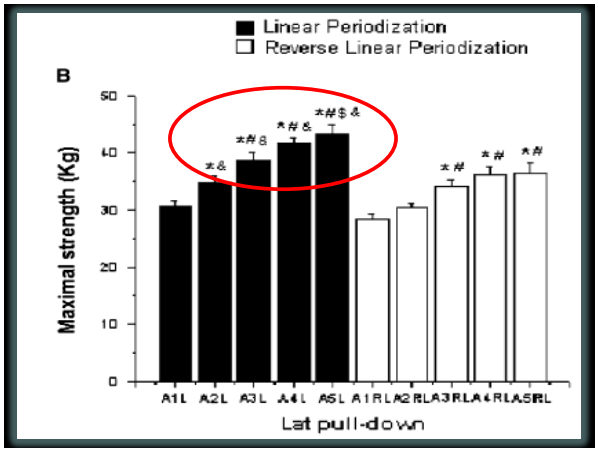
TABLE 1. Baseline subject characteristics.

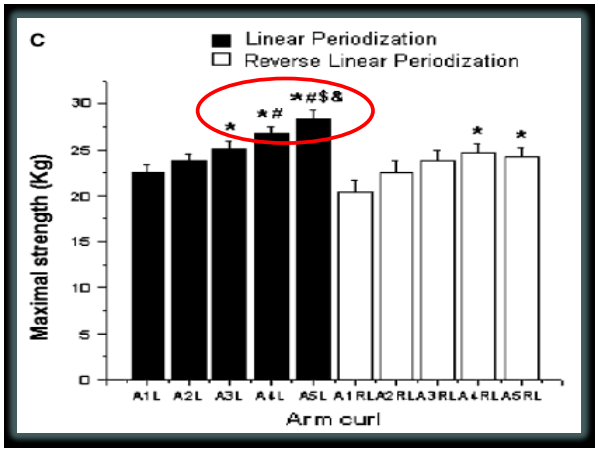
Variables	LP	RLP
Age (y)	27.6 ± 1.15	26.2 ± 0.92
Height (m)	1.62 ± 0.01	1.62 ± 0.02
Body mass (kg)	56.83 ± 1.57	55.78 ± 1.85
Body mass index	21.69 ± 0.53	21.29 ± 0.54
Training experience (y)	1.4 ± 0.68	1.6 ± 0.45

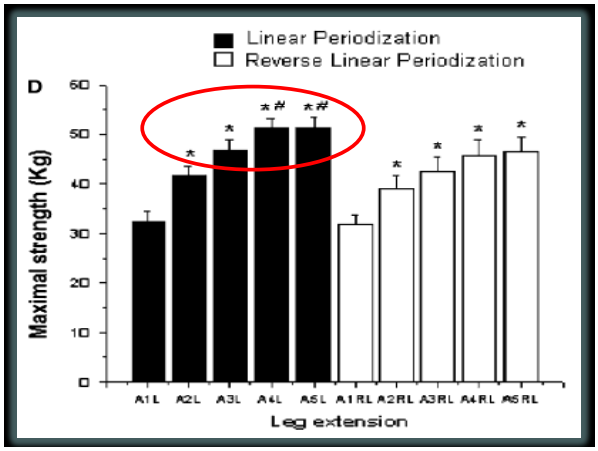
TABLE 2. Anthropometric variables during 12 weeks of strength training.

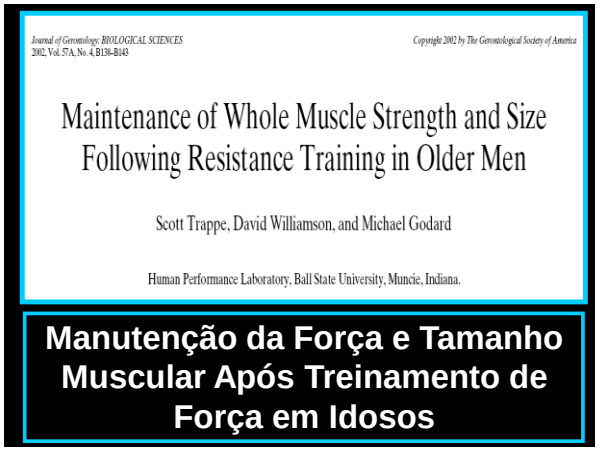
AV	Groups	A1	A2	A3	A4	A5
FM	LP	13.46 ± 0.62	11.91 ± 0.90	11.83 ± 1.01	11.07 ± 0.93*	11.13 ± 0.95
	RLP	14.39 ± 1.03	13.80 ± 0.97	13.32 ± 0.96	12.79 ± 0.93	12.34 ± 0.65
FFM	LP	43.37 ± 1.03	46.03 ± 0.85†	45.68 ± 0.75†	46.44 ± 0.95*†	46.72 ± 0.96*†
	RLP	41.39 ± 1.33	41.93 ± 1.30	42.34 ± 1.24	42.92 ± 1.23	42.68 ± 1.12
BF%	LP	23.05 ± 0.80	20.58 ± 1.15	20.38 ± 1.25	19.23 ± 1.25*	19.09 ± 1.23*
	RLP	25.06 ± 1.61	24.02 ± 1.59	23.25 ± 1.56	22.31 ± 1.38	22.76 ± 1.47










Journal of Gerontology: BIOLOGICAL SCIENCES
2002, Vol. 57A, No. 4, B130–B143

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Maintenance of Whole Muscle Strength and Size Following Resistance Training in Older Men

Scott Trappe, David Williamson, and Michael Godard

Human Performance Laboratory, Ball State University, Muncie, Indiana.

Manutenção da Força e Tamanho Muscular Após Treinamento de Força em Idosos

MÉTODOS

12 semanas de TF de força progressivo, executado na extensão dos joelhos a 80% de 1RM

2-3s na subida e 2-3s na fase excêntrica, a RM foi avaliada a cada 2 semanas

TF era realizado 3 x semana, 2 séries de 10RM + 1 série até a fadiga, com 2 minutos de intervalo entre as séries

MÉTODOS

Depois de 12 semanas de TF, o grupo DR parou com treinamento (6 meses)

O grupo TR continuou o TF por mais 12 semanas, porém, apenas 1 x semana

TF era realizado 1 x semana, 3 séries de 10RM, a cada 4 semanas 1RM era testada

Table 1. Subject Characteristics for the TR and DT Groups

Group	Age (y)	Height (cm)	Weight (kg) T1	Weight (kg) T2	Weight (kg) T3
TR (n = 5)	75 ± 1	175 ± 3	74.1 ± 3.3	73.5 ± 3.5	70.8 ± 4.0
DT (n = 5)	69 ± 1	183 ± 5	88.1 ± 7.2*	88.8 ± 7.2*	88.1 ± 7.7*

Table 2. 1RM Knee Extensor Strength for T1, T2, and T3

Subject	T1	T2	T3	%Δ T1 vs T2	%Δ T2 vs T3
Detraining					
A	28.8	54.6	48.9	90.0	−10.5
B	57.5	86.3	80.5	50.0	−6.7
C	54.6	86.3	74.7	57.9	−13.3
D	46.0	63.3	57.5	37.5	−9.1
E	63.3	80.5	69.0	27.3	−14.3
Mean	50.0	74.2*	66.1*,**	52.5	−10.8
SE	6.0	6.5	5.8	10.7	1.4
Training					
F	69.0	106.4	109.3	54.2	2.7
G	46.0	77.6	80.5	75.0	0.0
H	63.3	94.9	97.8	54.6	0.0
I	100.6	120.8	129.4	20.0	7.1
J	51.8	63.3	63.3	22.2	0.0
Mean	66.1	93.7*	96.0*	45.2	2.0
SE	9.5	10.0	11.4	10.5	1.4

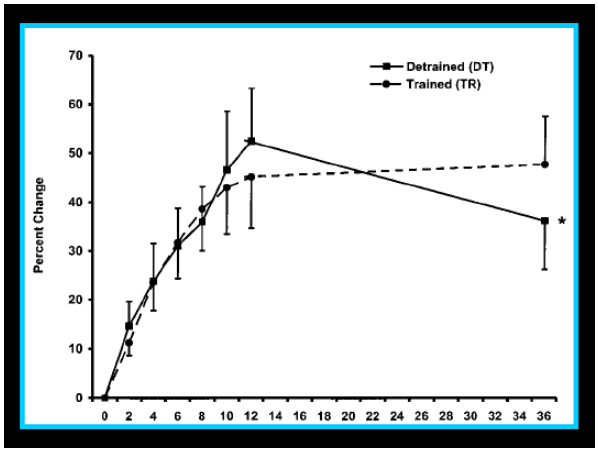


Table 3. Whole Muscle Size of the Right Thigh as Determined From CT for T1, T2, and T3

Subject	T1	T2	T3	%Δ T1 vs T2	%Δ T2 vs T3
Detraining					
A	105.9	116.5	108.5	10.1	−6.9
B	124.6	134.0	127.1	7.5	−5.1
C	160.7	167.1	159.1	4.0	−4.8
D	107.0	111.3	108.9	4.1	−2.2
E	135.3	144.8	136.1	7.0	−6.0
Mean	126.7	134.8*	127.9**	6.5	−5.0
SE	10.2	10.1	9.4	1.1	0.8
Training					
F	133.9	142.9	142.2	6.7	−0.5
G	142.8	148.8	148.0	4.2	−0.5
H	141.6	160.2	153.8	13.1	−3.9
I	175.2	177.3	179.2	1.2	1.1
J	115.5	129.1	129.5	11.8	0.3
Mean	141.8	151.6*	150.5*	7.4	−0.7
SE	9.7	8.1	8.2	2.3	0.9

CONCLUSÕES DO ESTUDO

TF de 12 semanas com 80% de 1RM é suficiente para aumentar e preservar a massa muscular e força em idosos

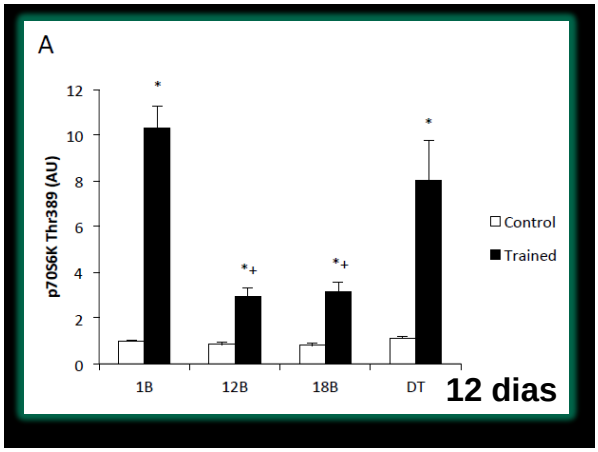
Um dia de treinamento por semana (baixo volume) com alta intensidade (80% de 1RM) foi suficiente para atenuar o processo de sarcopenia

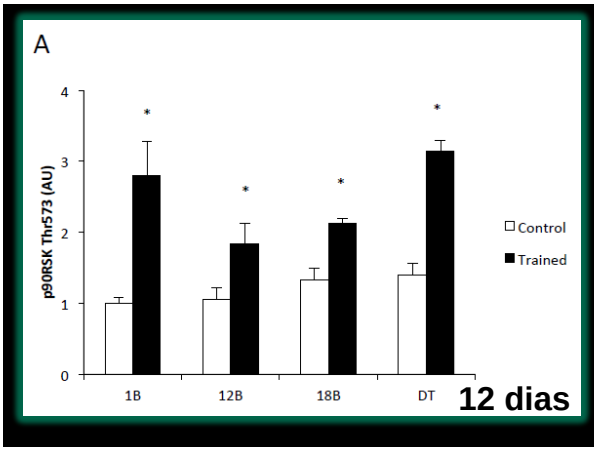
mTOR signaling response to resistance exercise is altered by chronic resistance training and detraining in skeletal muscle

Riki Ogasawara[1,2,3], Koji Kobayashi[4], Arata Tsutaki[4], Kihyuk Lee[4], Takashi Abe[5], Satoshi Fujita[2], Koichi Nakazato[4], Naokata Ishii[3]

Resposta da sinalização da mTOR ao TF é alterada pelo TF crônico e destreinamento

Articles in PresS. J Appl Physiol (January 31, 2013). doi:10.1152/japplphysiol.01161.2012





Eur J Appl Physiol (2002) 88: 50–60
DOI 10.1007/s00421-002-0681-6

ORIGINAL ARTICLE

Gerson E.R. Campos · Thomas J. Luecke
Heather K. Wendeln · Kumika Toma
Fredrick C. Hagerman · Thomas F. Murray
Kerry E. Ragg · Nicholas A. Ratamess
William J. Kraemer · Robert S. Staron

Muscular adaptations in response to three different resistance-training regimens: specificity of repetition maximum training zones

ADAPTAÇÕES MUSCULARES EM RESPOSTA A TRÊS DIFERENTES REGIMES DE TF: ESPECIFICIDADE DAS ZONAS DE TREINAMENTO DE RM

TREINAMENTO DE FORÇA

8 semanas = 4 sem c/ 2x + 4 c/ 3x. Exercícios: leg press, agachamento e cadeira extensora

Low repetitions: 4x 3-5RM, 3 min. descanso

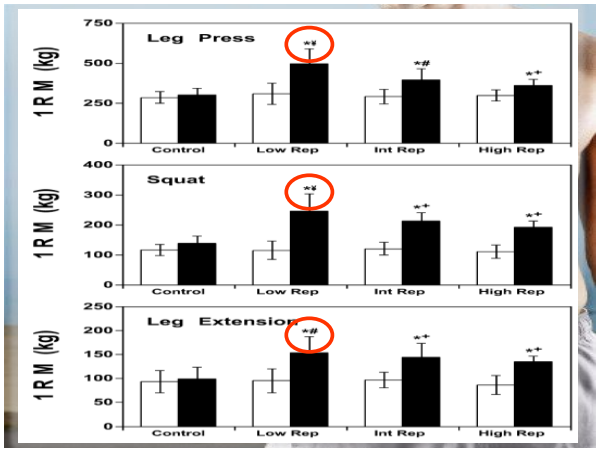
Int. repetitions: 3x 9-11RM, 2 min. descanso

High repetitions: 2x 20-28RM, 1 min. descanso

Table 5. Cross-sectional area (μm^2) of the three major muscle fiber types. Data are presented as mean (SD)

Training condition	Muscle fiber type		
	I	IIA	IIB
CONTROL			
Pre	5208 (1494)	6070 (1944)	4648 (1043)
Post	5155 (1239)	5982 (1547)	4813 (672)
LOW REP			
Pre	4869 (1178)	5615 (1042)	4926 (942)
Post	5475 (1425)*	6903 (1442)*	6171 (1436)*
INT REP			
Pre	4155 (893)	5238 (787)	4556 (877)
Post	4701 (809)*	6090 (1421)*	5798 (1899)*
HIGH REP			
Pre	3894 (1085)	5217 (1009)	4564 (1179)
Post	4297 (1203)	5633 (596)	5181 (714)

*Significantly different from corresponding pre-training values



REVIEW ARTICLE

Sports Med 2004; 34 (10): 663-679
0112-1642/04/0010-0663/$31.00/0
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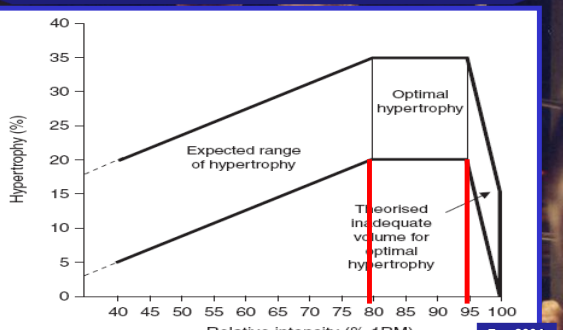
The Role of Resistance Exercise Intensity on Muscle Fibre Adaptations

Andrew C. Fry

Human Performance Laboratories, The University of Memphis, Memphis, Tennessee, USA

PAPEL DA INTENSIDADE DO TF SOBRE AS ADAPTAÇÕES NAS FIBRAS MUSCULARES

TREINAMENTO DE FORÇA E HIPERTROFIA MUSCULAR



Fry, 2004

TABLE 1. Fiber-type proportions in different populations or resulting from various types of training.

