

# Эластическое сопротивление THERA-BAND®

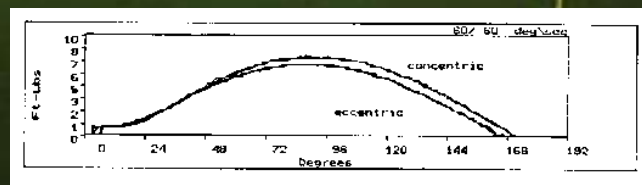
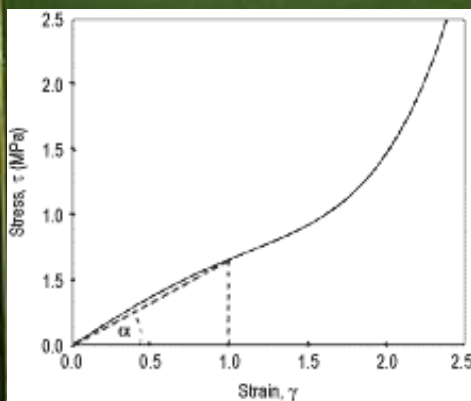


# Натуральный каучук

- Жидкий латекс – это смола коры каучукового дерева
- 72% всего каучука находится в 3 странах
- Тайланд, Индонезия, Малайзия
- Латекс – натуральное сырьё



# Где кривая эластического сопротивления?



# Виды тренировки с сопротивлением

## Вид

Изометрический

Изотонический

Изокинетический

Эластический

## Постоянны

длина мышцы

сопротивление

скорость

сопротивление

**Эластический** – это уникальный вид тренировки

# Сравнение изотонического и эластического видов тренировки

Схожий физиологический ответ на тренировку

(Aboodarda et al. 2011; Hostler et al. 2001; Nash et al. 2002, Sexsmith, 1992)

Без значительных отличий в силовых показателях

(Aboodarda et al. 2011; Behm, 1991; Colado & Triplett 2008; Takeshima et al. 2002; Smockum 2003)

Схожие профили ЭМГ

(Andersen et al. 2010; Jakobsen et al. 2012; LeBlanc et al. 2003; Lim, 1998; Matheson et al. 2001)

# Сравнение эластического сопротивления Thera-Band® и работы на тренажёрах

- Случайное, контролируемое 12-недельное исследование
- 3 группы (эластика, тренажёры, контрольная) женщин среднего возраста
- Одинаковые упражнения, сопоставление по интенсивности и ощущениям
- Обе тренировавшиеся группы значительно улучшили показатели силы и состава тела; значительных отличий между этими группами не обнаружено

## EFFECTS OF A SHORT-TERM RESISTANCE PROGRAM USING ELASTIC BANDS VERSUS WEIGHT MACHINES FOR SEDENTARY MIDDLE-AGED WOMEN

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<sup>1</sup>Department of Physical Education and Sports, University of Valencia, Valencia, Spain; <sup>2</sup>Neuromuscular Laboratory, Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, North Carolina

### ABSTRACT

Colado, JC and Triplett, NT. Effects of a short-term resistance program using elastic bands versus weight machines for sedentary middle-aged women. *J Strength Cond Res* 22(5): 1441-1448, 2008—This study was designed to determine whether different effects on functional capacity and body composition were produced by using different devices (elastic bands (EBs) versus weight machines (WMs)) with the same resistance training program. Forty-five healthy sedentary middle-aged women volunteers were chosen and randomly assigned to 1 of 3 groups: 21 subjects trained using EBs (EBG), 14 trained using WMs (WMG), and 10 were controls (CG). Both exercise groups trained with a periodized muscular endurance program twice a week for 10 weeks, with a total of 6 exercises per session for the major muscle groups. Exercise intensity was equalized by jointly monitoring the same targeted number of repetitions (TNRs) and rate of perceived exertion in active muscles (RPE-AM). Functional capacity was assessed by using knee pushup (KPU) and 60-second squat (S) tests. Body composition was measured using an 8-polar bioelectrical impedance analyzer. The results for both the EBG and WMG show a decrease in fat mass ( $p = 0.05$  and  $p < 0.01$ , respectively) and an increase in both the fat-free mass ( $p < 0.05$  and  $p < 0.01$ , respectively) and the number of repetitions in the KPU ( $p < 0.05$  and  $p < 0.01$ , respectively) and S tests ( $p < 0.01$  in both). None of the variables measured for the CG varied significantly. It can be concluded that, independently of the device used, the combined monitoring of TNRs and RPE-AM can be a valid tool for controlling the resistance exercise intensity and can lead to healthy adaptations. EBs can thus offer

significant physiological benefits that are comparable to those obtained from WMs in the early phase of strength training of sedentary middle-aged women.

**KEY WORDS:** targeted number of repetitions, active muscle rate of perceived exertion, functional capacity

### INTRODUCTION

Early postmenopause is a critical time for osteoporosis (5), one of the most serious public health problems affecting women today (34). Sarcopenia is a reduction in fat-free mass (FFM). FFM decreases by approximately 50% from 20 to 90 years of age. The rate of decline begins to become very apparent from the age of 30 onward and increases considerably after the age of 50. There is a clear relationship between loss of FFM and reduced muscular strength, functional capacity, and quality of life (6,21). Although increasing life expectancy is an important public health aim, it is even more important that it be accompanied by maintenance of functional health (21). Consequently, strategies to maintain or increase FFM in middle-aged women must be devised, including the development of resistance training programs (23). A general resistance training program with a few single and multiple-joint exercises for the major muscle groups, using light resistance at submaximal effort, few sets, and weekly sessions can be effective in the initial stages of training for sedentary subjects to increase FFM, muscle endurance, and muscle power (2). Improvement of the muscle endurance of the upper extremities, combined with improvement of the power of lower extremities favors an increase in functional capacity and enhances quality of life (18,35).

The American College of Sports Medicine (ACSM) states that it might be ideal to start a resistance training program with weight machines (WMs) (2). However, access to machines requires both facilities and financial resources. Although several companies have developed innovative machines that are small, easy to transport, and less expensive, there are often no community programs that provide access to these machines. In addition, the average dropout rate in formal exercise programs is approximately 50% in the first

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22(5):1441-1448

*Journal of Strength and Conditioning Research*

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VOLUME 22 | NUMBER 5 | SEPTEMBER 2008 | 1441

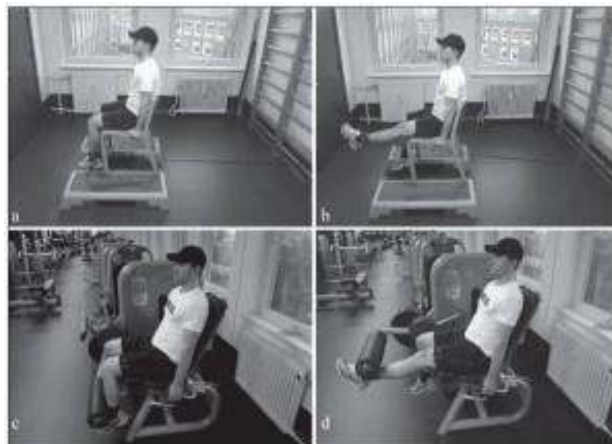
# Сравнение эластического сопротивления Thera-Band® и работы на тренажёрах

- Сравнивались нейромышечные характеристики двуглавой мышцы плеча во время сгибания руки с использованием изотонического веса и жгута Thera-Band
- Эластическое сопротивление показало лучшие результаты нейромышечной активации, а, стало быть, реабилитации



# Сравнение эластического сопротивления Thera-Band® и работы на тренажёрах

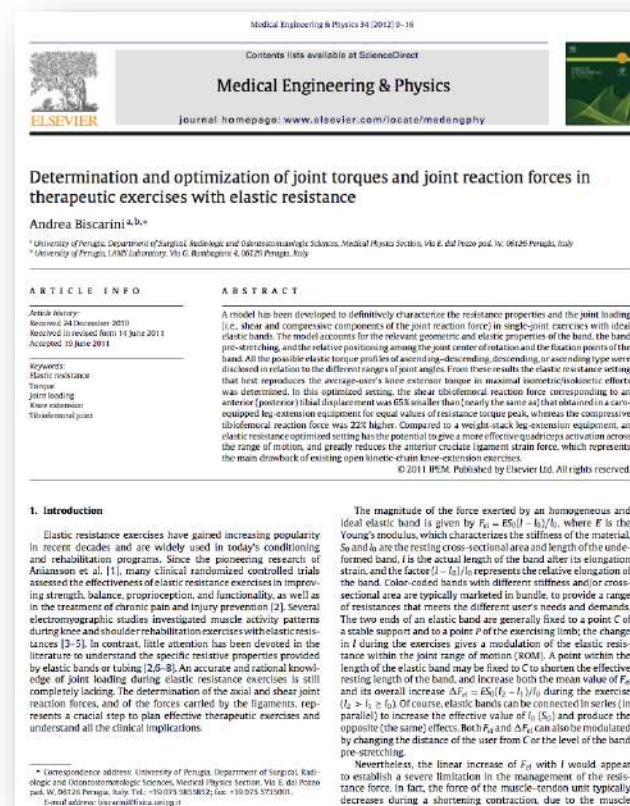
Эластическое сопротивление Thera-Band даёт идентичный тренажёрам (Nautilus, Technogym) уровень активации четырёхглавой мышцы бедра (согласно ЭМГ)





# Сравнение эластического сопротивления Thera-Band® и работы на тренажёрах

- Эластическое сопротивление более разнообразно чем работа на тренажёрах
- Эластика, в отличие от тренажёров, не вызывает повреждений ПКС во время выполнения разгибания колена в открытой кинетической цепи





# Сравнение эластического сопротивления Thera-Band® и работы на тренажёрах

- Разгибание колена с использованием эластического сопротивления Thera-Band даёт схожие с таковым в тренажёре «Nautilus» показатели отложенного начала мышечного утомления, максимального произвольного изотонического сокращения и MRT
- Эластическое сопротивление Thera-Band® может приводить к мышечной гипертрофии, не уступающей таковой, при работе на тренажёрах