Population	Fiber-Type Distribution (%) I	IIa	IIx	Hybrids
Recreationally active young men (9,34,46)	41	33	6	20
Resistance-trained (1,34,46)	39	56	< 1	5
Body builders (9)	27	47	9	17
Plyometric trained (28)	29	42	2	27
Sprint trained (2,22)	44	42	6	8
Endurance trained (15,47)	69	29	1	1
Elderly men (10,41)	61	22	2	15

Values represent the mean proportions of muscle fibers containing either type I, IIa, or IIx myosin heavy-chain (MHC) isoforms in different populations or after various training programs. Hybrid fibers contain more than one MHC isoform (I/IIa or IIa/IIx). All results stem from studies in which a pool of single fibers were analyzed for MHC isoform content using gel electrophoresis. Two of the studies on endurance-trained individuals were performed on gastrocnemius muscle (15,47), and the other data were obtained from vastus lateralis muscle.

MALISOUX, FRANCAUX e THEISEN, 2007

RECOMENDAÇÕES DO TREINAMENTO ISOMÉTRICO PARA HIPERTROFIA

	Treinamento isométrico baixa intensidade	Treinamento isométrico alta intensidade	Treinamento isométrico de intensidade máxima
Seleção do exercício	Mono/Multi articulares	Mono/Multi articulares	Mono/Multi articulares
Nível de torque	30-50% da CIVM	70-80% da CIVM	100% da CIVM
Repetições	1	1	10
Séries	2-6 por exercício Progressão de 2 para 4-6 p/ grupo muscular	2-6 por exercício Progressão de 2 para 4-6 p/ grupo muscular	1-3 por exercício Progressão de 1 para 3 p/ grupo muscular
Duração por repetição	40-60s, até a falha nas 1-2 séries finais	15-20s, até a falha nas 1-2 séries finais	3-5s
Descanso entre as séries e repetições	30-60s	30-60s	25-30s, 60s
Freqüência	3-4 sessões p/ grupo muscular/semana	3-4 sessões p/ grupo muscular/semana	3 sessões p/ grupo muscular/semana

CIVM = contração isométrica voluntária máxima

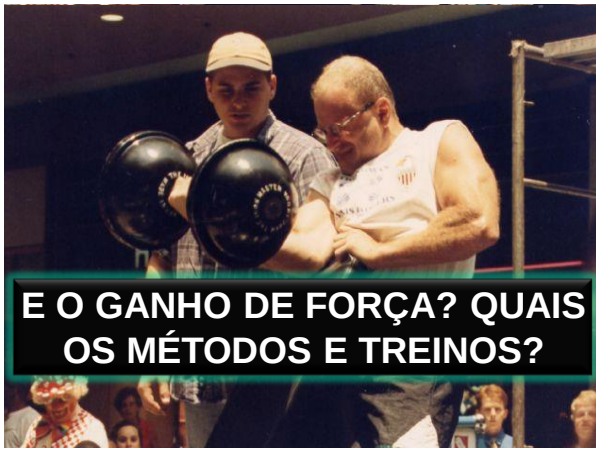
Wernborn et al., 2007

Isométrico baixa intensidade: interessante para indivíduos que não toleram altas forças e c/ restrição de angulação de movimento devido a dor e/ou lesão

Isométrico alta intensidade: interessante para indivíduos que não toleram forças próximas do máximo

Isométrico de intensidade máxima: tomar cuidado com respiração excessivamente interrompida e elevação na pressão arterial

Wernborn et al., 2007



SPECIAL COMMUNICATIONS

AMERICAN COLLEGE of SPORTS MEDICINE

Progression Models in Resistance Training for Healthy Adults

POSITION STAND

This pronouncement was written for the American College of Sports Medicine by Nicholas A. Ratamess, Ph.D.; Brent A. Alvar, Ph.D.; Tammy K. Evetoch, Ph.D., FACSM; Terry J. Housh, Ph.D., FACSM (Chair); W. Ben Kibler, M.D., FACSM; William J. Kraemer, Ph.D., FACSM; and N. Travis Triplett, Ph.D.

0195-9131/09/4103-0687/0
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

DIVISÃO DO TRABALHO DE FORÇA

TABELA 2. Caracterização das formas de manifestação da força muscular para iniciantes

	Intensidade	Número de séries (por exercício)	Intervalo/ séries (minutos)	Velocidade movimento	Frequência semanal (dias/ semana)
Força máxima	8 a 12 SFC (60 a 70% FM)	1 a 3	1 a 2	Lenta para moderada	2 a 3x p/ todo o corpo
Força hipertrófica	8 a 12RM (70 a 85% FM)	1 a 3	1 a 2	Moderada	2 a 3x p/ todo o corpo
Força explosiva	3 a 6 SFC 30 a 60% FM (MMSS) 0 a 60% FM (MMII)	1 a 3	2 a 3 (IA) 1 a 2 (IL)	Moderada para rápida	2 a 3x p/ todo o corpo
Resistência de força	10 a 15RM	1 a 3	< 1	Lenta	2 a 3x p/ todo o corpo

SFC = sem falha concêntrica; RM = repetições máximas; FM = força máxima; IA = intensidade alta; IL = intensidade leve/moderada; MMSS = membros superiores; MMII = membros inferiores.

ACSM, 2002; 2009

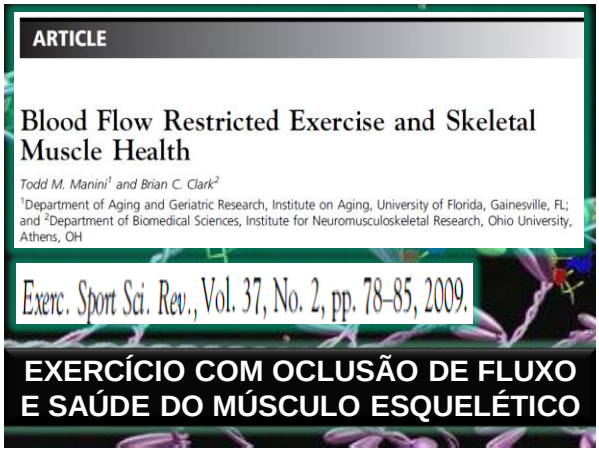
DIVISÃO DO TRABALHO DE FORÇA

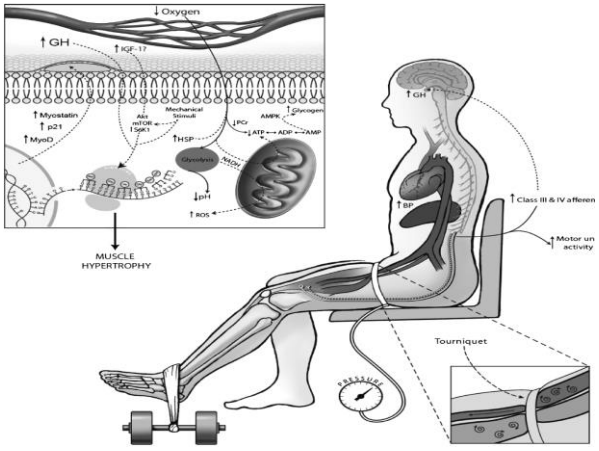
TABELA 4. Caracterização das formas de manifestação da força muscular para avançados

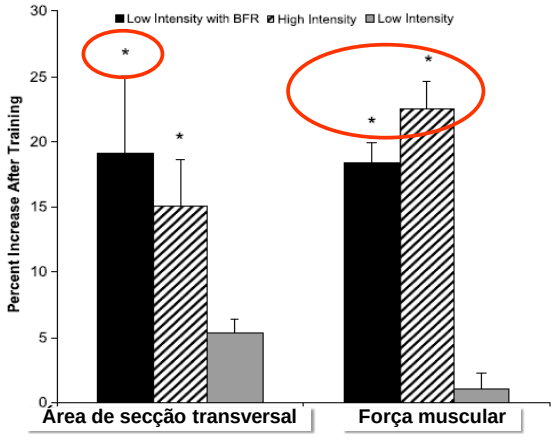
	Intensidade	Nº de séries/ exercício	Intervalo/ séries (minutos)	Velocidade do movimento	Frequência semanal (dias/ semana)
Força máxima	1 a 6RM (80-100% FM)	Múltiplas séries	2 a 3 (IA) 1 a 2 (IL)	Lenta a rápida	4 a 6x (com parcelamento dos grupos MM)
Força hipertrófica	1 a 12RM (70-100% FM) (ênfase 6-12RM)	3-6 (periodizado)	2 a 3 (IA) 1 a 2 (IL)	Lenta, moderada e rápida	4 a 6x (com parcelamento dos grupos MM)
Força explosiva	Treino p/ força máxima = 85 a 100% Treino p/ velocidade = 30 a 60% FM (MMSS) 0 a 60% FM (MMII)	3-6 (periodizado)	2 a 3 (IA) 1 a 2 (IL)	Rápida	4 a 5x p/todo o corpo ou parcelando MMSS e MMII
Resistência de força	≥ 15RM	Múltiplas séries	1 a 2	Moderada p/ rápida	4 a 6x (com parcelamento dos grupos MM)

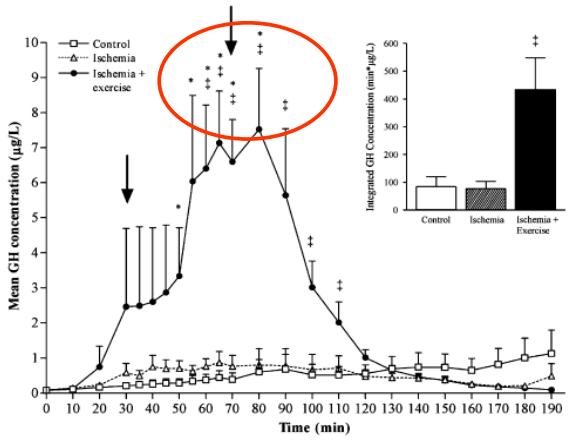
RM = repetições máximas; FM = força máxima; IA = intensidade alta; IL = intensidade leve/moderada; MMSS = membros superiores; MMII= membros inferiores.

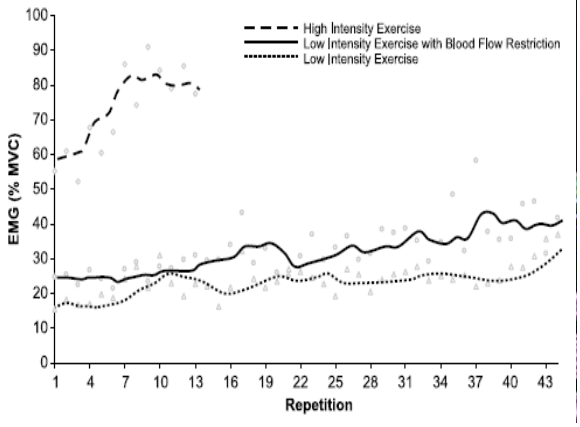
ACSM, 2002; 2009

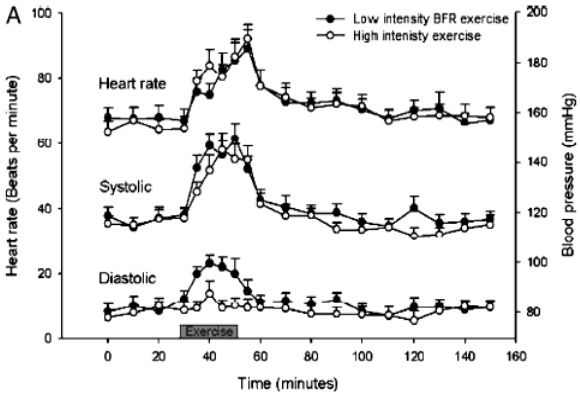


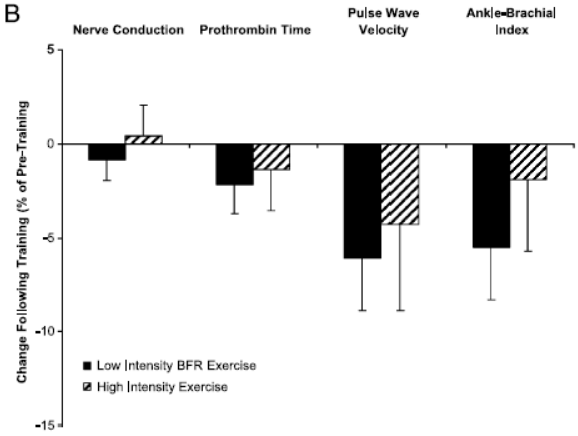



Low Intensity with BFR
High Intensity
Low Intensity
Percent Increase After Training
Área de secção transversal
Força muscular


Control
Ischemia
Ischemia + exercise
Mean GH concentration (µg/L)
Time (min)
Integrated GH Concentration (min*µg/L)
Control
Ischemia
Ischemia + Exercise


High Intensity Exercise
Low Intensity Exercise with Blood Flow Restriction
Low Intensity Exercise
EMG (% MVC)
Repetition


A
Low intensity BFR exercise
High intensity exercise
Heart rate
Systolic
Diastolic
Exercise
Heart rate (Beats per minute)
Blood pressure (mmHg)
Time (minutes)



Clin Physiol Funct Imaging (2013) doi: 10.1111/cpf.12117

Effect of very low-intensity resistance training with slow movement on muscle size and strength in healthy older adults

Yuya Watanabe[1], Haruhiko Madarame[1], Riki Ogasawara[2], Koichi Nakazato[3] and Naokata Ishii[1]

[1]Department of Life Sciences, Graduate School of Arts and Sciences, The University of Tokyo, Tokyo, [2]Department of Human and Engineered Environmental Studies, Graduate School of Frontier Sciences, The University of Tokyo, Chiba, and [3]Graduate School of Health and Sport Science, Nippon Sport Science University, Tokyo, Japan

Efeitos do treinamento de força de intensidade muito baixa com o movimento lento sobre o tamanho muscular e força em idosos saudáveis

Table 1 Physical characteristics of the participants.

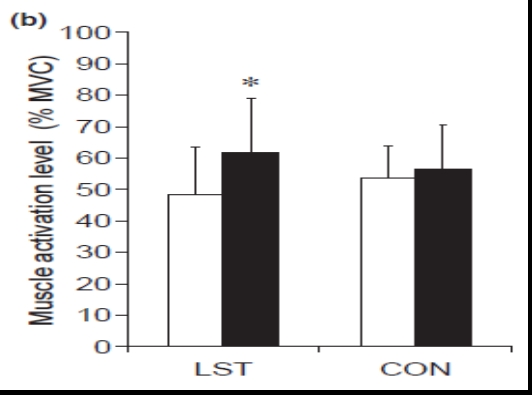
	LST (n = 9:7 men and 2 women)	CON (n = 9:7 men and 2 women)
Age (years)	69·0 ± 4·7	69·9 ± 5·1
Height (cm)	158·4 ± 10·2	159·8 ± 10·9
Body mass (kg)	60·8 ± 13·2	58·3 ± 13

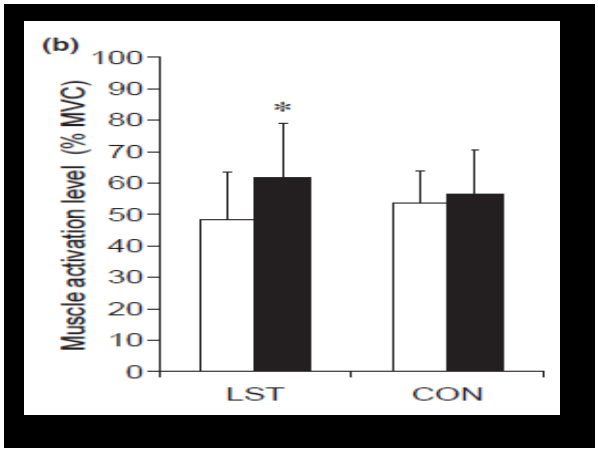
LST, low-intensity (30% 1RM) resistance training with slow movement and tonic force generation; CON, low-intensity (30% 1RM) resistance training with normal speed.

3 x 8 repetições a 30% de 1RM ajustado a cada 4 semanas – 2 x semana durante 12 semanas

Lento 3 s conc. e 3 s exc. + 1 s isom.

Convencional 1 s cada





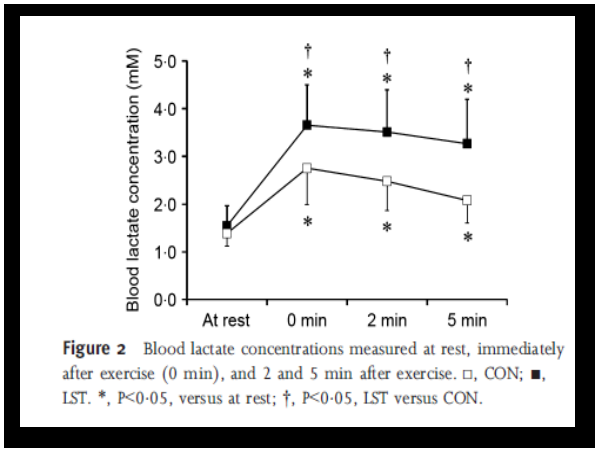


Figure 2 Blood lactate concentrations measured at rest, immediately after exercise (0 min), and 2 and 5 min after exercise. □, CON; ■, LST. *, P<0·05, versus at rest; †, P<0·05, LST versus CON.

Table 2 Systolic blood pressure measured at rest and during exercise.

LST (n = 9) At rest	During exercise	CON (n = 9) At rest	During exercise
131·1 ± 13·5	171·9 ± 31·8*	128·4 ± 12·0	165·0 ± 17·1*

Blood pressures are expressed in millimetres of mercury. LST, low-intensity (30% 1RM) resistance training with slow movement and tonic force generation; CON, low-intensity (30% 1RM) resistance training with normal speed.
*P<0·05 versus at rest.

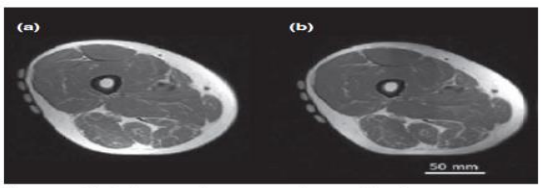


Figure 3 Typical magnetic resonance images showing transverse sections of the thigh taken before (a) and after (b) LST intervention for 12 weeks.

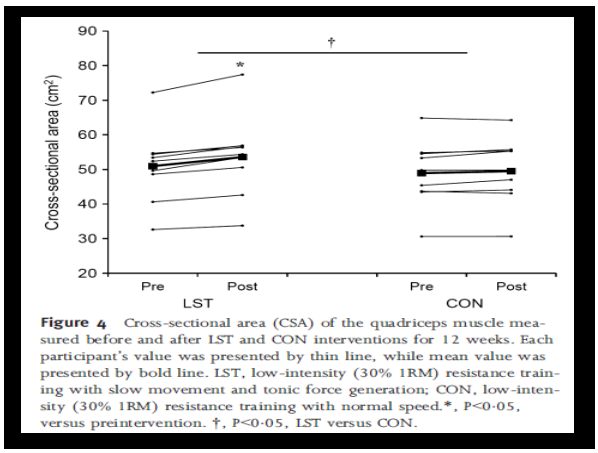


Figure 4 Cross-sectional area (CSA) of the quadriceps muscle measured before and after LST and CON interventions for 12 weeks. Each participant's value was presented by thin line, while mean value was presented by bold line. LST, low-intensity (30% 1RM) resistance training with slow movement and tonic force generation; CON, low-intensity (30% 1RM) resistance training with normal speed.*, P<0·05, versus preintervention. †, P<0·05, LST versus CON.

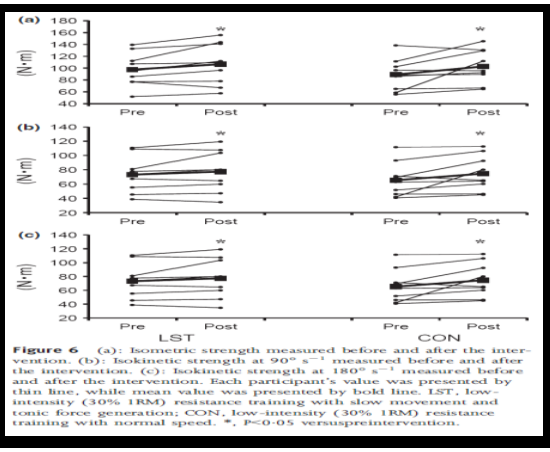


Figure 6 (a): Isometric strength measured before and after the intervention. (b): Isokinetic strength at 90° s^{-1} measured before and after the intervention. (c): Isokinetic strength at 180° s^{-1} measured before and after the intervention. Each participant's value was presented by thin line, while mean value was presented by bold line. LST, low-intensity (30% 1RM) resistance training with slow movement and tonic force generation; CON, low-intensity (30% 1RM) resistance training with normal speed. *, P<0·05 versuspreintervention.

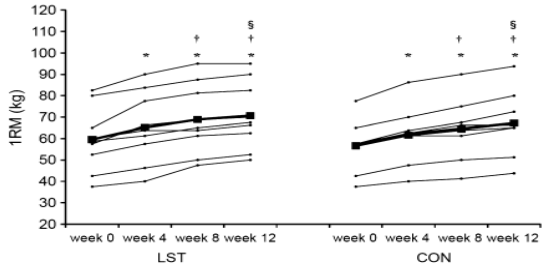


Figure 5 One repetition maximum at 0, 4, 8 and 12 weeks of the intervention. Each participant's value was presented by thin line, while mean value was presented by bold line. IST, low-intensity (30% 1RM) resistance training with slow movement and tonic force generation; CON, low-intensity (30% 1RM) resistance training with normal speed. *, P<0·05 versus week 0; †, P<0·05 versus week 4; §, P<0·05 versus week 8.

J Physiol 590.2 (2012) pp 351–362

Muscle time under tension during resistance exercise stimulates differential muscle protein sub-fractional synthetic responses in men

Nicholas A. Burd[1], Richard J. Andrews[1], Daniel W.D. West[1], Jonathan P. Little[1], Andrew J.R. Cochran[1], Amy J. Hector[1], Joshua G.A. Cashaback[2], Martin J. Gibala[1], James R. Potvin[2], Steven K. Baker[3] and Stuart M. Phillips[1]

[1]Exercise Metabolism Research Group, [2]Occupational Biomechanics Laboratory, Department of Kinesiology, and [3]Michael G. DeGroote School of Medicine, Department of Neurology, McMaster University, Hamilton, Ontario, Canada

O tempo de tensão durante o treinamento de força estimula a síntese proteica de diferentes sub-frações em homens

8 sujeitos jovens treinados em força

Cadeira extensora unilateral

3 x até a falha com 30% de 1RM

Lento 6 s conc. e 6 s exc.

Convencional 1 s cada

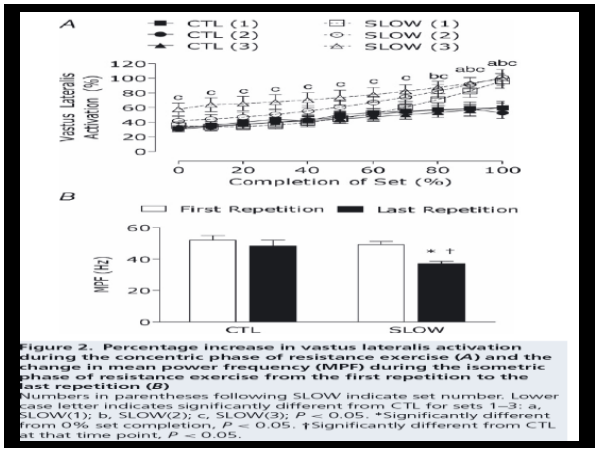


Figure 2. Percentage increase in vastus lateralis activation during the concentric phase of resistance exercise (*A*) and the change in mean power frequency (MPF) during the isometric phase of resistance exercise from the first repetition to the last repetition (*B*)
Numbers in parentheses following SLOW indicate set number. Lower case letter indicates significantly different from CTL for sets 1–3: a, SLOW(1); b, SLOW(2); c, SLOW(3); $P < 0.05$. *Significantly different from 0% set completion, $P < 0.05$. †Significantly different from CTL at that time point, $P < 0.05$.

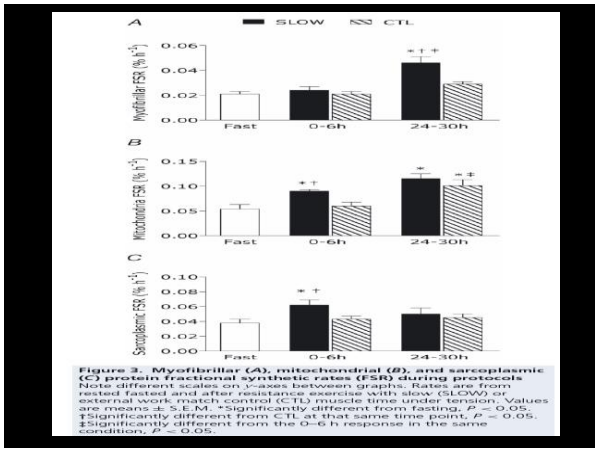
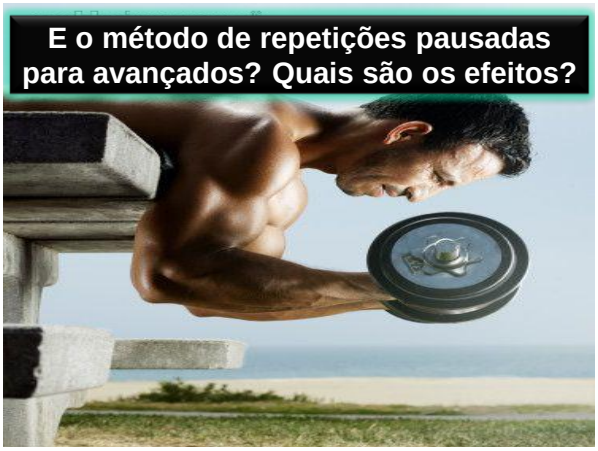
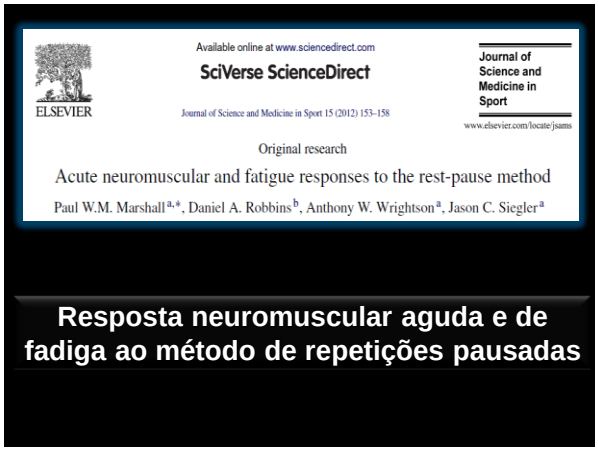


Figure 3. Myofibrillar (*A*), mitochondrial (*B*), and sarcoplasmic (*C*) protein fractional synthetic rates (FSR) during protocols
Note different scales on *y*-axes between graphs. Rates are from rested fasted and after resistance exercise with slow (SLOW) or external work match control (CTL) muscle time under tension. Values are means ± S.E.M. *Significantly different from fasting, $P < 0.05$. †Significantly different from CTL at that same time point, $P < 0.05$. ‡Significantly different from the 0–6 h response in the same condition, $P < 0.05$.





14 indivíduos jovens treinados em força - ~5 anos

Sessões agudas:

A) 20 reps - 5 x 4 reps a 80% de 1RM c/ 3 min intervalo

B) 20 reps – 5 x 4 reps a 80% de 1RM c/ 20 s intervalo

Método repetição pausada reps até falha c/ 20 s intervalo

Table 1
Maximal isometric force output (*N*) and squat rate of force development (RFD) ($N s^{-1}$) measured before (PRE), immediately post (IP), and 5-min post (5P) each exercise protocol ($n = 14$). Data are mean ± SE.