Journal of Sports Sciences and Medicine (2011) 10, 635-643  
http://www.jssm.org

## Research article

### Muscle strength and damage following two modes of variable resistance training

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#### Abstract

Nautilus Machine (NM) and Elastic Resistance (ER) have gained considerable popularity among athletes and recreational fitness seeking to increase muscle strength. However, there is controversy concerning the use of ER for increasing muscle hypertrophy and strength among healthy-trained individuals. The aim of the study was to compare effect of repeated near maximal contractions by ER/NM as indicators of muscle damage including maximal strength decrement (MVIC), rate of muscle soreness (DOMS), concentration of plasma creatine kinase (CK) and neuronal high muscle signal on T2-weighted images using magnetic resonance imaging (MRI). Nine healthy male subjects completed two modalities of exercise (5 sets x 10RM ER/NM) in a counterbalanced crossover study design with three weeks "wash-out" period between experiments. The MVIC was measured and DOMS onset and recorded for 4 consecutive days while blood samples were collected on day 1, 3, 5 and 7. Prior to and forty-eight hours after completion of each mode of exercise, subjects underwent MRI scanning. The average of applied forces demonstrated significantly higher value for NM compared with ER (342 ± 34.2 N vs 246.71 ± 46.6 N respectively) throughout the 3 sets of dynamic exercise (all  $p < 0.05$ ). However, the indicators of muscle damage (T2 relaxation time, DOMS, MVIC and serum CK) exhibited a very similar response across both modes of training. Plasma CK increased significantly following both modes of training with the peak value on Day 3 ( $p < 0.05$ ). The time course of muscle soreness reached a significant level after both modes of exercise and showed a peak value on the 2<sup>nd</sup> day ( $p < 0.05$ ). The T2 relaxation time demonstrated a statistically significant increase following ER and NM compared with the pre-test value ( $p < 0.05$ ). The similarity of time responses following both the ER and NM training modes suggests that both modes of training provide a similar training stress, despite a considerably lower external force generation during ER. The importance of these findings is underlined by the fact that exercise-induced muscle damage has been shown to be the underlying mechanism of further muscle hypertrophy.

**Key words:** Elastic resistance training, magnetic resonance imaging, muscle strain, muscle hypertrophy.

#### Introduction

It is well documented that repeated eccentric contractions or unaccustomed resistance training will cause muscle soreness, transient decrements in muscle function and an increased leakage of intracellular proteins into the vascular space (Clarkson and Hubal 2002, Howatson and van Someren 2006, Sesto 1991). Electromyography observations further show rupture of the myofibrils, Z-line streaming and focal splits, while urine analysis sug-

gests connective tissue damage. Muscle damage following repeated eccentric contractions and/or bouts of unaccustomed exercise has been the subject of many research studies (Clarkson and Hubal 2002, Esken et al., 2003, Littman et al., 2000, Newham et al., 1983). However, no investigation to date appears to have studied this phenomenon following exercise bouts with Variable External Resistance Training (VET) devices such as the CAM-Nautilus Machine (NM) (Nautilus, Vancouver, WA) and Elastic Resistance (ER) (Hygenic Corporation, Akron, Ohio).

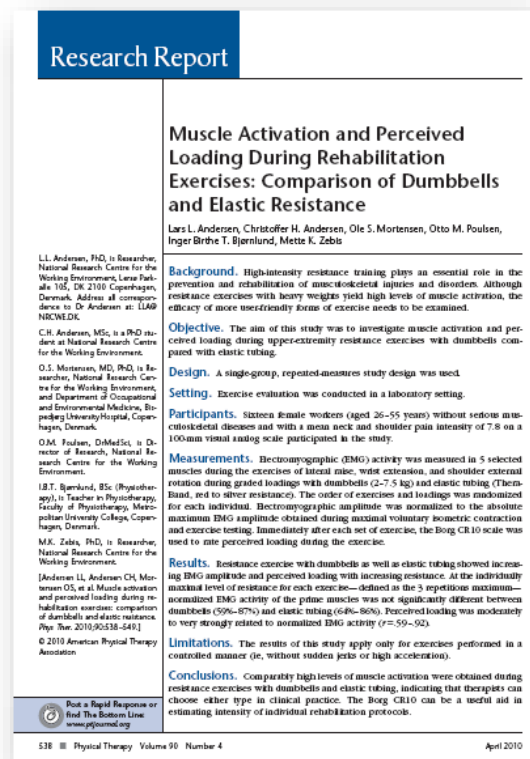
NM and ER have gained considerable popularity among athletes and recreational fitness seeking to increase muscle strength (Graven et al., 1989, Manning et al., 1990, Page and Elliotson, 2003, Wallace et al., 2006). This is due in part to the fact that VET devices provide varying external resistance based on the muscle force generating capacity throughout the range of motion (Jamar et al., 2010, Manning et al., 1990). The ER exercise device is comprised of elastic band material that requires muscle force to transiently extend the length of the elastic band. It is an affordable and effective mode of training in therapeutic and rehabilitative settings (Hollerbach et al., 1998; Page et al., 1992). Despite the popularity of ER, there is controversy concerning the use of this mode of exercise for increasing muscle hypertrophy and strength among healthy-trained individuals. This stems from an unfounded assumption that an "elastic device provides a low level of external force" (Ebben and Jensen, 2002; Hodges, 2006; Newsom et al., 2005; Tschier et al., 1998) and therefore is limited in providing an appropriate neuromuscular stimulus for strength development. ER devices were originally commercialized as low cost therapeutic aids in muscle rehabilitation where comparatively low resistances are the norm. Reinforcing the assumption that ER devices provide low resistance, Hagios (1999) reported the resistance of an elastic device from 3.3N (yellow) to 70.1N (silver) when elastic materials were at 85% (minimum) and 155% (maximum) of deformation from resting length (un-stretched), respectively.

To increase the magnitude of elastic force, two strategies have been recommended in the research literature: firstly, reducing the initial length of the elastic device (Page and Elliotson, 2003) and secondly, doubling or tripling the number of elastic units (using additional various elastic colour coded bands in parallel) (Hodges, 2006; Sinaceur et al., 2001). These strategies have the potential to further increase the utility of ER devices by enabling significant increases in resistance. Thus ER devices that are often used as a physical therapy aid may

Received: 04 July 2011 / Accepted: 14 August 2011 / Published online: 01 December 2011

# Сравнение эластического сопротивления Thera-Band® и работы со свободными весами

- Сравнивались 3 упражнения с использованием изотонической работы со свободными весами и эластическое сопротивление Thera-Band  
Измерялись личные ощущения и уровни активации мышц, согласно ЭМГ
- Значительной разницы в показателях не выявлено
- Оба варианта работы могут быть эффективно использованы



# Обзор биомеханики

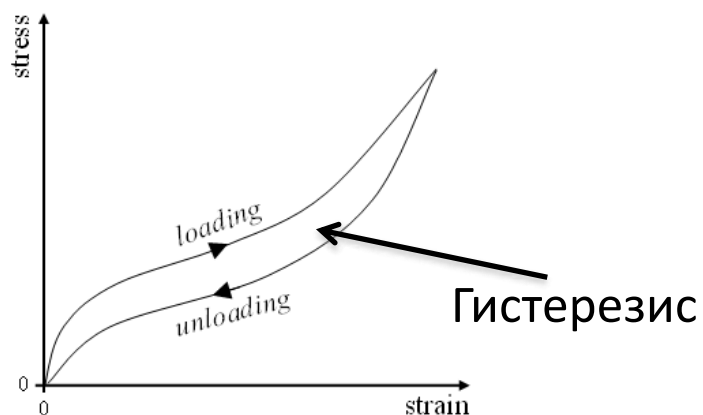
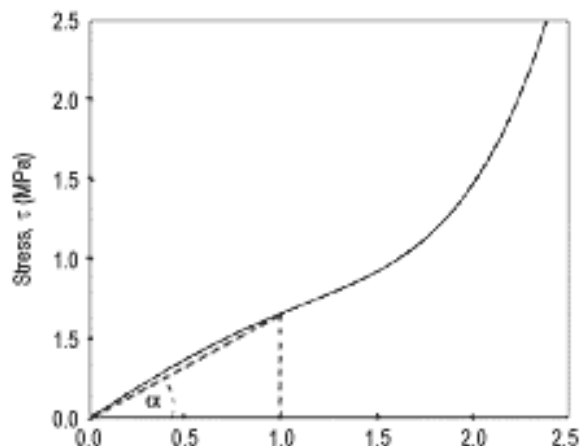
**Сила** = Масса x Ускорение (сопротивление резины)

**Момент силы** = Сила (сопротивление резины) x Плечо рычага (сила мышцы)



Ньютон

# Деформационное напряжение резины



Эластическое сопротивление резины основано на её процентном удлинении

$$\% = [(конечная\ длина - начальная\ длина) / (начальная\ длина)] * 100$$

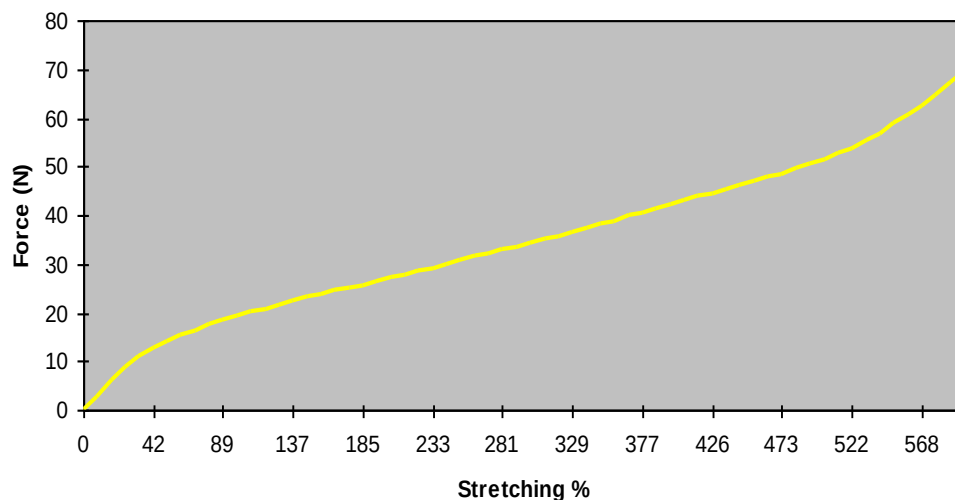
1 meter

2 meters

Вне зависимости от цвета ленты, её сопротивление будет одинаковым при одинаковом растяжении, безотносительно начальной длины!

# 3 области растяжения лент Thera-Band®

Klippel, et al. 1999



Область горба:  
0~25%

Линейная область:  
25%~500%

Экспоненциальная область:  
от 500% до разрыва

Наиболее эффективная область работы с эластическим сопротивлением – это от 25% до 250% растяжения ленты

# Эластическое сопротивление зависит от 3 факторов:

$$\text{Force} = \text{K} * \text{CSA} * \Delta L$$

Эластический коэффициент  
(зависит от латекса)

Поперечное сечение  
(количество материала)

Изменение длины  
(растяжение)

# Прогрессия Thera-Band®

|                    |                             | Растяжение ленты или жгута |              |
|--------------------|-----------------------------|----------------------------|--------------|
| Цвет<br>Thera-Band | Увеличение<br>сопротивления | 100%<br>(кг)               | 200%<br>(кг) |
| Бежевый            | -                           | 1.1                        | 1.5          |
| Жёлтый             | 25%                         | 1.4                        | 2.0          |
| Красный            | 25%                         | 1.7                        | 2.5          |
| Зелёный            | 25%                         | 2.1                        | 3            |
| Синий              | 25%                         | 2.6                        | 3.9          |
| Чёрный             | 25%                         | 3.3                        | 4.6          |
| Серебряный         | 40%                         | 4.6                        | 7            |
| Золотой            | 40%                         | 6.4                        | 9.5          |

# Обзор биомеханики

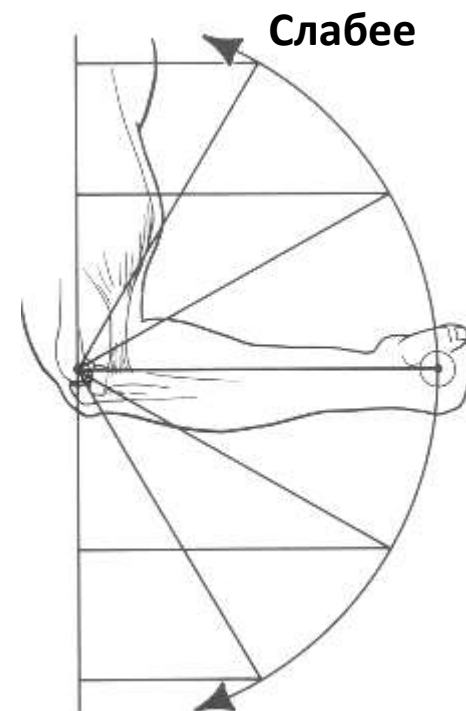
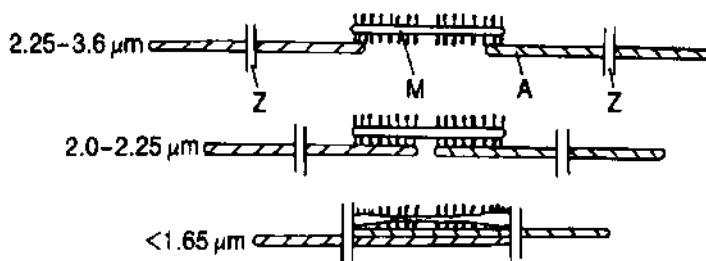
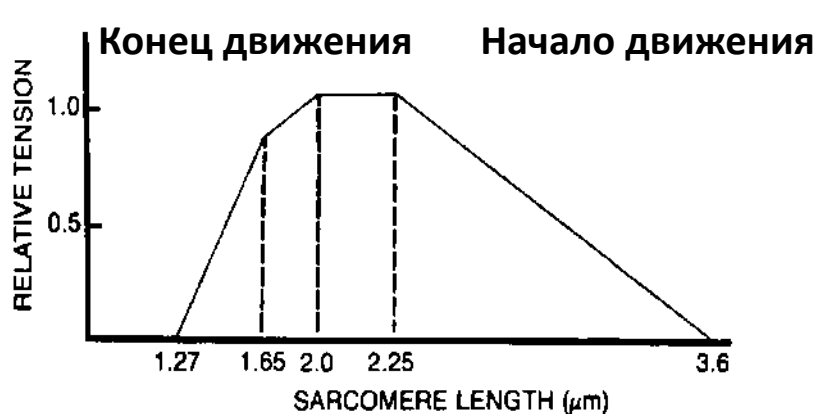
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**Момент силы** = Сила (сопротивление резины) x Плечо рычага (сила мышцы)



Ньютон

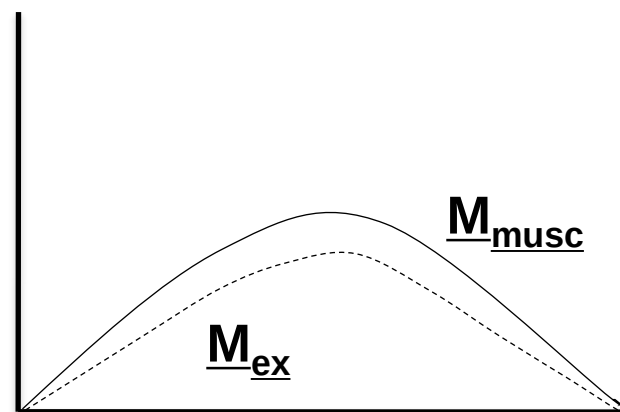
# Кривая силы мышцы



Кривая в форме колокола: Мышца наиболее слаба в конце движения и наиболее сильна в середине движения

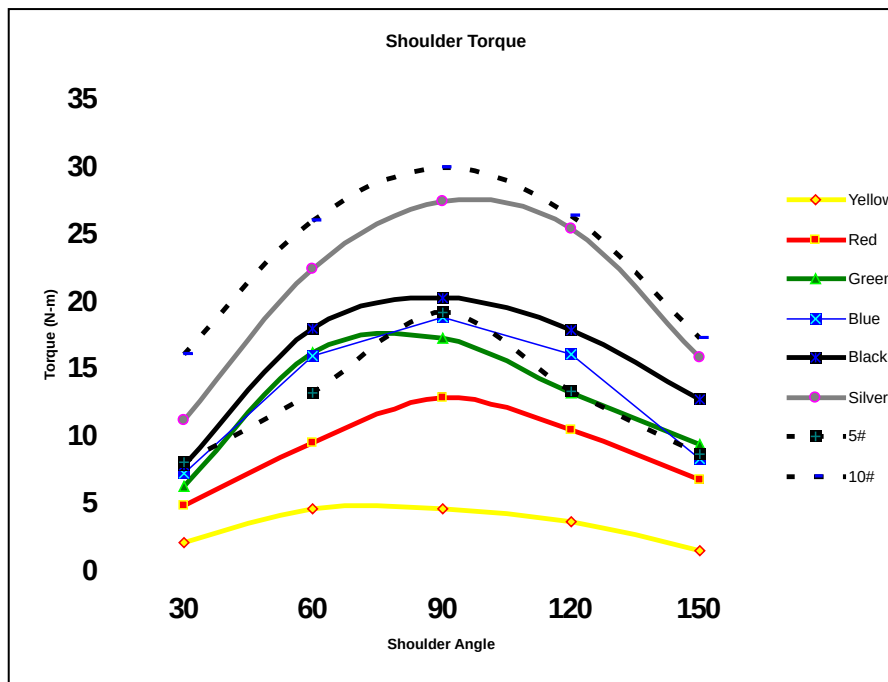
# Использование мышечной силы

- Момент силы упражнения должен совпадать с моментом силы мышцы
- Критически важно для дозировки эластического сопротивления



Отношение момента силы упражнения ( $M_{ex}$ ) к моменту силы мышцы ( $M_{musc}$ )

# Кривые момента силы упражнения при эластическом сопротивлении

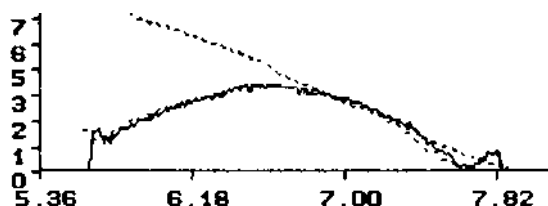


Эластическое сопротивление создаёт схожий с изотоническим момент силы упражнения

Hughes, et al. JOSPT. 29(7):413-420,1999.

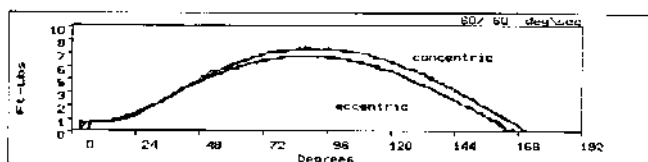


# Кривые момента силы упражнения при различных видах сопротивления



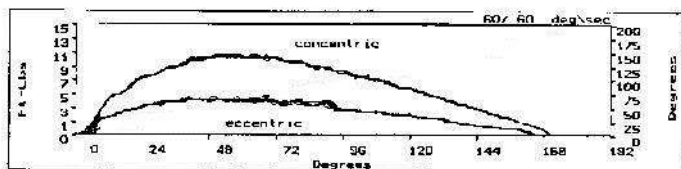
Изотоническое (утяжелители)

Симметричный в восходящей и нисходящей частях пик в середине движения



Эластическое (Thera-Band)

Симметричный в восходящей и нисходящей частях пик в середине движения

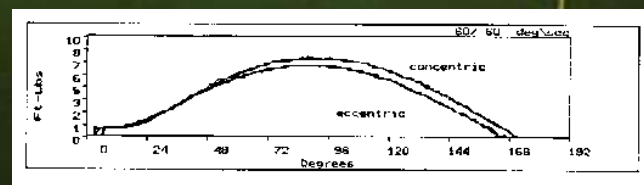
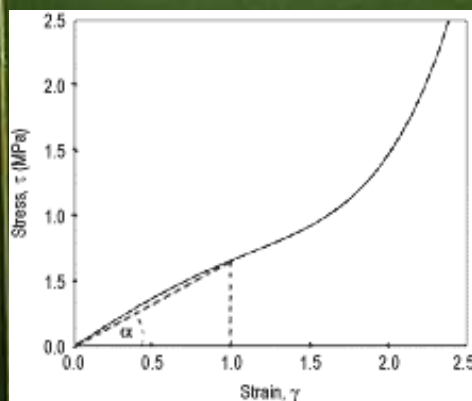