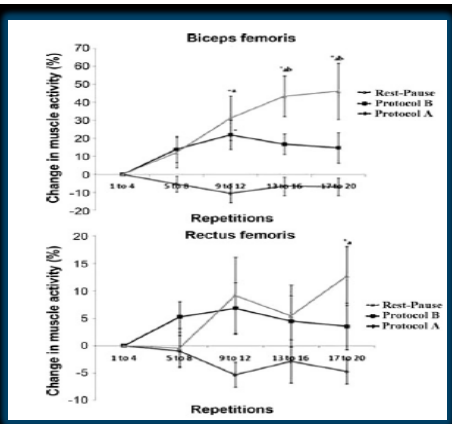
	Protocol A	Protocol B	Rest-pause method
Maximal isometric force output (*N*)			
PRE	1203.5 ± 99.8	1144.6 ± 84.6	1198 ± 75.2
IP	1105.6 ± 94.6*	1054.4 ± 89.9*	1095.3 ± 64.4*
5P	1219.9 ± 89.3	1146.6 ± 99.4	1169.1 ± 81.6
Maximal squat RFD ($N s^{-1}$)			
PRE	4204.3 ± 584.6	4517 ± 723.9	4562 ± 571.5
IP	4057.2 ± 504.4*	3668.2 ± 537.9*	4038.2 ± 676.3*
5P	4667.6 ± 583.8	4260.3 ± 793.9	4494.9 ± 723.5

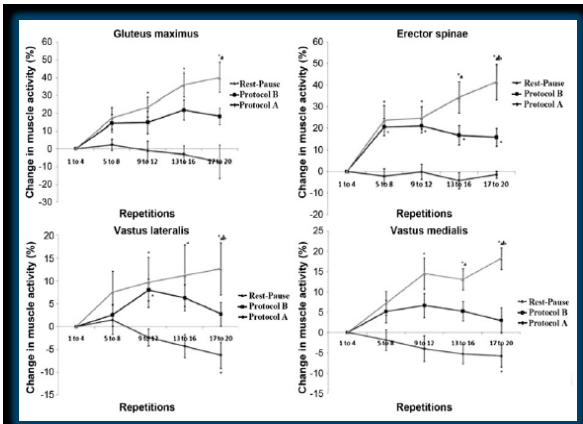
* $p < 0.05$ as compared to PRE.

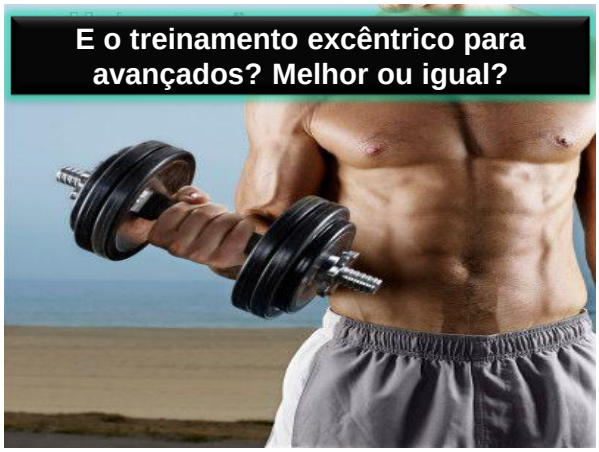
O método de repetições pausadas ↑EMG

Não foi mais fadigante versus sem falha

Pode ser eficiente para indivíduos treinados







Experimental Gerontology 45 (2010) 400–409

Contents lists available at ScienceDirect

Experimental Gerontology

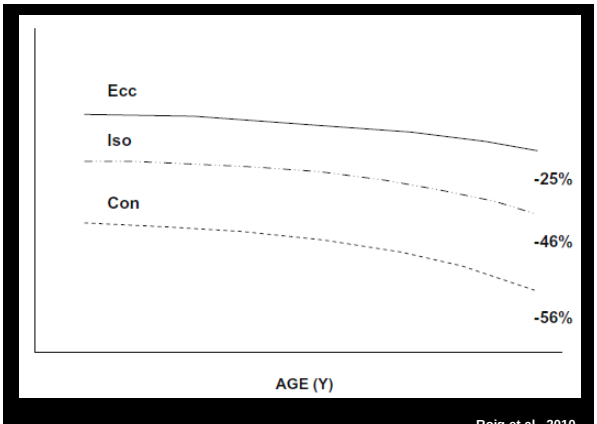
journal homepage: www.elsevier.com/locate/expgero

Review

Preservation of eccentric strength in older adults: Evidence, mechanisms and implications for training and rehabilitation

Marc Roig [a,b,*], Donna L. MacIntyre [a,b,c], Janice J. Eng [a,c], Marco V. Narici [d], Constantinos N. Maganaris [d], W. Darlene Reid [a,b]

[a] Department of Physical Therapy, University of British Columbia, Vancouver, Canada
[b] Muscle Biophysics Laboratory, University of British Columbia, Vancouver, Canada
[c] Rehabilitation Research Laboratory, GF Strong Rehabilitation Centre, Vancouver, Canada
[d] Institute for Biomedical Research into Human Movement and Health, Manchester Metropolitan University, Manchester, United Kingdom



Roig et al., 2010

Muscular Performance after Concentric and Eccentric Exercise in Trained Men

HARALD VIKNE[1,2], PER E. REFSNES[3], MERETE EKMARK[2], JON INGULF MEDBØ[4], VIDAR GUNDERSEN[5], and KRISTIAN GUNDERSEN[2]

[1]Norwegian School of Sport Sciences, Oslo, NORWAY; [2]Department of Molecular Biosciences, University of Oslo, NORWAY; [3]Norwegian Olympic Sports Centre, Oslo, NORWAY; [4]National Institute of Occupational Health, Oslo, NORWAY; and [5]Department of Anatomy and the CMBN, University of Oslo, NORWAY

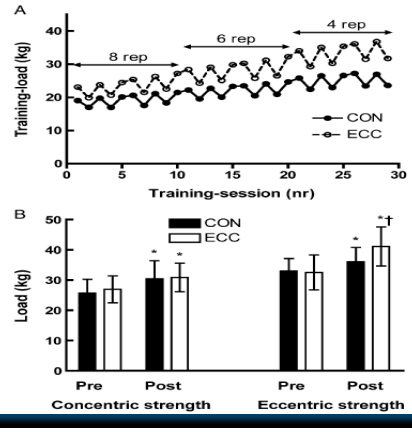
Med. Sci. Sports Exerc., Vol. 38, No. 10, pp. 1770–1781, 2006.

Desempenho muscular após treinamento concêntrico e excêntrico em homens treinados

TABLE 2. The training program for the concentric exercise and eccentric exercise groups.

Week	Training Session Each Week 1	2	3	Reps per week
1	3 × 8RM	3 × 8 medium	3 × 8RM	72
2	3 × 8 medium	4 × 8RM		56
3	4 × 8RM	3 × 8 medium	4 × 8RM	88
4	3 × 8 medium	4 × 8RM		56
5	4 × 6RM	3 × 6 medium	4 × 6RM	66
6	3 × 6 medium	4 × 6RM		42
7	4 × 6RM	4 × 6 medium	4 × 6RM	72
8	4 × 6 medium	4 × 6RM		48
9	5 × 4RM	4 × 4 medium	5 × 4RM	56
10	4 × 4 medium	5 × 4RM		36
11	5 × 4RM	4 × 4 medium	5 × 4RM	56
12	4 × 4 medium	5 × 4RM		36

The training within each session is given as the number of sets times the number of repetitions in each set. The designated intensity of each training session is termed RM (maximum load) or medium (10–15% lower than maximum).



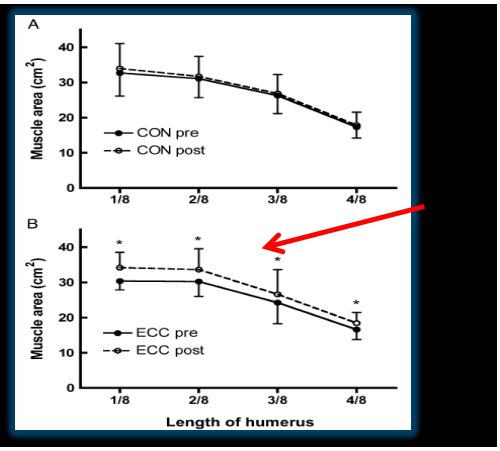


TABLE 4. Single-fiber cross-sectional area, weighted mean cross-sectional area, and relative cross-sectional fiber area in CON and ECC before and after the training period.

	CON (N = 7) Pre	Post	Δ (%)	ECC (N = 6) Pre	Post	Δ (%)
Fiber area (μm²)						
Type I	5942 ± 1628	5821 ± 1304	−2 ± 9	5320 ± 1227	6635 ± 1361*	25 ± 11†
Type IIA	9615 ± 3004‡	10,087 ± 3059‡	5 ± 15	9459 ± 1387‡	13,213 ± 1899‡*	40 ± 18†
Weighted mean	8408 ± 2670	8715 ± 2654	4 ± 15	7394 ± 1223	10,453 ± 1910*	41 ± 20†
IIAfi-area	1.6 ± 0.2	1.7 ± 0.3	7 ± 15	1.8 ± 0.3	2 ± 0.3*	12 ± 7
Relative fiber area/%						
Type I	24.7 ± 8.3	24.1 ± 10.7	−0.6 ± 13.2	36.1 ± 5.5†	27 ± 5.1*	−9.1 ± 8.4
Type II	75.3 ± 8.3	75.9 ± 10.7	0.6 ± 13.2	63.9 ± 5.5†	73 ± 5.1*	9.1 ± 8.4

Values are means ± SD. CON, concentric exercise group; ECC, eccentric exercise group.
* Significantly different from pre values ($P < 0.05$); † significantly different from CON ($P < 0.01$); ‡ significantly larger than type I fibers ($P < 0.001$).

Maior hipertrofia e ganho de força excêntrica

Ganho similar de força concêntrica e velocidade angular

BOA ESTRATÉGIA PARA INDIVÍDUOS TREINADOS

Architectural, functional, and molecular responses to concentric and eccentric loading in human skeletal muscle

Acta Physiol (Oxf). 2014 Jan 4. doi: 10.1111/apha.12225. [Epub ahead of print]

[1, 2]Martino V. Franchi, [1]Philip J. Atherton, [2]Neil D. Reeves, [3]Martin Flück, [1]John Williams, [1]William K. Mitchell, [1]Anna Selby, [1]Reyes M. Beltran-Valls and [1]Marco V. Narici

Respostas estruturais, funcionais e moleculares ao TF concêntrico e excêntrico no músculo humano

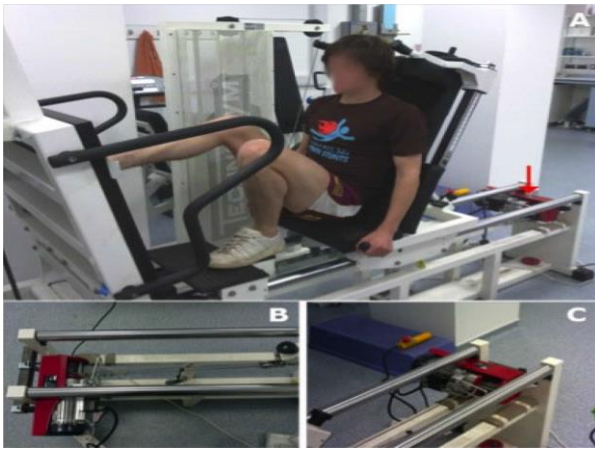
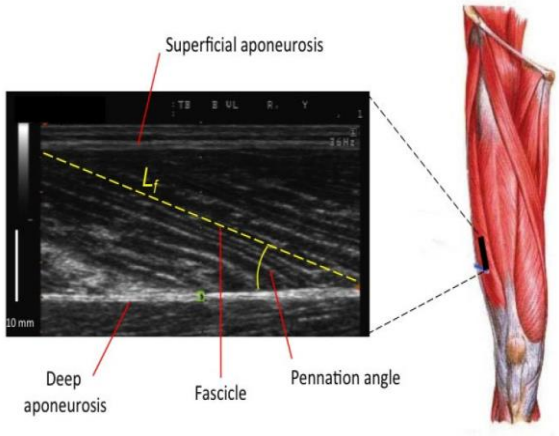
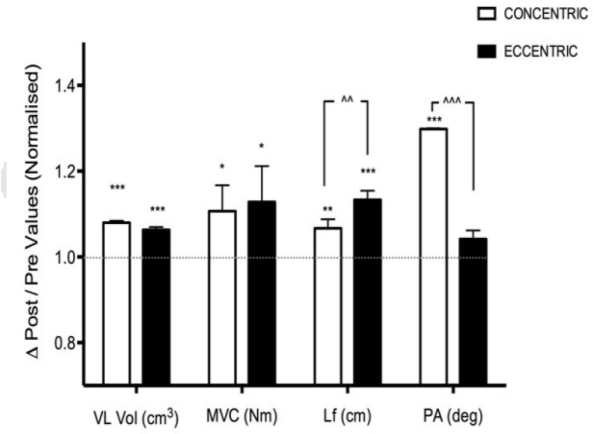


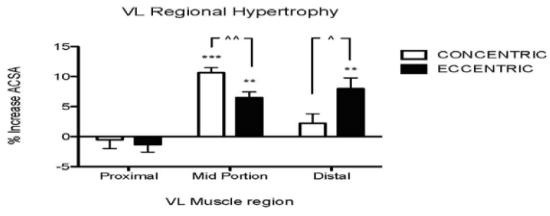
Table 1. Maximum lifting or lowering ability changes for the CON Group (CON) and the ECC one (ECC). EMG values were recorded only at baseline during 1RM leg-press for concentric and eccentric phases. Load ratio is also showed and calculated as the ratio of pre and post ECC/CON training loads.

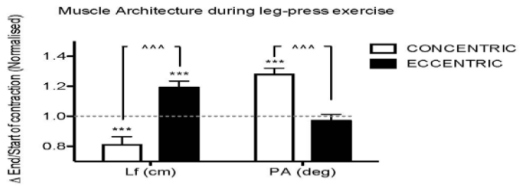
CON 1RM (Kg)			ECC 1RM (Kg)			Load ratio	
Pre	Post	Δ%	Pre	Post	Δ%	Pre	Post
192 ± 16	262 ± 30	36*	233 ± 13	337 ± 9	44*	1.21	1.29
EMG (mV)			EMG (mV)				
0.33± 0.1			0.31± 0.1				

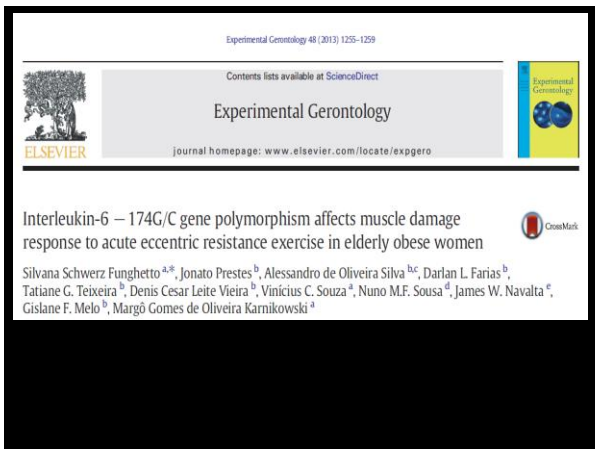
(Pre = baseline, Post = Post-training) values are means ± SEM (** P<0.05, pre-to-post difference*).