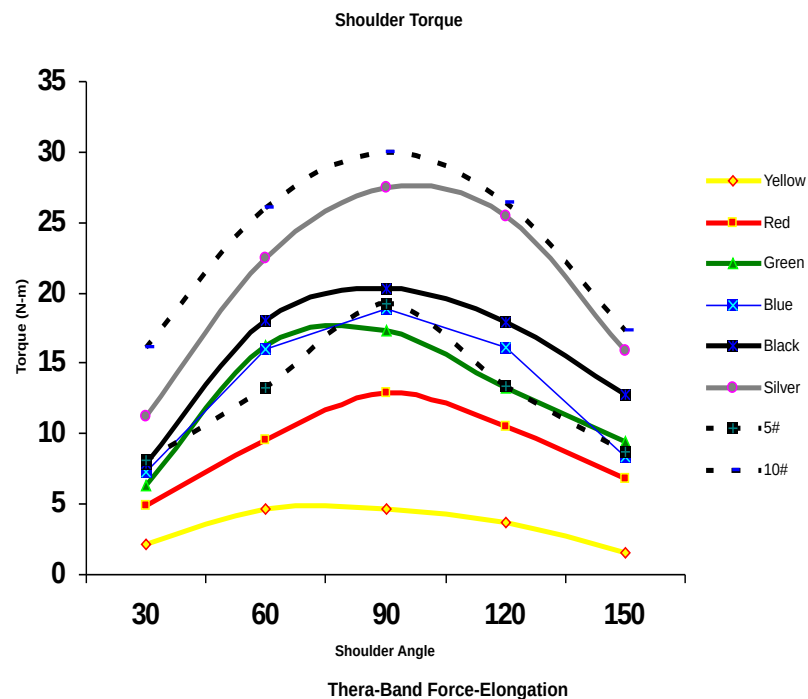
Изотоническое (блок)

Ассиметричный (восходящая часть = 2 нисходящие) пик в конце движения

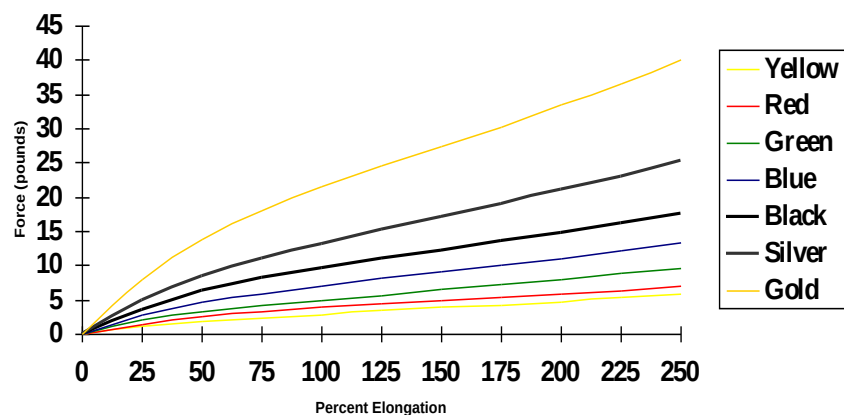


# Промежуточный итог



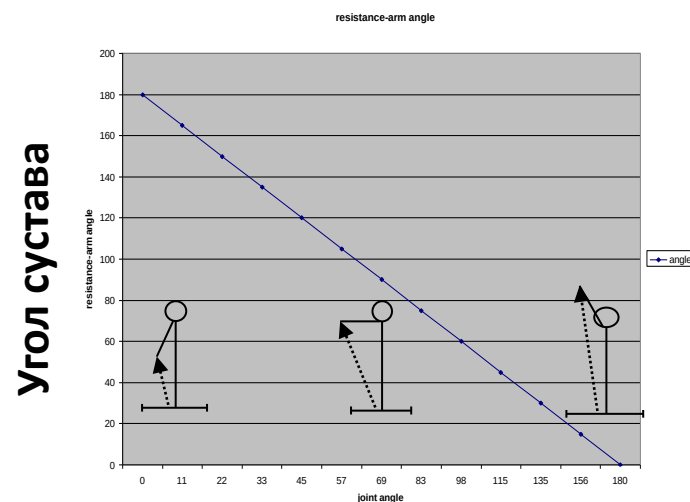
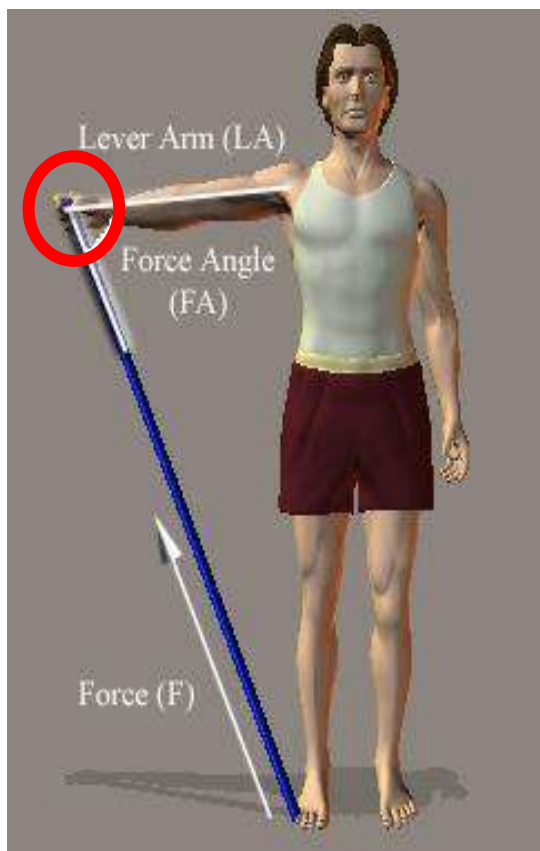


Так, почему же кривая выполнения упражнения с эластическим сопротивлением имеет вид колокола, не смотря на то, что сопротивление резины возрастает?



# Угол силы

Угол силы образуется вектором силы и плечом рычага

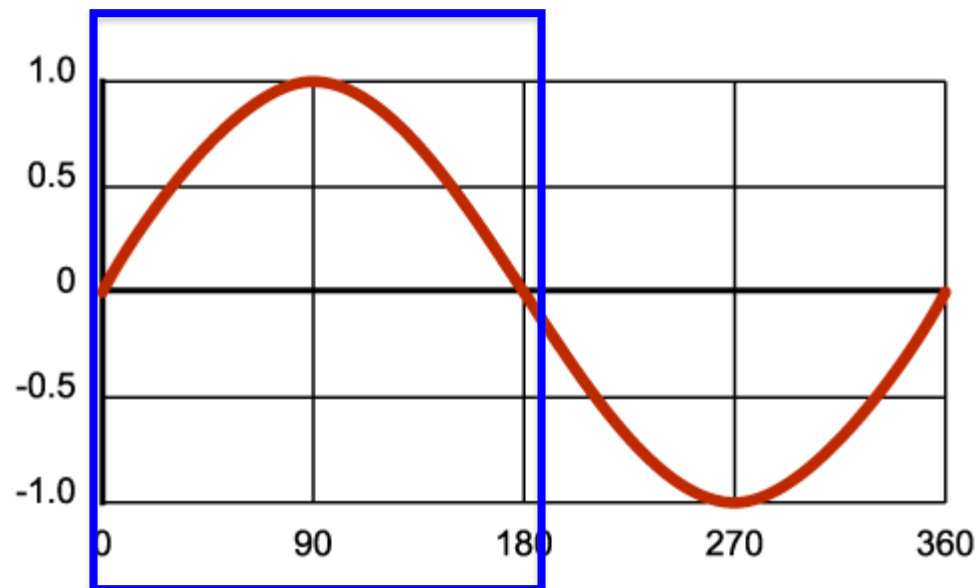
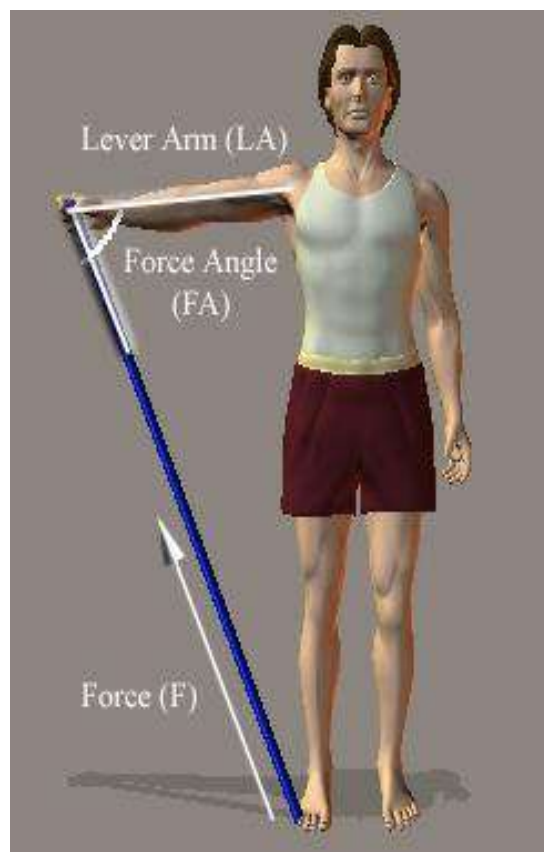


Угол силы

По мере того, как угол сустава увеличивается, угол силы уменьшается

# Момент силы и угол силы

Момент силы = сила \* плечо рычага \* синус угла силы



# Момент силы и угол силы

Момент силы = сила \* плечо рычага \* синус угла силы

Мышца наиболее слаба в конце движения. В этот момент нам нужен маленький угол силы ( $0-15^\circ$ )



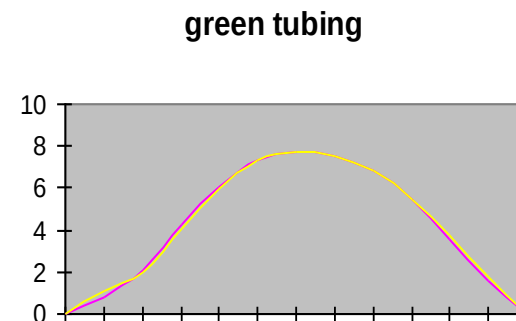
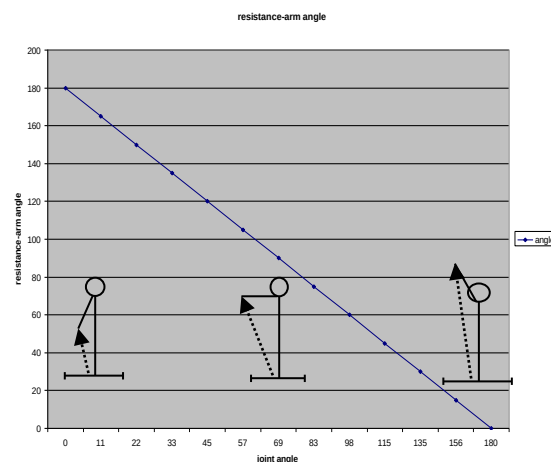
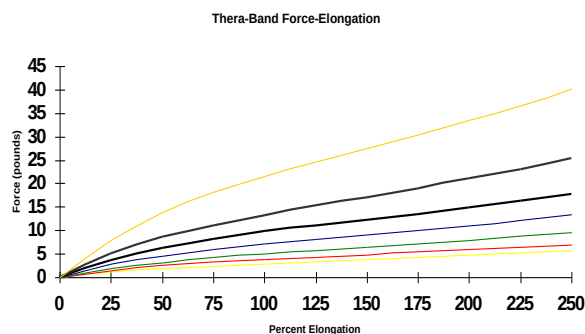
Дельта максимально сокращена, а, значит, наиболее слаба при полном подъёме руки.

Угол силы =  $0$ :

$(MC = C * PR * 0)$

Момент силы =  $0$

# Момент силы эластического сопротивления



СИЛА &

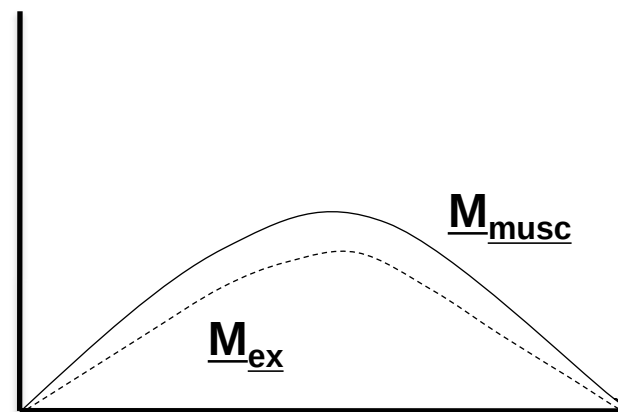
УГОЛ СИЛЫ

= МОМЕНТ СИЛЫ

В то время, как сопротивление эластической ленты растёт,  
угол силы уменьшается

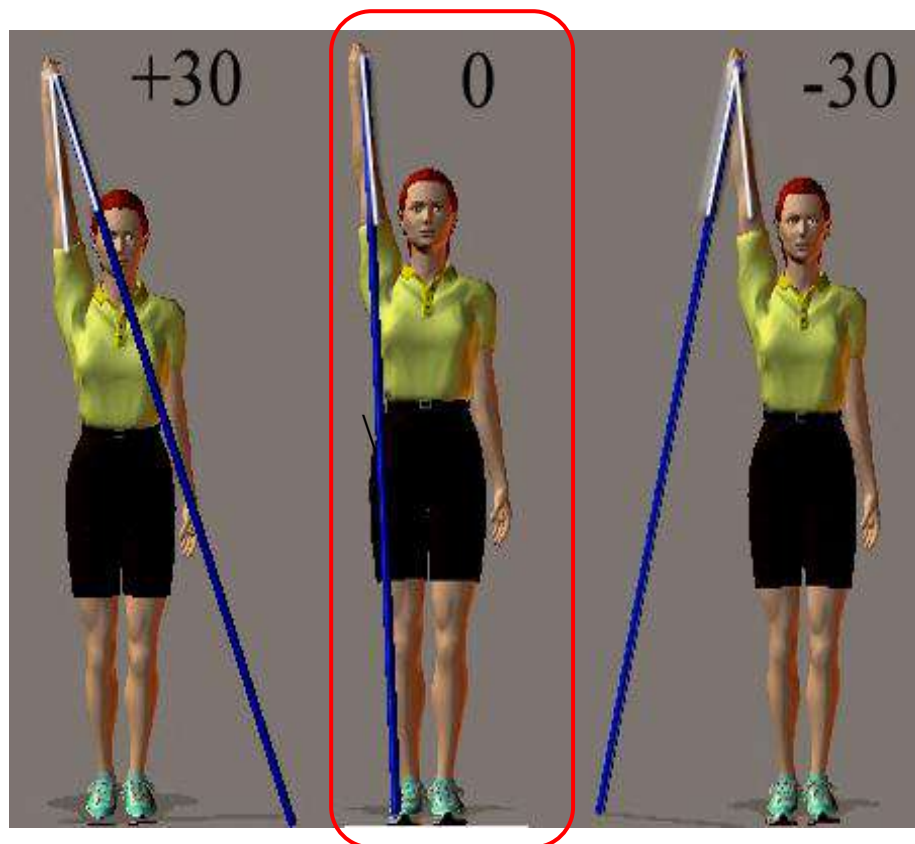
# Дозировка эластического сопротивления

1. Позиция спортсмена позволяет тренеру «прописать соответствующую дозу» момента силы во время выполнения упражнения
2. Легко определить силу сопротивления эластической ленты или жгута



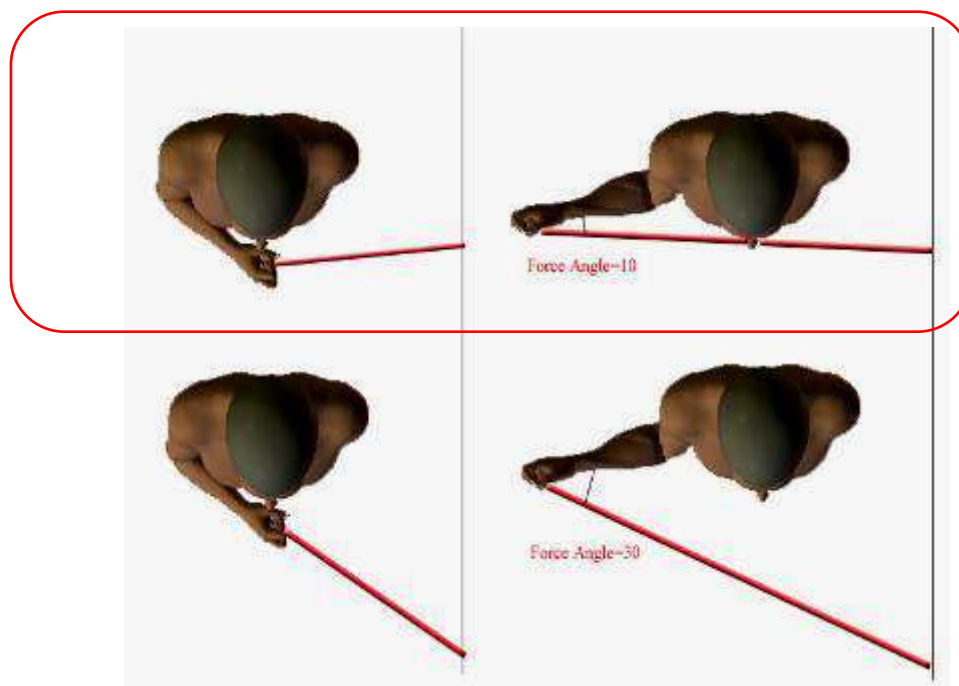
**Мышца должна проходить весь объём движения сустава**

# Выбор места крепления резины



**Место крепления резины должно находиться на одной линии с осью сустава, совершающего движение**

# Выбор места крепления резины



**Удостоверьтесь в том, что в конце движения угол силы равен 0-15°**

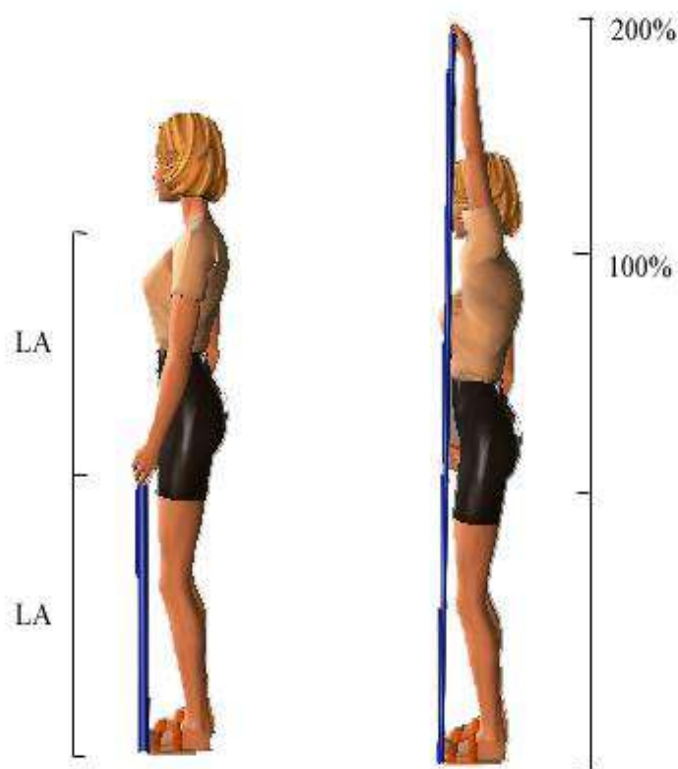
# Пример правильного выбора места крепления резины



Обратите внимание на более высокое, чем обычно, место крепления резины.

Таким образом достигается маленький угол силы в конце движения.