Experimental Gerontology 48 (2013) 1255–1259

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journal homepage: www.elsevier.com/locate/expgero

Interleukin-6 – 174G/C gene polymorphism affects muscle damage response to acute eccentric resistance exercise in elderly obese women

Silvana Schwerz Funghetto [a,*], Jonato Prestes [b], Alessandro de Oliveira Silva [b,c], Darlan L. Farias [b], Tatiane G. Teixeira [b], Denis Cesar Leite Vieira [b], Vinícius C. Souza [a], Nuno M.F. Sousa [d], James W. Navalta [e], Gislane F. Melo [b], Margô Gomes de Oliveira Karnikowski [a]

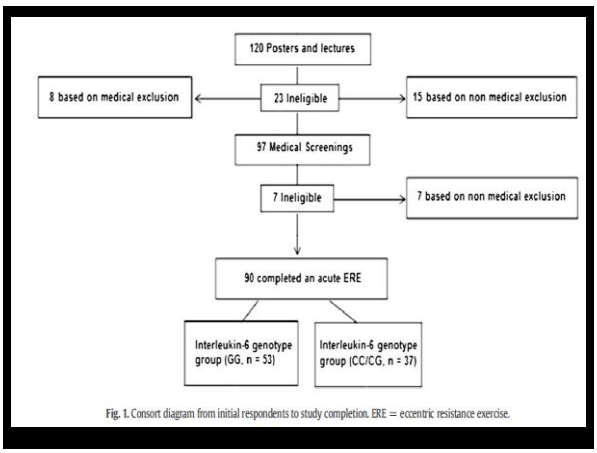
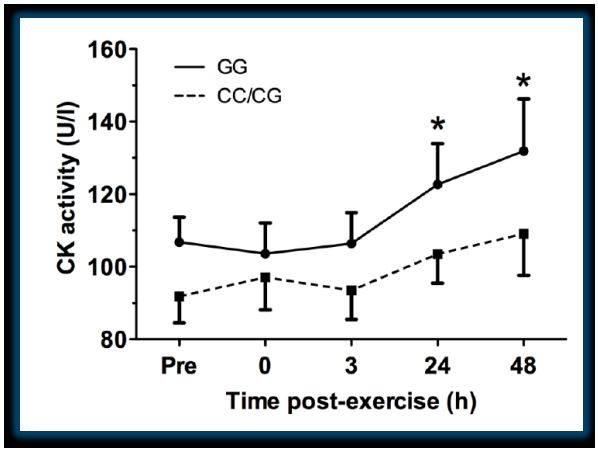


Fig. 1. Consort diagram from initial respondents to study completion. ERE = eccentric resistance exercise.



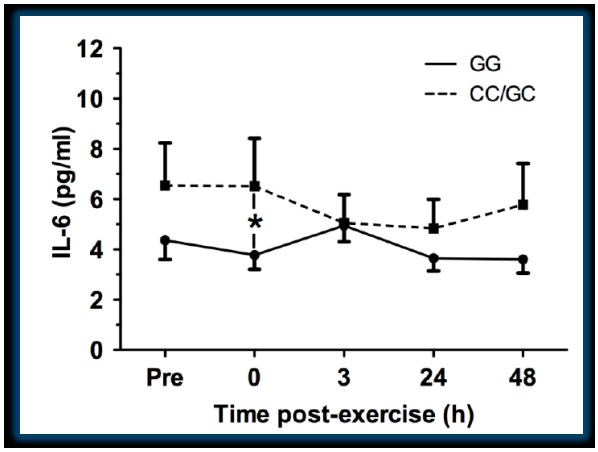


Table 3
Subject's phenotypes by IL-6 genotype group (mean ± SE).

	GG	CC/CG	*p*-value
CK activity (U/l)			
Baseline	106.8 ± 6.9	91.8 ± 7.2	0.086
Peak	153.6 ± 14.9	130.7 ± 11.0	0.400
Integral	356.3 ± 29.5	287.9 ± 21.1[a]	0.043
IL-6 activity (pg/ml)			
Baseline	4.37 ± 0.77	6.54 ± 1.70	0.158
Peak	6.67 ± 0.75	8.71 ± 2.01	0.932
Integral	13.40 ± 1.81	19.02 ± 2.21[a]	0.041

[a] Significantly different between IL-6 genotypes.

EXISTEM AQUELES QUE RESPONDEM MAIS?

Journal of Science and Medicine in Sport xxx (2013) xxx–xxx

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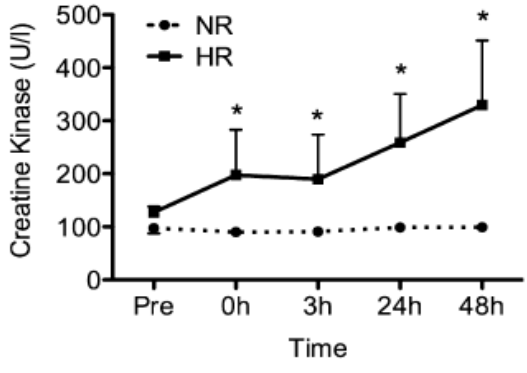
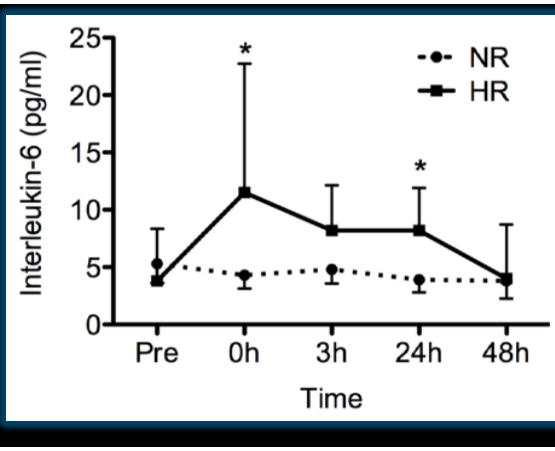
Original research

Identification of high responders for interleukin-6 and creatine kinase following acute eccentric resistance exercise in elderly obese women

Vitor Tajra[a], Ramires Alsamir Tibana[a], Denis Cesar Leite Vieira[a], Darlan Lopes de Farias[a], Tatiane Gomes Teixeira[a], Silvana Schwerz Funghetto[b], Alessandro Oliveira Silva[a], Nuno Manuel Frade de Sousa[c], Jeffrey Willardson[d], Margô Gomes Oliveira Karnikowski[b], Jonato Prestes[a,*]

[a] Catholic University of Brasília, Graduation Program on Physical Education, Brasília, Brazil
[b] University of Brasília (UnB), Brasília, Brazil
[c] University of Sao Paulo, Graduation Program Interunits in Bioengineering, Sao Carlos, Brazil
[d] Kinesiology and Sports Studies Department, Eastern Illinois University, Charleston, IL, USA





Acute and Chronic Cardiovascular Response to 16 Weeks of Combined Eccentric or Traditional Resistance and Aerobic Training in Elderly Hypertensive Women: A Randomized Controlled Trial

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J Strength Cond Res XX(X): 000–000, 2014

Resposta cardiovascular aguda e crônica a 16 semanas de treinamento de força tradicional ou excêntrico combinado com aeróbio em idosas hipertensas

Table 1. Subject characteristics.*

Variables	C ($N = 20$)	ERT ($N = 20$)	TRT ($N = 20$)
Age (y)	63.1 (2.3)	64.2 (3.1)	62.6 (2.5)
Body mass (kg)	69.87 (11.90)	66.51 (13.93)	67.21 (11.18)
Height (m)	1.55 (0.04)	1.54 (0.05)	1.53 (0.05)
Body mass index ($kg \cdot m^{-2}$)	28.98 (4.36)	27.79 (4.73)	28.47 (4.40)
Body adiposity index (%)	29.96 (5.66)	24.21 (2.61)	26.59 (4.59)
Waist (cm)	94.55 (9.24)	93.35 (11.56)	93.80 (10.40)
Hip (cm)	100.05 (13.84)	97.70 (6.76)	102.55 (9.77)
Neck (cm)	33.99 (3.63)	34.51 (2.55)	34.35 (2.80)
Waist-to-hip ratio	0.97 (0.25)	0.95 (0.07)	0.91 (0.08)
Systolic blood pressure (mm Hg)	160.70 (9.12)	162.70 (7.81)	163.05 (4.43)
Diastolic blood pressure (mm Hg)	89.85 (4.81)	85.50 (4.26)†	88.80 (3.60)
Medications (%)			
Angiotensin-converting enzyme inhibitors	9	6	5
Angiotensin receptor blockers	6	5	10
Dihydropyridine calcium channel blockers	4	8	5

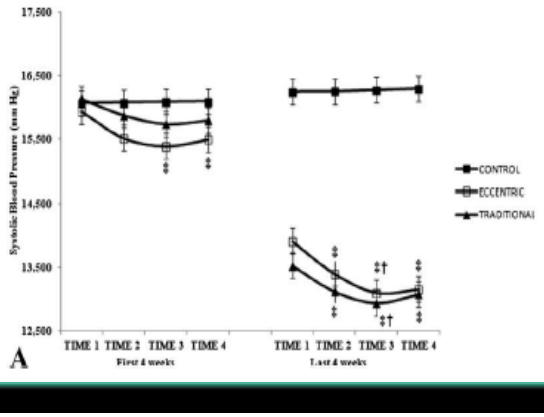
*Data are expressed by means and *SD*. N = sample number; C = control group; TRT = traditional resistance training; ERT = eccentric resistance training.
†Significantly different from the C group and TRT (≤0.05).

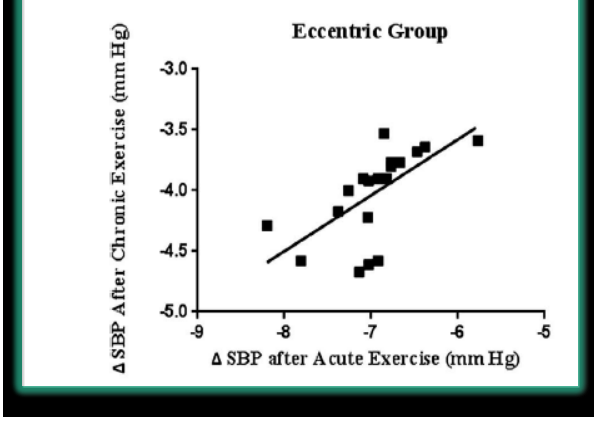
Table 2. Blood pressure and muscle strength at baseline and 16-week follow-up.*

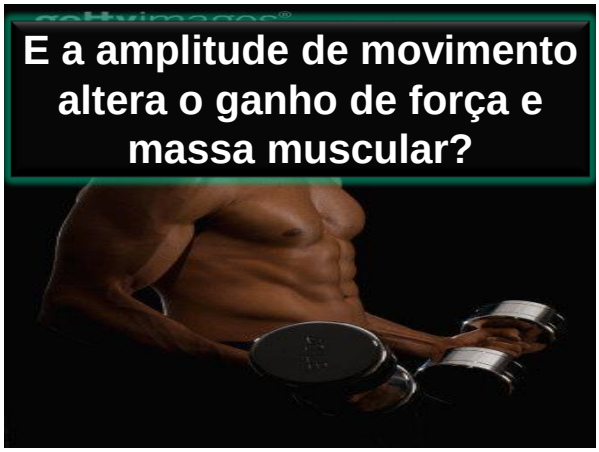
	SBP (mm Hg)		DBP (mm Hg)		PP (mm Hg)	
	PRE	Post	PRE	Post	PRE	Post
Control group	160.70 (9.13)	162.55† (8.94)	89.85 (4.82)	90.10 (4.53)	70.85 (9.66)	72.45† (9.86)
CV%	2.68	5.50	5.36	5.03	13.65	13.61
ES	0.14		0.04		0.11	
ERT group	166.05 (8.06)	135.20†‡ (8.80)	90.15 (4.26)	78.30†‡§ (4.39)	75.90 (7.76)	56.90†‡ (8.40)
CV%	4.85	6.51	4.72	5.61	10.22	14.76
ES	2.48		1.84		1.59	
TRT group	167.60‡ (4.31)	132.50†‡§ (7.96)	91.25 (3.55)	79.20†‡ (3.17)	76.35 (5.05)	53.30†‡§ (8.27)
CV%	2.57	6.01	3.89	4.01	6.61	15.51
ES	4.24		2.35		2.51	

	Bench press (kg)		45° leg press (kg)	
	PRE	Post	PRE	Post
Control group				
CV%				
ES				
ERT group	15.90 (1.48)	24.05†‡§ (1.72)	69.00 (4.21)	105.15†‡§ (4.00)
CV%	9.33	7.17	6.09	3.81
ES	3.48		5.82	
TRT group	16.20 (1.28)	21.88† (1.23)	68.25 (5.40)	90.80† (6.04)
CV%	7.91	5.64	7.91	6.65
ES	2.99		2.68	

*Data are expressed by means and *SD*. TRT = traditional resistance training; ERT = eccentric resistance training; SBP = systolic blood pressure; DBP = diastolic blood pressure; PP = pulse pressure; CV = coefficient of variation; ES = effect size.
†Differences within groups pre vs. post (≤0.05).
‡Differences between eccentric vs. control at the same time point (≤0.05); differences between traditional vs. control at the same time point (≤0.05); differences between eccentric vs. traditional at the same time point (≤0.05).
§Significant exercise group × time interaction (≤0.05).







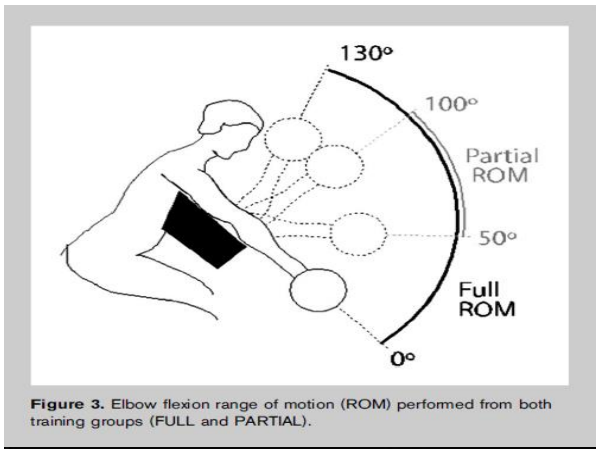


Figure 3. Elbow flexion range of motion (ROM) performed from both training groups (FULL and PARTIAL).

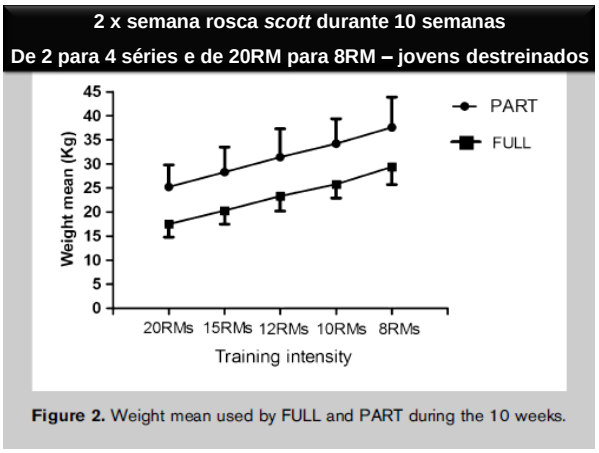
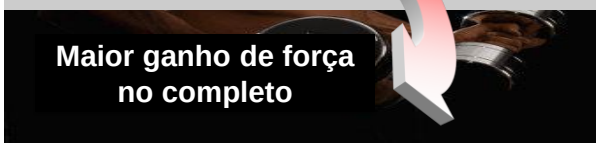


Figure 2. Weight mean used by FULL and PART during the 10 weeks.