# Правильный выбор длины эластической ленты (жгута)



Растяжение 200% при прохождении конечностью угла в  $180^\circ$

**Используйте начальную длину ленты (жгута) равную длине двигающейся конечности**

# Реактивная тренировка

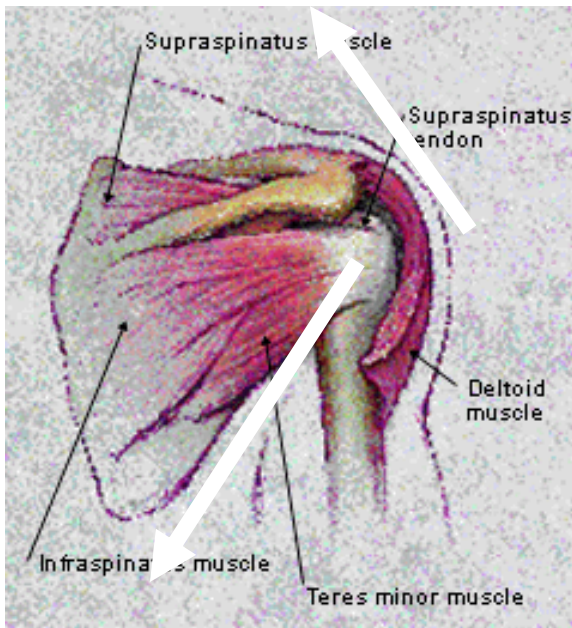
## ➤ Векторная тренировка

- Создание вектора сопротивления или помощи мышцам

## ➤ Упражнения “Stealth”

- Разработаны для автоматической, бессознательной активации истинных функций мышц
- «Динамическая изометрия»

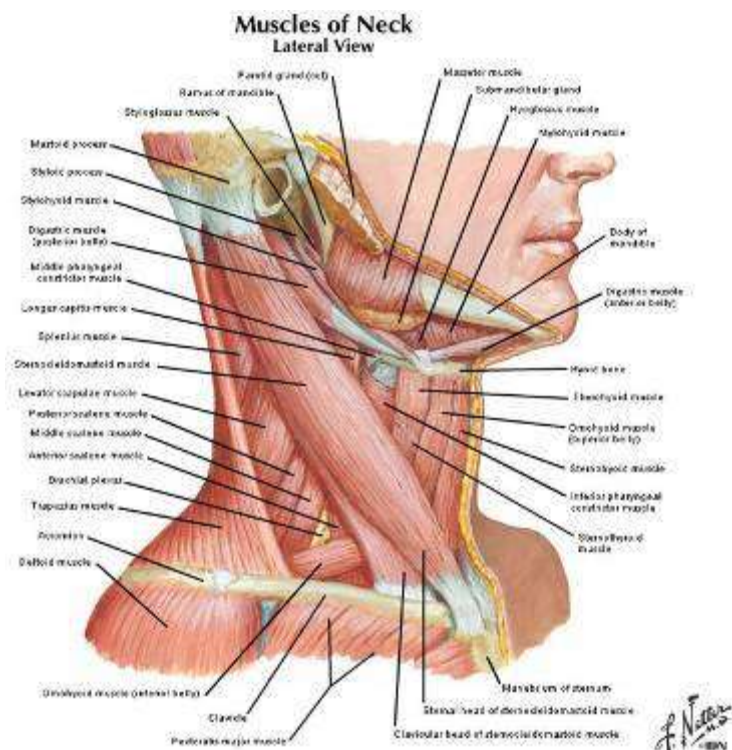
# «Косынка»



Дельтовидная мышца /  
Вращательная манжета

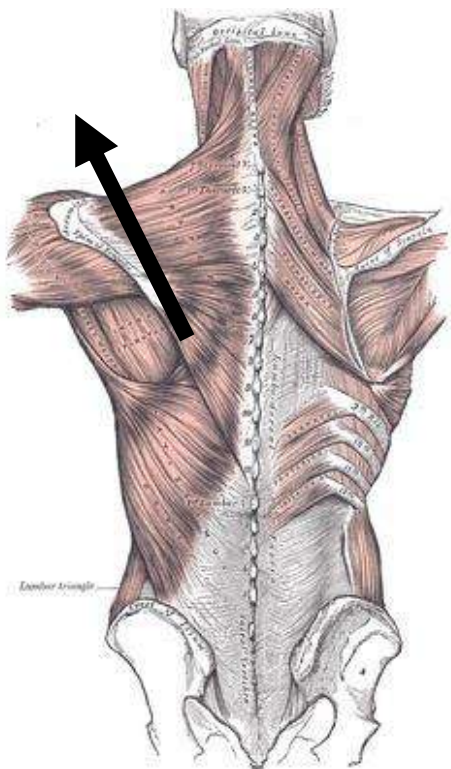


## Глубокие сгибатели шеи



## Стабилизация глубоких сгибателей шеи вектором дорсо-вентрального направления

## Нижняя порция трапеции



# Вращательная манжета



# Thera-Band Kicks



# Тяги



Передняя



Задняя



Латеральная

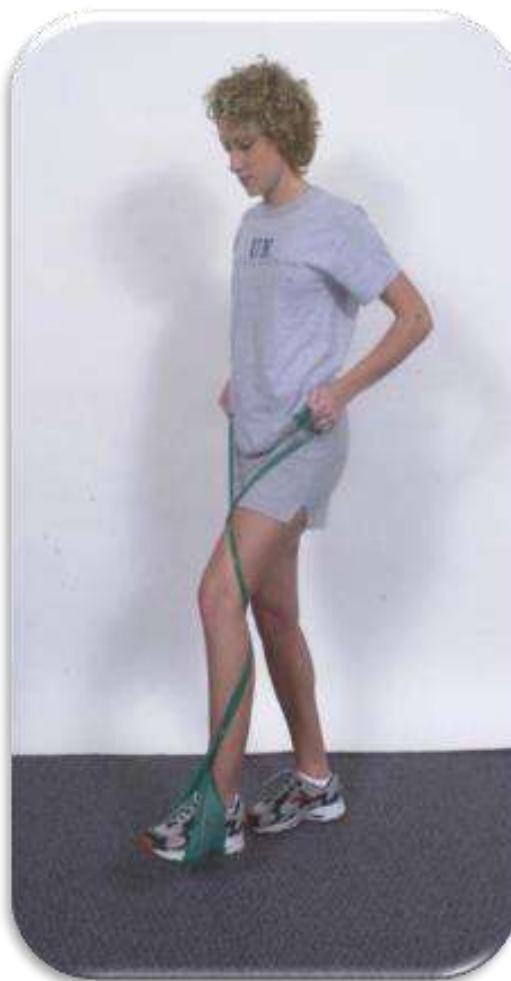


Медиальная

# Tensegrity



# Помощь в походе



# Шкала Борга

Оцените свои ощущения

6 Никаких ощущений

7

8 Чрезвычайно легко

9 Очень легко

10

11 Легко

12

13 Слегка тяжело

14

15 Тяжело

16

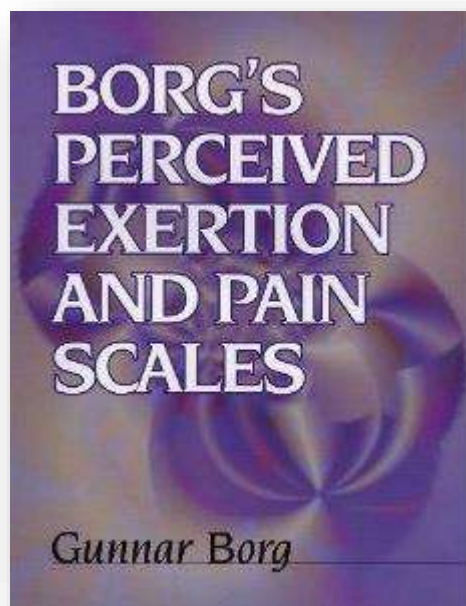
17 Очень тяжело

18

19 Чрезвычайно тяжело

20 Максимальные

ощущения



МЕЖДУНАРОДНАЯ ФЕДЕРАЦИЯ  
ФИЗИОТЕРАПЕВТОВ И РЕАБИЛИТОЛОГОВ

## Research Report

### Muscle Activation and Perceived Loading During Rehabilitation Exercises: Comparison of Dumbbells and Elastic Resistance

Lars L. Andersen, Christoffer H. Andersen, Ole S. Mortensen, Otto M. Poulsen, Inger Birthe T. Bjørnlund, Mette K. Zebis

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C.H. Andersen, MSc, is a PhD student at National Research Centre for the Working Environment.

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O.M. Poulsen, DMedSci, is Director of Research, National Research Centre for the Working Environment.

I.B.T. Bjørnlund, BSc (Physiotherapy), is Teacher in Physiotherapy, Faculty of Physiotherapy, Metropolitan University College, Copenhagen, Denmark.

M.K. Zebis, PhD, is Researcher, National Research Centre for the Working Environment.

[Andersen LL, Andersen CH, Mortensen OS, et al. Muscle activation and perceived loading during rehabilitation exercises: comparison of dumbbells and elastic resistance. *Phys Ther* 2010;90:538-545.]

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**Background.** High-intensity resistance training plays an essential role in the prevention and rehabilitation of musculoskeletal injuries and disorders. Although resistance exercises with heavy weights yield high levels of muscle activation, the efficacy of more user-friendly forms of exercise needs to be examined.

**Objective.** The aim of this study was to investigate muscle activation and perceived loading during upper-extremity resistance exercises with dumbbells compared with elastic tubing.

**Design.** A single-group, repeated-measures study design was used.

**Setting.** Exercise evaluation was conducted in a laboratory setting.

**Participants.** Sixteen female workers (aged 26-55 years) without tendon musculoskeletal diseases and with a mean neck and shoulder pain intensity of 7.8 on a 100-mm visual analog scale participated in the study.

**Measurements.** Electromyographic (EMG) activity was measured in 5 selected muscles during the exercises of lateral raise, wrist extension, and shoulder external rotation during graded loadings with dumbbells (2-7.5 kg) and elastic tubing (Thera-Band, not to other resistance). The order of exercises and loadings was randomized for each individual. Electromyographic amplitude was normalized to the absolute maximum EMG amplitude obtained during maximal voluntary isometric contraction and exercise testing. Immediate after each set of exercise, the Borg CR10 scale was used to rate perceived loading during the exercise.

**Results.** Resistance exercise with dumbbells as well as elastic tubing showed increasing EMG amplitude and perceived loading with increasing resistance. At the individually maximal level of resistance for each exercise—defined as the 3 repetitions maximum—normalized EMG activity of the prime muscles was not significantly different between dumbbells (59%-87%) and elastic tubing (64%-86%). Perceived loading was moderately to very strongly related to normalized EMG activity ( $r=0.59-0.92$ ).

**Limitations.** The results of the study apply only for exercises performed in a controlled manner (ie, without sudden jerks or high acceleration).

**Conclusions.** Comparably high levels of muscle activation were obtained during resistance exercises with dumbbells and elastic tubing, indicating that therapists can choose either type in clinical practice. The Borg CR10 can be a useful aid in estimating intensity of individual rehabilitation protocols.

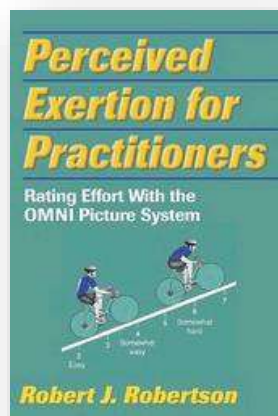
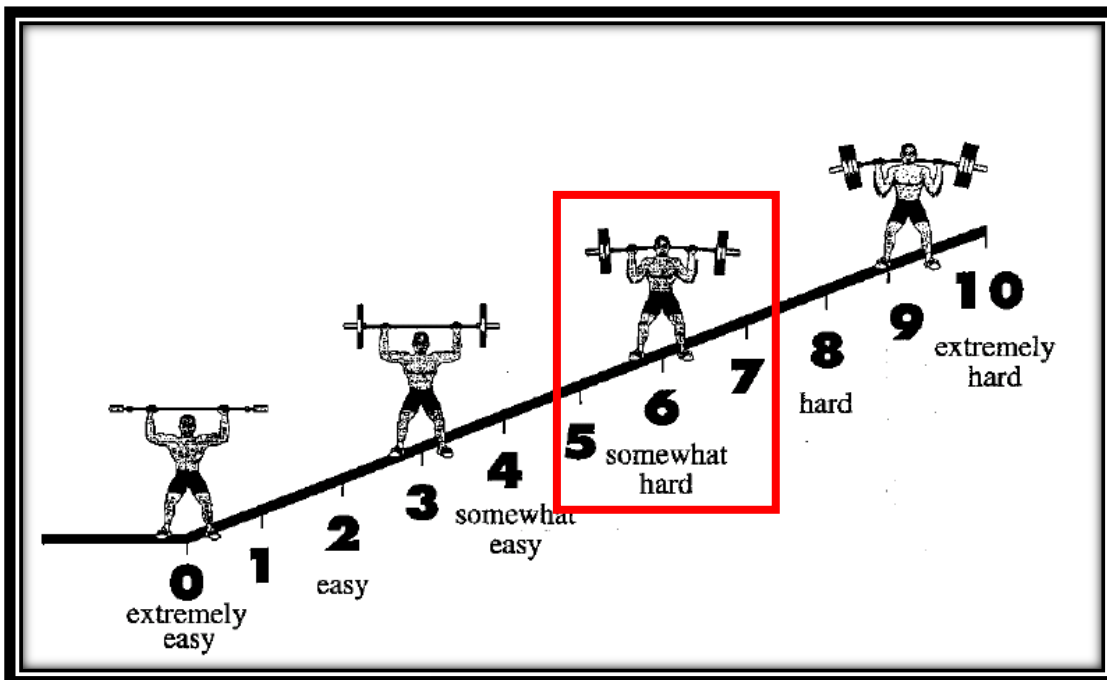
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April 2010

Шкала Борга адаптирована  
к эластическому сопротивлению  
Andersen et al. 2010

# Шкала OMNI



## EFFECTS OF A SHORT-TERM RESISTANCE PROGRAM USING ELASTIC BANDS VERSUS WEIGHT MACHINES FOR SEDENTARY MIDDLE-AGED WOMEN

JUAN C. COLADO<sup>1</sup> AND N. THAVIS TREPLETT<sup>2</sup>

<sup>1</sup>Department of Physical Education and Sports, University of Valencia, Valencia, Spain; <sup>2</sup>Neuromuscular Laboratory, Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, North Carolina

### ABSTRACT

**Colado, JC and Treplett, NT.** Effects of a short-term resistance program using elastic bands versus weight machines for sedentary middle-aged women. *J Strength Cond Res* 22(5): 1441–1448, 2008. This study was designed to determine whether different effects on functional capacity and body composition were produced by using different devices (elastic bands (EB) versus weight machines (WM)) with the same resistance training program. Forty-five healthy sedentary middle-aged women volunteers were chosen and randomly assigned to 1 of 2 groups: 21 subjects trained using EBs (EBG), 14 subjects trained using WMs (WBG), and 10 were controls (CG). Both exercise groups trained with a periodized muscular endurance program twice a week for 10 weeks, with a total of 6 exercises per session for the major muscle groups. Subjective intensity was equated by jointly monitoring the same targeted number of repetitions (TNR) and rate of perceived exertion in active muscles (RPE-AM). Functional capacity was assessed by using knee push-up (KPU) and 40-second squat (S) tests. Body composition was measured using an 8-point bioelectrical impedance analyzer. The results for both the EBG and WBG show a decrease in fat mass ( $p = 0.05$  and  $p < 0.01$ , respectively) and an increase in both the fat-free mass ( $p < 0.05$  and  $p < 0.01$ , respectively) and the number of repetitions in the KPU ( $p < 0.05$  and  $p < 0.01$ , respectively) and S tests ( $p < 0.01$  in both). None of the variables measured for the CG varied significantly. It can be concluded that, independently of the device used, the combined monitoring of TNR and RPE-AM can be a valid tool for controlling the resistance exercise intensity and can lead to healthy adaptations. EBs can offer

significant physiological benefits that are comparable to those obtained from WM in the early phase of strength training of sedentary middle-aged women.

**KEY WORDS:** targeted number of repetitions, active muscle rate of perceived exertion, functional capacity

### INTRODUCTION

Early postmenopause is a critical time for musculoskeletal (MSK), one of the most serious public health problems affecting women today (1). Sarcopenia is a reduction in fat-free mass (FFM). FFM decreases by approximately 50% from 20 to 90 years of age. The rate of decline begins to become very apparent from the age of 50 onward and increases considerably after the age of 60. There is a clear relationship between loss of FFM and reduced muscular strength, functional capacity, and quality of life (52). Although increasing life expectancy is an important public health aim, it is even more important that it be accompanied by maintenance of functional health (21). Consequently, strategies to maintain or increase FFM in middle-aged women must be devised, including the development of resistance training programs (28). A general resistance training program with a few single- and multiple-joint exercises for the major muscle groups, using light resistance at submaximal effort, for one, two, or three sessions can be effective in the initial stages of training for sedentary subjects to increase FFM, muscle endurance, and muscle power (2). Improvement of the muscle endurance of the upper extremities, combined with improvement of the power of lower extremities, forces an increase in functional capacity and enhances quality of life (33,37).

The American College of Sports Medicine (ACSM) states that it might be ideal to start a resistance training program with weight machines (WMs) (2). However, access to machines requires both facilities and financial resources. There are often no community programs that provide access to these machines. In addition, the average dropout rate in formal exercise programs is approximately 50% in the first

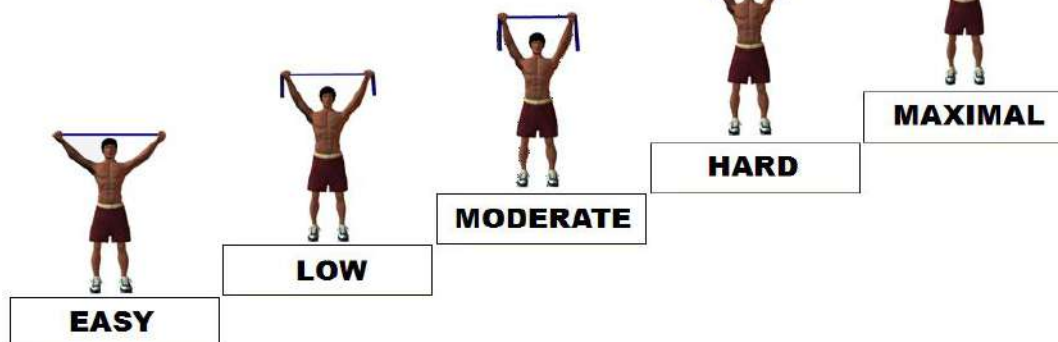
Address correspondence to Juan C. Colado, jcolado@uva.es.  
22(5):1441–1448  
*Journal of Strength and Conditioning Research*  
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VOLUME 22 | NUMBER 5 | SEPTEMBER 2008 | 1441

Шкала OMNI, адаптирована к  
эластическому сопротивлению  
Colado et al. 2008, 2011

# Шкала интенсивности сопротивления Thera-Band®

**Thera-Band®** R.I.S.E  
Systems of Progressive Exercise



## CONCURRENT VALIDATION OF THE OMNI-RESISTANCE EXERCISE SCALE OF PERCEIVED EXERTION WITH THERA-BAND RESISTANCE BANDS

JUAN C. COLADO,<sup>1</sup> XAVIER GARCIA-MARSA,<sup>1</sup> TRAVIS N. THREPLITT,<sup>2</sup> JORGE FLANDEZ,<sup>3</sup> SERGIO BORRIEANE,<sup>4</sup> AND VICTOR TIELLA<sup>5</sup>

<sup>1</sup>Laboratory of Physical Activity and Health, Department of Physical Education and Sports, University of Valencia, Valencia, Spain; <sup>2</sup>Neuromuscular Laboratory, Department of Health, Leisure and Exercise Science, Appalachian State University, Boone, NC; and <sup>3</sup>Faculty of Pedagogy in Physical Education, Sports and Recreation, Jyväskylä University of Oulu, Finland, Oulu

### ABSTRACT

Colado JC, Garcia-Marsa X, Threplitt TN, Flandez J, Borriane S, Tiella V. Concurrent validation of the OMNI-Resistance Exercise Scale of perceived exertion with Thera-Band resistance bands. *J Strength Cond Res* 26(11): 3018–3024, 2012. The concurrent validity of the OMNI-Resistance Exercise Scale (OMNI-RES) of perceived exertion for use with elastic bands was studied during isometric resistance exercises. Twenty healthy, physically active subjects completed both familiarization and testing sessions. The criterion variables were myoelectric activity, recorded by electromyography, and heart rate, recorded by a heart rate monitor. The subjects performed 2 separate sets of 15 repetitions in each of the 2 testing sessions and for each of the exercises applied (i.e., frontal and lateral raises). One set was carried out with the separation between the hands gripping the elastic band allowing the 15 repetition maximum to be performed in the selected exercise, whereas the other set was carried out with the separation between hands of +50% of the previous grip. The perceived exertion rating for the active muscles and for the overall body, muscular activity, and heart rate were measured during the final repetition of each set. The results showed significant differences ( $p \leq 0.001$ ) in myoelectric activity, heart rate, and OMNI-RES scores between the low- and high-intensity sets and the intraclass correlation coefficient was 0.92–0.98. So it can be concluded that the OMNI-RES can be used for prescribing the intensity of exercises when elastic bands are used. This would allow the training stimulus dosage to be precisely controlled in both the session in progress and between different sessions, and allowing to differentiate between different

levels of intensity according to the physical aptitude and special physiological needs of the subjects.