Table 1. Results from 1RM tests before and after 10 weeks of training.*†

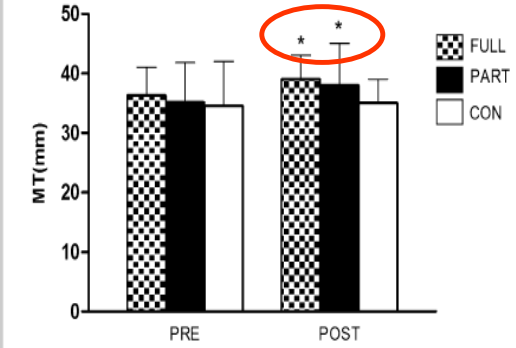
1RM test	FULL	PART	CON
Baseline (kg)	27.3 ± 3.3	29.7 ± 6.8	27.5 ± 6.8
10 wks (kg)	34.3 ± 5.2	34.4 ± 8.3	27.8 ± 6.2
Δ%	25.7 ± 9.6‡§	16.0 ± 6.7‡	1.7 ± 5.5

*1RM = 1 repetition maximum; FULL = full-range-of-motion group; PART = partial-range-of-motion group; CON = control group.
†Values are given as mean ± *SD*.
‡Higher than baseline ($p < 0.05$).
§Higher than PART ($p < 0.05$).



Maior ganho de força no completo

Espessura muscular igual para os dois



Impact of Range of Motion During Ecologically Valid Resistance Training Protocols on Muscle Size, Subcutaneous Fat, and Strength

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J Strength Cond Res 28(1): 245–255 2014

Impacto da amplitude de movimento durante TF sobre o tamanho muscular, gordura subcutânea e força

Table 1. Participants' physical characteristics at baseline.*

Group	Age (y)	Mass (kg)	Height (cm)
SR	19 ± 3.4	74.9 ± 10.1	174 ± 13.3
LR	19 ± 2.6	73.8 ± 14.9	171 ± 11.8
Con	23 ± 2.4	77.9 ± 13.1	176 ± 9.5

*SR = shorter range of motion; LR = longer range of motion; Con = control group.

Table 2. Resistance training program outline.*†

Exercise	Reps	Sets	Recovery (s)	Intensity (1RM %)
Day 1				
BB back squat	10	3	90	80
Knee extension	10	3	60	80
Bulgarian split squat	10	3	90	80
DL Sampson chair	4 × 10-s holds	3	60	-
Day 2				
BB back squat	10	3	90	80
Knee extension	10	3	60	80
Leg press	10	3	90	80
DB lunges	10	3	60	80
Day 3				
BW squats	30	3	90	-
DL Sampson chair	4 × 20-s holds	3	60	-
BW lunges	30	3	90	-
SR Sampson chair	5 × 5-s holds	3	60	-

*BB = barbell; DB = dumbbell; DL = double-legged; SR = single-legged; BW = body weight; RM = repetition maximum.
†Exercises were carried out at 80% 1RM where appropriate or using body mass.

TABLE 3. Paired changes to VL CSA and pennation angle of fascicles at different femur lengths over the training and detraining phases.*†

Site (% femur length)	Baseline	Week 8	Week 10	Week 12
25 CSA	SR 2,877 ± 338	SR 3,425 ± 303‡	SR 3,361 ± 306‡	SR 3,265 ± 310
	LR 2,684 ± 427	LR 3,592 ± 303‡	LR 3,461 ± 309‡	LR 3,328 ± 295
	Con 3,201 ± 253	Con 3,086 ± 259	Con 3,079 ± 240	Con 3,086 ± 259
50 CSA	SR 3,033 ± 289	SR 3,699 ± 342‡	SR 3,526 ± 334‡	SR 3,382 ± 304‡
	LR 3,004 ± 385	LR 3,545 ± 339‡	LR 3,424 ± 349‡	LR 3,233 ± 338‡
	Con 3,326 ± 354	Con 3,314 ± 364	Con 3,294 ± 357	Con 3,314 ± 364
75 CSA	SR 1,081 ± 175	SR 1,162 ± 127‡	SR 1,115 ± 127‡	SR 1,037 ± 119‡
	LR 1,074 ± 224	LR 1,505 ± 217‡§	LR 1,369 ± 200‡	LR 1,219 ± 191‡
	Con 1,366 ± 165	Con 1,370 ± 185	Con 1,358 ± 175	Con 1,370 ± 185
25 PEN	SR 10.1 ± 0.3	SR 10.3 ± 0.3‡	SR 10.0 ± 0.7	SR 9.9 ± 0.2
	LR 10.2 ± 0.3	LR 11.2 ± 0.6‡	LR 11.1 ± 0.6	LR 11.0 ± 0.6
	Con 11.9 ± 0.2	Con 12.2 ± 0.1	Con 12.0 ± 0.1	Con 12.2 ± 0.1
50 PEN	SR 16.5 ± 0.5	SR 17.2 ± 0.3‡	SR 16.8 ± 0.9	SR 16.4 ± 0.4
	LR 15.9 ± 0.2	LR 17.1 ± 0.8‡	LR 16.6 ± 0.8	LR 16.0 ± 0.6
	Con 16.4 ± 0.8	Con 16.4 ± 0.7	Con 16.3 ± 0.7	Con 16.4 ± 0.7
75 PEN	SR 16.0 ± 1.4	SR 17.9 ± 1.2‡	SR 16.8 ± 0.9‡	SR 16.8 ± 0.9
	LR 15.5 ± 0.6	LR 17.5 ± 0.7‡	LR 17.2 ± 0.6‡	LR 16.3 ± 0.5
	Con 19.4 ± 0.7	Con 18.5 ± 0.7	Con 18.4 ± 0.6	Con 18.5 ± 0.7

*CSA = cross-sectional area; PEN = pennation; SR = shorter range of motion; LR = longer range of motion.
†Values are millimeters squared and degrees (mean ± *SE*).
‡Significantly different from other training group.
§Significantly above baseline.

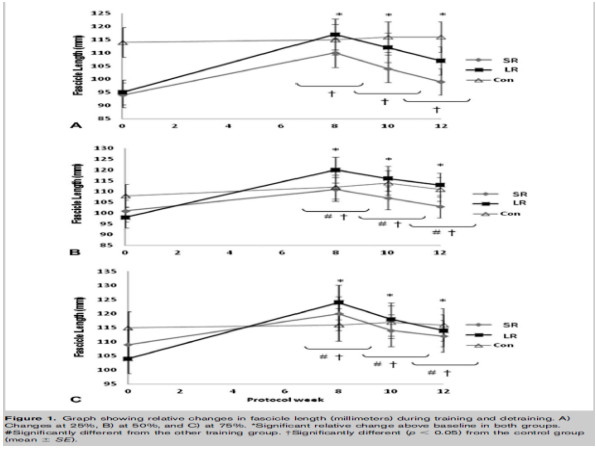

Figure 1. Graph showing relative changes in fascicle length (millimeters) during training and detraining. A) Changes at 25%, B) at 50%, and C) at 75%. *Significant relative change above baseline in both groups. #Significantly different from the other training group. †Significantly different ($p < 0.05$) from the control group (mean ± *SE*).

TABLE 4. Changes in quadriceps MVC over a range of knee flexion angles from baseline to week 8 (posttraining).

	Torque (N·m) baseline–week 8		Relative change (%)	
Knee flexion angle (°)	SR	LR	SR	LR
30	106–108	102–127	2 ± 8	18 ± 5*
50	167–175	157–193	5 ± 10*	16 ± 4*
60	191–197	186–213	4 ± 5*	11 ± 7*
65	207–216	194–231	5 ± 4*	19 ± 8*
70	212–225	202–247	6 ± 2*	13 ± 2*
75	218–215	193–232	−1 ± 3	18 ± 11*
90	216–218	161–208	1 ± 2	30 ± 5*

*Significantly above baseline measures.

Clin Physiol Funct Imaging (2013) **33**, pp359–363 doi: 10.1111/cpf.12036

Influence of exercise order on upper body maximum and submaximal strength gains in trained men

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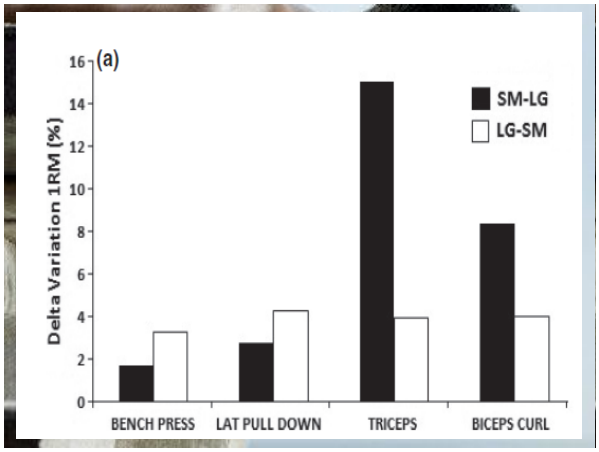
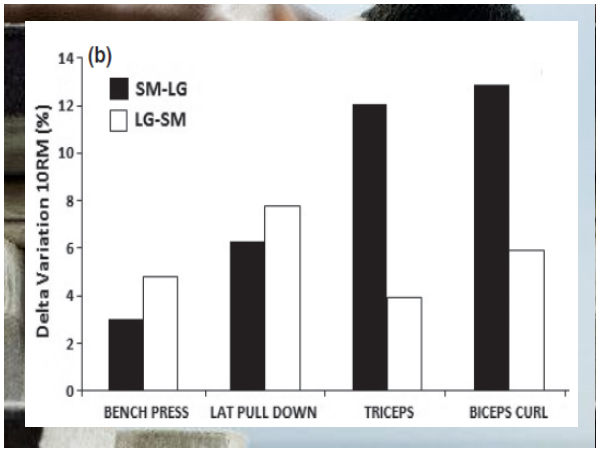
INFLUÊNCIA DA ORDEM DOS EXERCÍCIOS SOBRE A FORÇA MÁXIMA E SUBMÁXIMA DE MEMBROS SUPERIORES EM HOMENS TREINADOS





Effect of adding single-joint exercises to a multi-joint exercise resistance-training program on strength and hypertrophy in untrained subjects

Paulo Gentil, Saulo Rodrigo Sampaio Soares, Maria Cláudia Pereira, Rafael Rodrigues da Cunha, Saulo Santos Martorelli, André Santos Martorelli, and Martim Bottaro

Appl. Physiol. Nutr. Metab. 38: 341–344 (2013)

Efeito da adição de exercícios monoarticulares a um programa de TF com exercícios multiarticulares sobre a força e hipertrofia em sujeitos destreinados

Table 1. Characteristics of subjects in the multi-joint training group (MJ) and in the MJ plus single-joint (SJ) training group (MJ+SJ).

Characteristics	MJ (n = 14)	MJ+SJ (n = 15)
Age (y)	22.36±2.1	22.8±2.65
Height (cm)	175.8±5.9	175.2±8.7
Body weight		
Pretraining (kg)	69.25±5.79	72.67±11.05
Post-training (kg)	71.05±6.13	73.93±10.99
Δ (%)	2.60	1.73
Flexed arm circumference		
Pretraining (cm)	30.56±2.61	31.29±2.78
Post-training (cm)	31.82±2.36*	33.35±2.15*
Δ (%)	4.11	6.56
Elbow flexor muscle thickness		
Pretraining (mm)	31.64±3.85	32.78±4.03
Post-training (mm)	33.69±3.52*	35.09±3.55*
Δ (%)	6.46	7.04
Elbow flexor peak torque		
Pretraining (N·m)	49.26±9.49	48.99±11.52
Post-training (N·m)	54.38±10.08*	55.29±10.24*
Δ (%)	10.40	12.85

Note: Values are expressed as means ± standard deviation.
*$p < 0.05$ for post-training vs. pretraining.

Journal of Sports Sciences, December 2009; 27(14): 1617–1625

Routledge

Effects of agonist–antagonist complex resistance training on upper body strength and power development

DANIEL W. ROBBINS[1], WARREN B. YOUNG[1], DAVID G. BEHM[2], & WARREN R. PAYNE[1]

EFEITOS DO TF AGONISTA-ANTAGONISTA SOBRE A FORÇA E POTÊNCIA DE MEMBROS SUPERIORES

SEMANAS 1-4

	Week 1				Week 2			
Exercise	Sets	Reps	Load	Rest*	Sets	Reps	Load	Rest*
Bench pull	4	6	6-RM	4 min	5	5	5-RM	4 min
Bench press	3	6	6-RM	4 min	4	5	5-RM	4 min
Bench press throw	1	6	40% 1-RM	4 min	1	5	40% 1-RM	4 min

*Rest between like sets. RM = repetition maximum.

Week 3				Week 4			
Sets	Reps	Load	Rest*	Sets	Reps	Load	Rest*
6	4	4-RM	4 min	6	3	3-RM	4 min
4	4	4-RM	4 min	4	3	3-RM	4 min
2	4	40% 1-RM	4 min	2	3	40% 1-RM	4 min

SEMANAS 5-8

	Week 1				Week 2			
Exercise	Sets	Reps	Load	Rest*	Sets	Reps	Load	Rest*
Bench pull	4	6	6-RM	4 min	5	5	5-RM	4 min
Bench press	1	6	6-RM	4 min	1	5	5-RM	4 min
Bench press throw	3	6	40% 1-RM	4 min	4	5	40% 1-RM	4 min

*Rest between like sets. RM = repetition maximum.

Week 3				Week 4			
Sets	Reps	Load	Rest*	Sets	Reps	Load	Rest*
6	4	4-RM	4 min	6	3	3-RM	4 min
4	4	4-RM	4 min	4	3	3-RM	4 min
2	4	40% 1-RM	4 min	2	3	40% 1-RM	4 min

Variable	Complex set Pre	Post	Gain	%Δ	Effect size
Bench pull 1-RM (kg)	92.1 ± 14.1	96.7 ± 15.9	4.5 ± 3.0*	2.2 ± 1.1	0.45 (small)
Bench press 1-RM (kg)	100.9 ± 27.8	106.0 ± 27.6	5.1 ± 3.4*	2.4 ± 1.8	0.26 (small)
BPT height (cm), 4 throws	97.1 ± 18.5	99.9 ± 10.3	2.7 ± 15.3	5.0 ± 16.5	0.21 (small)
BPT peak velocity ($m \cdot s^{-1}$), 4 throws	6.8 ± 0.5	7.1 ± 0.4	0.3 ± 0.4	4.2 ± 6.3	0.73 (medium)
BPT peak power (W), 4 throws	3002 ± 898	3232 ± 716	230 ± 227	9.7 ± 9.2	0.36 (small)

*Significant difference between pre and post values ($P < 0.01$).

Traditional set Pre	Post	Gain	%Δ	Effect size
95.9 ± 14.1	98.5 ± 15.9	2.6 ± 3.8	1.2 ± 1.7	0.26 (small)
94.6 ± 20.5	99.1 ± 20.4	4.5 ± 3.5	2.3 ± 1.9	0.31 (small)
86.8 ± 17.6	95.4 ± 17.5	8.6 ± 8.8	10.8 ± 10.7	0.70 (medium)
7.0 ± 0.5	7.2 ± 0.6	0.2 ± 0.3	3.0 ± 4.0	0.58 (medium)
3047 ± 552	3321 ± 528	274 ± 152*	9.4 ± 5.4	0.70 (medium)

Variable	Complex Absolute training gains	Time (h)*	Efficiency
Bench pull 1-RM (kg)	4.5 ± 2.97	4.53	1.00 ± 0.66 ($kg \cdot h^{-1}$)
Bench press 1-RM (kg)	5.1 ± 3.37	4.53	1.13 ± 0.74 ($kg \cdot h^{-1}$)
BPT height (cm)	2.7 ± 15.32	4.53	0.60 ± 0.38 ($cm \cdot h^{-1}$)
BPT peak velocity ($m \cdot s^{-1}$)	0.3 ± 0.41	4.53	0.06 ± 0.09 ($m \cdot s^{-1} \cdot h^{-1}$)
BPT peak power (W)	230 ± 227	4.53	50.7 ± 50.1 ($W \cdot h^{-1}$)

Traditional Absolute training gains	Time (h)*	Efficiency	Effect size
2.6 ± 3.80	10.13	0.26 ± 0.38 ($kg \cdot h^{-1}$)	1.37 (large)
4.5 ± 3.46	10.13	0.45 ± 0.34 ($kg \cdot h^{-1}$)	1.18 (large)
8.6 ± 8.78	10.13	0.85 ± 0.87 ($cm \cdot h^{-1}$)	0.37 (small)
0.2 ± 0.30	10.13	0.02 ± 0.03 ($m \cdot s^{-1} \cdot h^{-1}$)	0.60 (medium)
274 ± 152	10.13	27.1 ± 15.0 ($W \cdot h^{-1}$)	0.64 (medium)

THE EFFECT OF AN UPPER-BODY AGONIST–ANTAGONIST RESISTANCE TRAINING PROTOCOL ON VOLUME LOAD AND EFFICIENCY

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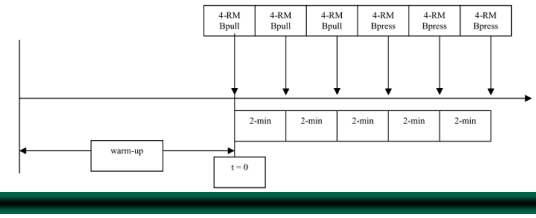
J Strength Cond Res 24(x): 000–000, 2010

EFEITOS DE UM PROTOCOLO AGONISTA-ANTAGONISTA DE MEMBROS SUPERIORES SOBRE O VOLUME TOTAL E EFICÊNCIA



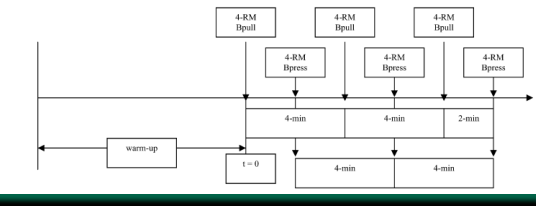


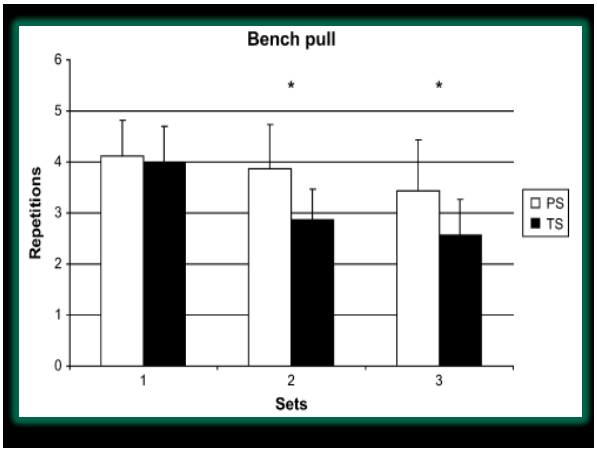
Table 2. Percent changes in VL from set 1 to set 2, set 2 to set 3, and set 1 to set 3 for Bpull and Bpress during PS and TS protocols. ($N = 16$).*†

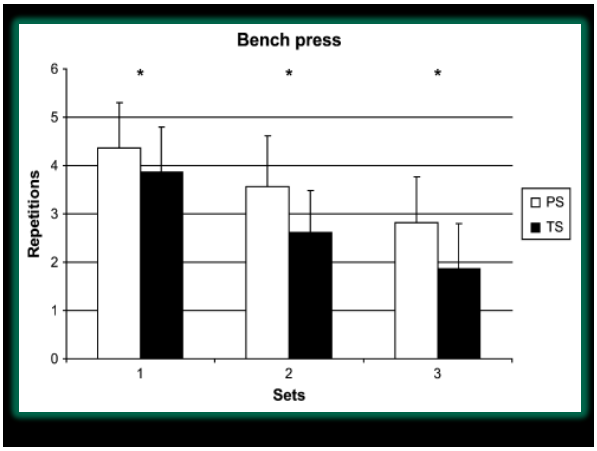
	Set 1–set 2		Set 2–set 3		Set 1–set 3	
Variable	PS	TS	PS	TS	PS	TS
Bpull VL	−6.5 (±11.8)	−27.5 (±13.4)	−11.3 (±13.9)	−10.9 (±17.4)	−17.3 (±15.9)	−34.7 (±18.5)
Bpress VL	−19.0 (±16.2)	−32.9 (±11.9)	−20.2 (±18.4)	−27.1 (±20.7)	−36.1 (±16.4)	−50.7 (±16.5)

*VL = volume load; Bpull = bench pull; Bpress = bench press; PS = paired set; TS = traditional set.
†Values are given as mean% (*SD*).

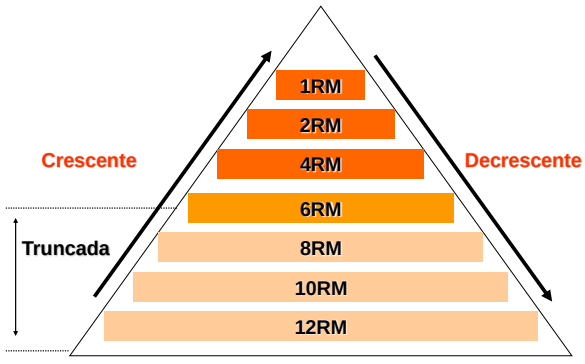
Table 4. Efficiency (volume load/time) calculations for session Bpull, VL, and session Bpress VL during PS and TS protocols. ($N = 16$).*

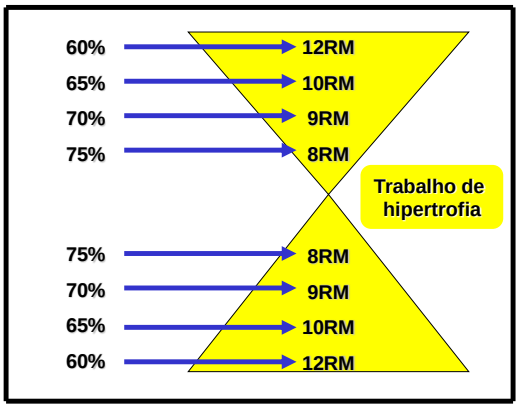
	PS			TS		
Variable	VL (kg)	Time (min)†	Efficiency ($kg \cdot min^{-1}$)	VL (kg)	Time (min)†	Efficiency ($kg \cdot min^{-1}$)
Bpull	895.4	10	89.5	738.1	10	73.8
Bpress	930.4	10	93.0	731.3	10	73.1





Programa de treinamento Pirâmide Crescente e Decrescente e Truncada Crescente e Decrescente



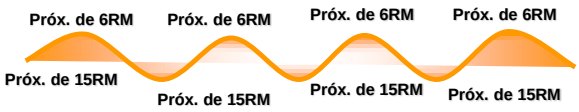


Padrão de sobrecarga dupla. Reproduzido de Bompa, 2000.

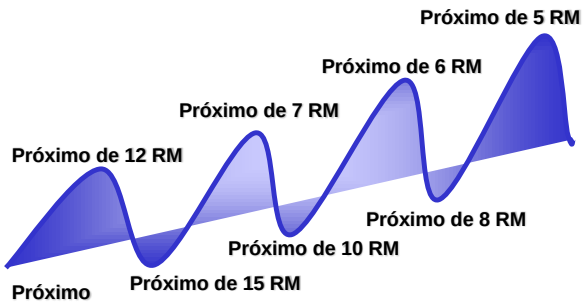
Ondulatório (avançado)

Exercício	Séries	Repetições	Peso
Peck deck	8	15, 6, 15, 6, 15, 6, 15, 6	Próximo às RMs

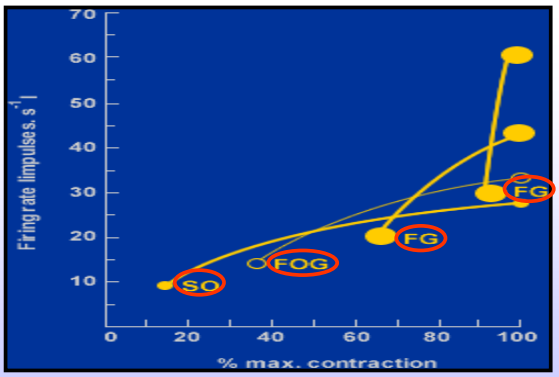
Intervalos entre as séries: 2 minutos.



ONDULATÓRIO CRESCENTE

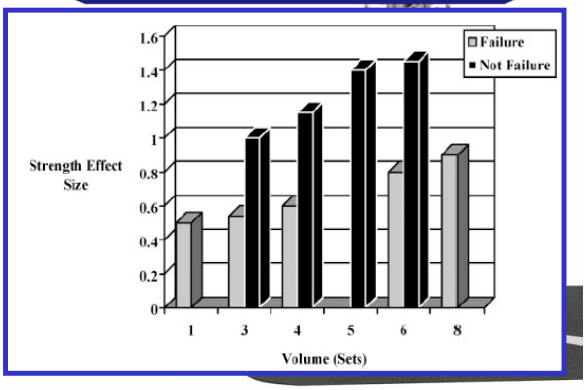


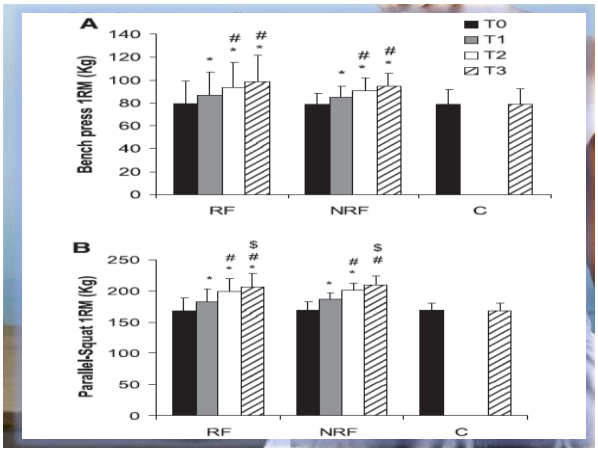
Intervalos entre as séries: 2 minutos.



Princípio de Henneman. Reproduzido de SALE (1992).

TREINAMENTO ATÉ A FADIGA





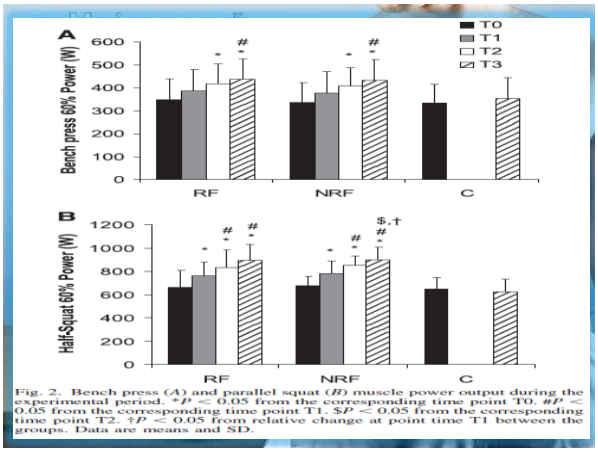
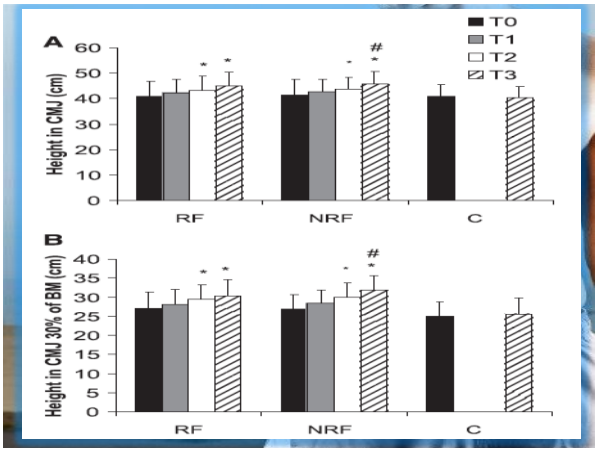
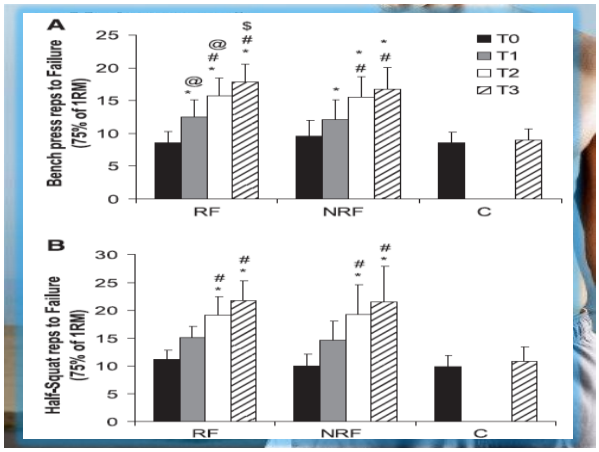


Fig. 2. Bench press (*A*) and parallel squat (*B*) muscle power output during the experimental period. *$P < 0.05$ from the corresponding time point T0. #$P < 0.05$ from the corresponding time point T1. $$P < 0.05$ from the corresponding time point T2. †$P < 0.05$ from relative change at point time T1 between the groups. Data are means and SD.