**KEY WORDS:** myoelectric activity, heart rate, elastic bands, physical conditioning, strength training

### INTRODUCTION

The OMNI perceived exertion scale for resistance exercise (OMNI-RES) is a tool that helps to control intensity during strength training exercises and can be applied to men, women, boys, and girls alike (1922). As described by Legally et al. (8), there is a functional link between the 3 kinds of responses that may appear when physical exercise is being carried out: physiological, perceptual, and performance. Some of the physiological variables that usually change during resistance exercises, and that can therefore be used to control intensity while they are being carried out, are blood lactic acid concentration, muscular activity, and heart rate (8,12,13,20). For example, Robertson et al. (1922) used the following criterion variables for concurrent validation of the OMNI-RES: total weight lifted, blood lactic acid concentration, and rating of perceived exertion for active muscles (RPE-AM) and for the overall body (RPE-O).

Despite its ease of use and the fact that the reliability of the overall RPE scale for prescribing exercise intensity in different workout sessions (5,18,11) has already been shown, few studies (2–4,6,7) have applied the RPE-AM to control intensity during resistance exercise programs by using the OMNI-RES Scale for active muscles (OMNI-RES-AM). Several of these studies (24) have been characterized by the fact that to match the intensity of the resistance exercise with different types of resistance devices (i.e., elastic bands and tubing, weight machines, free weights and aquatic devices that increase drag forces), the targeted number of repetitions was maintained while applying the RPE-AM by using the OMNI-RES. These studies showed that the methodological measure was valid, as using different measures for dynamic strength training produced

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26(11):3018–3024  
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3018 | *Journal of Strength and Conditioning Research*



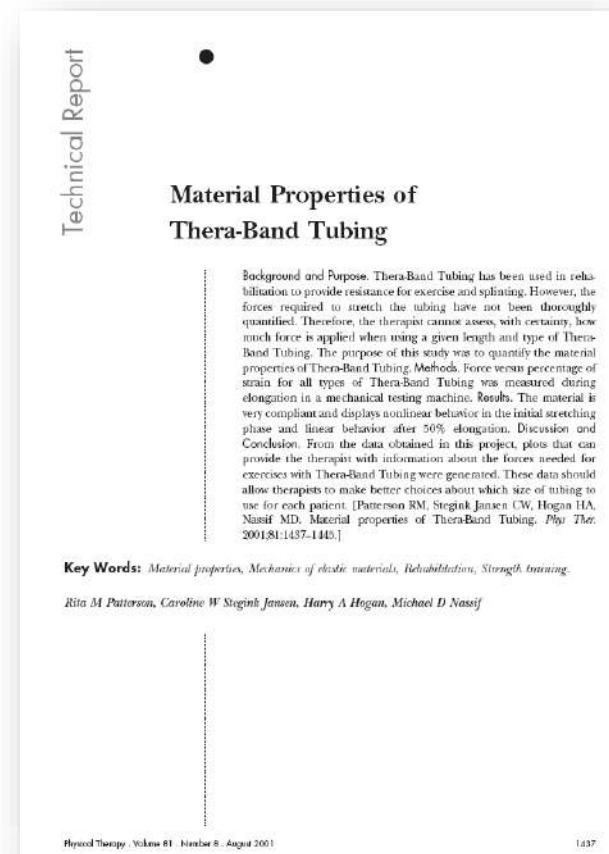
# Растягиваются ли ленты со временем?

Нет! Небольшая потеря сопротивления происходит сразу после распаковки

- Рекомендуется растянуть ленту или жгут перед первым использованием для того, чтобы «настроить» материал

Patterson показал, что после предварительного растяжения: в течение 5000 последующих изменений в сопротивлении не обнаруживается

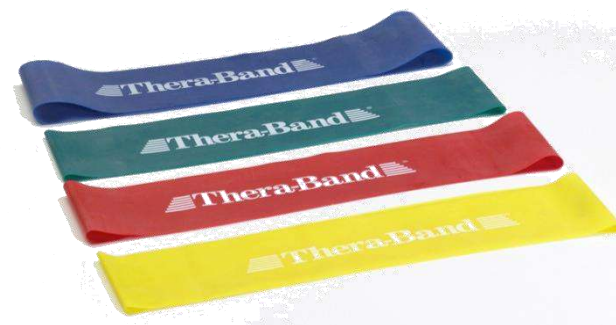
- 250% после 5400 + растяжений (4 упражнения, 10 повторений, 3 раза в день, 5 дней в неделю, 9 недель)



# Меры предосторожности

- Проинструктируйте своего клиента
- Будьте осторожны при выполнении упражнений, в ходе которых лента может отскочить в лицо клиенту, при необходимости защищайте глаза очками
- Чувствительным к латексу клиентам подойдёт продукция Latex Free
- Обследуйте ленту или жгут на предмет надрывов
- Не растягивайте ленту или жгут более, чем на 300%





# Нарезанные ленты Thera-Band®

- Памятки с мерами безопасности в комплекте с каждой лентой освобождают от ответственности
- Ленты по 1,5 метра
- 30 лент в коробке
- UPC код



# Жгуты Thera-Band®

- Достоверная прогрессия
- От жёлтого цвета к серебряному
- Без талька
- Защита от надрывов и микрповреждений



# Жгуты с ручками Thera-Band®

Достоверная цветовая прогрессия  
Thera-Band

- От жёлтого к серебряному

Удобные, мягкие на ощупь,  
прочные ручки



# Упаковки лент и жгутов Thera-Band®

## Упаковка низкого сопротивления

Жёлтый, красный, зелёный

## Упаковка высокого сопротивления

Синий, чёрный

- Помогает клиентам планировать прогрессию
- Ленты и жгуты по 1,5 метра
- Инструкции по применению и технике безопасности





# Петли Thera-Band®

- 4 цвета прогрессии Thera-Band
- Инструкции по применению и технике безопасности
- Легче, чем завязывать узел на ленте
- Меньше скручиваются



# Работа на бёдра



Наружная ротация



Внутренняя ротация



Отведение



Мост с разведением

# Жгуты с манжетами Thera-Band®

- 4 цвета прогрессии Thera-Band® (от красного к чёрному)
- Удобные манжеты на липучках





# Аксессуары Thera-Band®

## Мягкие ручки

- Ценная находка для пациентов с дисфункцией рук
- Удобные, хотя и жёсткие
- Идеальны для фитнеса

## Фиксация

- Крепится к ленте или жгуту

## Спортивная ручка

- Специально разработана для бейсбола, тенниса, гольфа
- Уникальная система трёх креплений

## Манжеты на конечности

- Удобно облегают запястье или голень
- Крепится карабином к ленте или жгуту

Soft Grip  
Handles



Assist



Sports Handle



Extremity Straps



# Дверной якорь Thera-Band®

- Надёжные петли
- Легко дозирует длину ленты или жгута
- Не повреждает ленту или жгут
- Расширяет возможности использования других продуктов Thera-Band
- Превращает любую дверь в тренажёр
- Задействует все части тела



# Почему Thera-Band®?

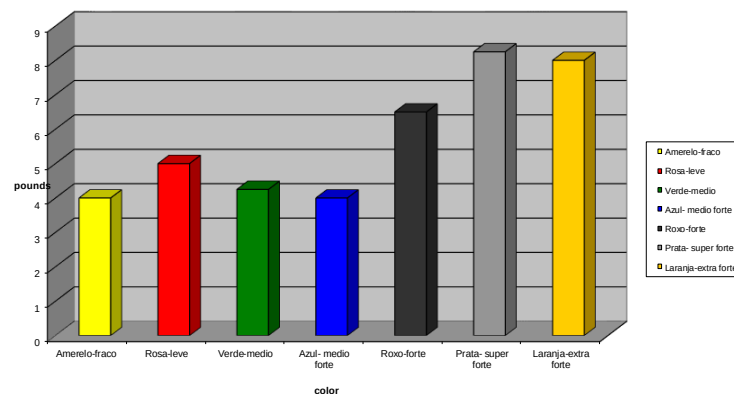
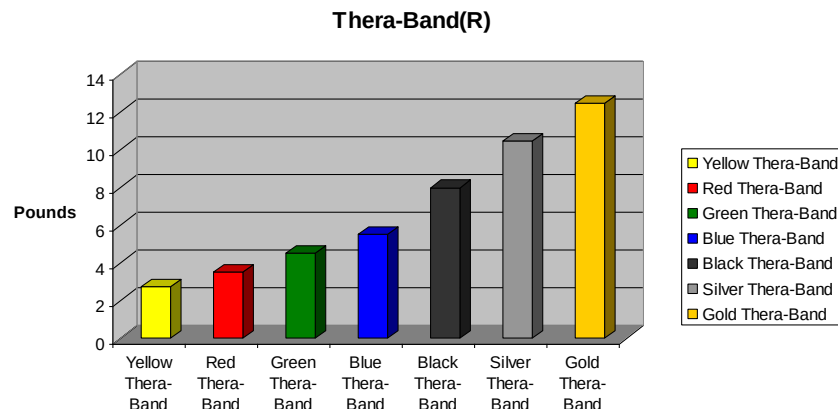
Все три разновидности эластичных продуктов Thera-Band  
равнозначны по сопротивлению, согласно цветам



# Почему Thera-Band®? Достоверная прогрессия



Эластика  
конкурентов



# Результаты на основе фактов

- Доступная база данных
- Более 250 рандомизированных контролируемых исследований посвящённых продукции Thera-Band®  
*Рандомизированное контролируемое исследование = высший уровень доказательности*
- Более тысячи опубликованных на основе продукции Thera-Band® статей
- Более 40 исследований по всему миру идут в данный момент
- Существует «Thera-Band® Research Advisory Committee», состоящий из 16 профессионалов мирового уровня в области спортивной медицины