Clin Physiol Funct Imaging (2014) doi: 10.1111/cpf.12137

Different acute cardiovascular stress in response to resistance exercise leading to failure versus not to failure in elderly women with and without hypertension – a pilot study

Vitor Tajra[1], Denis C. L. Vieira[1], Ramires A. Tibana[1], Tatiane G. Teixeira[1], Alessandro O. Silva[1], Darlan L. Farias[1], Dahan da C. Nascimento[1], Nuno M. F. de Sousa[2], Jeffrey Willardson[3] and Jonato Prestes[1]

[1]Graduation Program on Physical Education, Catholic University of Brasília, Brasília, [2]Graduation Program Interunits in Bioengineering, University of Sao Paulo, Sao Carlos, Brazil and [3]Kinesiology and Sports Studies Department, Eastern Illinois University, Charleston, IL, USA

Diferente estresse cardiovascular agudo em resposta ao treinamento de força realizado até a falha versus sem falha em idosas com e sem hipertensas

Table 1 Subject's physical characteristics.

	Normotensive (n = 7)	Hypertensive (n = 7)
Age, year	67·43 ± 7·59	69·29 ± 6·95
Height, cm	154·71 ± 9·50	149·00 ± 4·73
Weight, kg	58·99 ± 14·10	61·07 ± 12·69
Waist circumference, cm	77·11 ± 9·63	83·04 ± 12·87
Neck circumference, cm	30·97 ± 2·56	32·58 ± 2·60
Systolic blood pressure, mmHg	119·14 ± 4·97	122·29 ± 7·02
Diastolic blood pressure, mmHg	73·28 ± 5·44	67·29 ± 3·55*

*Significant difference compared to normotensive group (P<0·05).

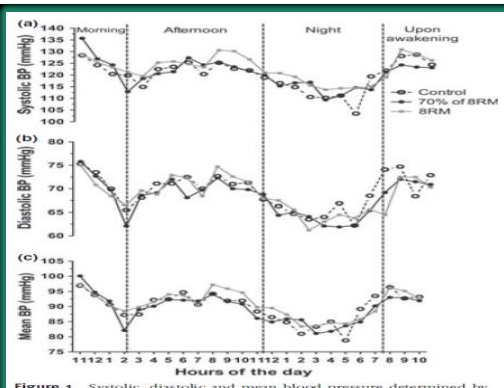


Figure 1 Systolic, diastolic and mean blood pressure determined by ambulatory blood pressure monitoring after 8RM, 70% of 8RM training sessions and non-exercise control session. Systolic blood pressure (a); diastolic blood pressure (b) and mean blood pressure (c). Values are presented as mean.

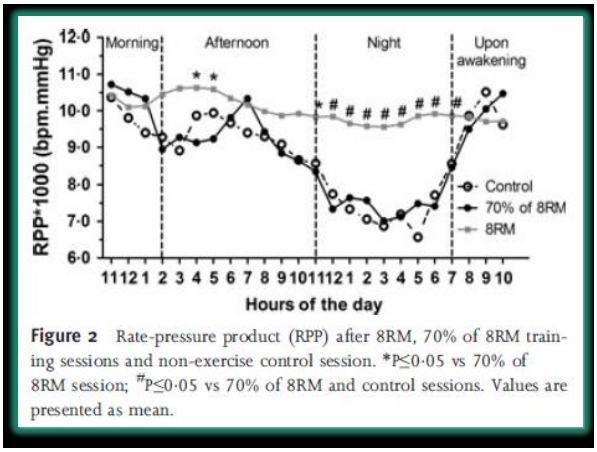


Figure 2 Rate-pressure product (RPP) after 8RM, 70% of 8RM training sessions and non-exercise control session. *P≤0·05 vs 70% of 8RM session; #P≤0·05 vs 70% of 8RM and control sessions. Values are presented as mean.

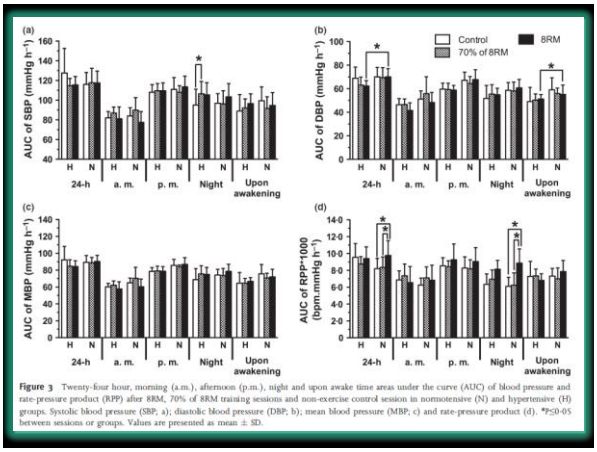


Figure 3 Twenty-four hour, morning (a.m.), afternoon (p.m.), night and upon awake time areas under the curve (AUC) of blood pressure and rate-pressure product (RPP) after 8RM, 70% of 8RM training sessions and non-exercise control session in normotensive (N) and hypertensive (H) groups. Systolic blood pressure (SBP; a); diastolic blood pressure (DBP; b); mean blood pressure (MBP; c) and rate-pressure product (d). *P≤0·05 between sessions or groups. Values are presented as mean ± SD.

Circuit resistance training in sedentary women: body composition and serum cytokine levels

Fabiano Candido Ferreira, Alexandra Ivo de Medeiros, Cristiane Nicioli, João Elias Dias Nunes, Gilberto Eiji Shiguemoto, Jonato Prestes, Roberto Mário Machado Verzola, Vilmar Baldissera, and Sérgio Eduardo de Andrade Perez

Appl. Physiol. Nutr. Metab. **35**: 163–171 (2009)

Received 8 June 2009. Accepted 2 December 2009. Published on the NRC Research Press Web site at apnm.nrc.ca on 1 April 2010.

TREINAMENTO DE FORÇA CIRCUITADO EM MULHERES SEDENTÁRIAS: COMPOSIÇÃO CORPORAL E CITOCINAS

Table 3. Pre- and post-training body composition.

Variable	Pretraining period	Post-training period	*p*
Body mass (kg)[a]	57.848±7.796 (53.347–62.350)	56.955±6.284 (53.327–60.583)	0.3703
Fat body mass (kg)[a]	21.911±8.150 (17.205–26.616)	17.824±4.235 (15.379–20.269)[b]	0.0213
Lean body mass (kg)[a]	35.937±4.926 (33.093–38.782)	39.130±4.950 (36.272–41.988)[b]	0.0006
Bone mineral content (kg)[a]	2.500±0.346 (2.300–2.700)	2.489±0.346 (2.290–2.689)	0.3591
% body fat mass[a]	37.10±10.84 (30.84–43.36)	31.19±6.06 (27.69–34.68)[b]	0.0142
Trunk fat mass (kg)[a]	8.859±2.999 (7.128–10.591)	7.327±1.920 (6.219–8.436)[b]	0.0171
Trunk lean mass (kg)[a]	16.764±2.342 (15.412–18.117)	17.809±1.861 (16.734–18.884)[b]	0.0365
% trunk fat mass[c]	36.50±10.31 (13.10–46.90)	31.30±6.88 (11.60–35.30)[d]	0.0219
Upper limb fat mass (kg)[a]	2.301±1.169 (1.626–2.976)	1.494±0.469 (1.223–1.765)[b]	0.0053
Upper limb lean mass (kg)[a]	4.199±0.727 (3.779–4.619)	4.375±0.822 (3.900–4.849)[b]	0.0198
% upper limb fat mass[a]	33.74±13.06 (26.20–41.27)	25.39±6.81 (21.46–29.33)[b]	0.0056
Lower limb fat mass (kg)[a]	9.221±3.776 (7.041–11.401)	7.735±2.124 (6.509–8.961)	0.0516
Lower limbs lean mass (kg)[a]	12.773±2.030 (11.601–13.945)	14.538±2.409 (13.147–15.929)[b]	0.0001
% lower limb fat mass[a]	40.69±10.87 (34.42–46.97)	34.50±5.90 (31.09–37.91)[b]	0.0130

QUADRO 17. Exemplo de circuito de ação cardiovascular

Exercícios	Execução
Supino	15-20RM
Leg press	15-20RM
Abdominal supra	15-20RM
Esteira	5 minutos
Pulley frente	15-20RM
Mesa flexora	15-20RM
Abdominal oblíquo	15-20RM
Bicicleta ergométrica	5 minutos
Desenvolvimento	15-20RM
Cadeira adutora	15-20RM
Extensão coluna	15-20RM
Elíptico	5 minutos

Marchetti, P; Charro. M. Estrutura Metodológica para Montagem de Programas e Sistemas de TF. In: Prestes, J; Foschini, D; Marchetti, P; Charro, M. Prescrição e Periodização do TF em academias. São Paulo: Manole, 2010.

TF E DIABETES PRESCRIÇÃO

1. Leg press
2. Extensão do quadril
3. Crucifixo máq.
4. Desenvolvimento
5. Abdominal
6. Mesa flexora
7. Bicicleta
8. Esteira

8 semanas, 3 x semana, circuito - estações 7 exercícios de força alternando com exercícios aeróbios

Adaptado de Maiorana et al., 2002

TF E DIABETES PRESCRIÇÃO

Estação: 45s para os exercícios aeróbios e de força (15 repetições, 3s cada), **intervalo** entre as estações: 15s, totalizando 1h

Intensidade do TA: 70% da FCM e após 5 semanas, 85%

Intensidade do TF: 55% de 1RM, após 3 semanas, 65% e 5 min na esteira para finalizar o circuito

Adaptado de Maiorana et al., 2002

RESULTADOS DO ESTUDO

Redução significativa da FC e DP no exercício submáximo

↘

Aumentou o limiar ventilatório

↘

Melhora na força e na captação de O_2

↘

Diminuição das pregas cutâneas, %G, da RCQ e da glicemia em jejum

EXERCÍCIO E DIABETES: PRESCRIÇÃO

Aquecimento 5 minutos e alongamento antes e depois

1. Cadeira extensora
2. Supino reto
3. Mesa flexora
4. bíceps c/ halteres
5. Puxada por trás
6. Flexão plantar
7. Desenv. c/ halteres
8. Remada sentada
9. Extensão tríceps
10. Flexão do tronco

8 semanas, 3 x semana, circuito, alternância c/ exercícios aeróbios

Dunstan et al., 1998

TF E DIABETES: PRESCRIÇÃO

4 primeiras semanas foram realizadas 2 séries, depois 3 séries, a 50-55% de 1RM

10-15 reps por exercício (30s) + 30s de aeróbio

Sessão de 1h no total

Intensidade dos exercícios aeróbios: < 50 W a 60 rpm

Dunstan et al., 1998

TF E DIABETES: PRESCRIÇÃO

EXERCÍCIO aumenta à ação da insulina e diminui seus níveis plasmáticos

Pessoas de 50-63 anos

Aumento na força, massa magra e redução na gordura corporal

Miller et al., 1994

nature publishing group

ARTICLES
INTERVENTION AND PREVENTION

Treatment of Obese Adolescents: The Influence of Periodization Models and ACE Genotype

Denis Foschini[1,2], Ronaldo C. Araújo[3], Reury F.P. Bacurau[4], Aline De Piano[1], Sandro S. De Almeida[5], June Carnier[1], Thiago D.S. Rosa[5], Marco T. De Mello[6] , Sérgio Tufik[6] and Ana R. Dâmaso[1]

Obesity (2009) doi:10.1038/oby.2009.247

Table 2 Resistance training program for both groups

LP group[a]			
Weeks 1–2[c]	Weeks 3–6	Weeks 7–10	Weeks 11–14
Three sets 15–20RM	Three sets 15–20RM	Three sets 10–12RM	Three sets 6–8RM
DUP group[b]			
Weeks 1–2[c]	Day 1	Day 2	Day 3
Three sets 15–20RM	Three sets 15–20RM	Three sets 10–12RM	Three sets 6–8RM

Table 3 Anthropometrics, biochemical, and physiological variables for LP and DUP groups

	LP ($n = 16$)			DUP ($n = 16$)			LP vs. DUP	
Variable	Baseline	After intervention	ES	Baseline	After intervention	ES	Baseline *P*	After intervention *P*
Height (cm)	165 ± 8	165.3 ± 7.9	0.03	169.1 ± 8.0	169.3 ± 8.3	0.02	0.17	0.15
Body mass (kg)	98.9 ± 13.5	90.3 ± 12.7**	0.63	107.6 ± 12.2	96.9 ± 11.4**	0.87	0.81	0.15
BMI (kg/m²)	36.5 ± 5.6	33.2 ± 5.2**	0.58	37.7 ± 4.4	33.8 ± 4.4**	0.88	0.51	0.73
Body fat (%)	45.5 ± 8	38.3 ± 9.5**	0.90	45.1 ± 8.3	31.7 ± 10.1**	1.6	0.89	0.78
Body fat (kg)	43.7 ± 11	34 ± 11.7**	0.88	48.8 ± 11.4	36.6 ± 12.4**	1.07	0.25	0.57
Fat-free mass (kg)	53.3 ± 6	55.1 ± 7.7*	0.3	58.8 ± 9.9	60.2 ± 9.6*	0.14	0.09	0.12
Visceral fat (cm)	4.3 ± 0.2	2.8 ± 0.8**	0.75	4.4 ± 1.5	3.2 ± 1**	0.8	0.75	0.28
Subcutaneous fat (cm)	3.6 ± 0.4	3.1 ± 0.6*	1.25	3.6 ± 0.6	3 ± 0.6**	1.0	0.88	0.68
Glucose (mg/dl)	89.6 ± 6.6	88.8 ± 5.3	0.12	89.3 ± 6.8	89.5 ± 5.2	0.02	0.90	0.74
Insulin (μU/dl)	15.4 ± 3.4	13.6 ± 5.2	0.52	19.7 ± 4.7	14 ± 3.9**	1.21	0.66	0.86
HOMA-IR	3.4 ± 1.31	3.1 ± 1.9	0.22	4.3 ± 1.3	3.1 ± 1.2**	0.92	0.18	0.78

Table 3 Anthropometrics, biochemical, and physiological variables for LP and DUP groups

	LP ($n = 16$)			DUP ($n = 16$)			LP vs. DUP	
Variable	Baseline	After intervention	ES	Baseline	After intervention	ES	Baseline *P*	After intervention *P*
Total cholesterol (mg/dl)	163 ± 30.9	146 ± 30**	0.55	178.6 ± 30.5	155.2 ± 18.2**	0.76	0.18	0.36
HDL cholesterol (mg/dl)	42.2 ± 6	42.7 ± 5.1	0.21	42.1 ± 7.7	43.8 ± 9	0.24	0.97	0.69
LDL cholesterol (mg/dl)	104 ± 26.9	89.8 ± 27.5**	0.52	117.1 ± 27.2	94.2 ± 16**	0.84	0.22	0.61
SBP (mm Hg)	130.4 ± 14.5	111.8 ± 6.7**	1.28	136.7 ± 17.2	118.3 ± 9.0**	1.06	0.42	0.08
DBP (mm Hg)	81.4 ± 10.8	71.8 ± 5.4**	0.92	85.3 ± 5.1	74.0 ± 5.1**	2.21	0.22	0.26
VO_{2max} (ml/kg/min)	27.5 ± 6.8	30.3 ± 8.1**	0.41	24.7 ± 5	28 ± 6.6**	0.66	0.21	0.43
RMR (kcal)	1,847.2 ± 407.9	1,591.7 ± 361.8*	0.62	1,873.3 ± 575	1,819.7 ± 506.4	0.09	0.81	0.08