Exercise prescription

Dr. Mohsen Ebrahimi

What is FatMax?

Oxygen uptake (O2) and carbon dioxide production (CO2)

From this carbohydrate and fat oxidation are calculated and graph constructed

FatMax
The exercise intensity at which fat oxidation peaks

Fat oxidation in grams per minute

0.7
0.525
0.35
0.175
0

Fat oxidation peaks at moderate intensity

Fat oxidation low at low intensities

Fat oxidation drops to close to zero at high intensities

45 50 55 60 65 70 75 80 85 90 95

Exercise intensity (%HRmax)

mysportscience
Unlock the Power of Science to Optimise Performance

@jeukendrup

www.mysportscience.com

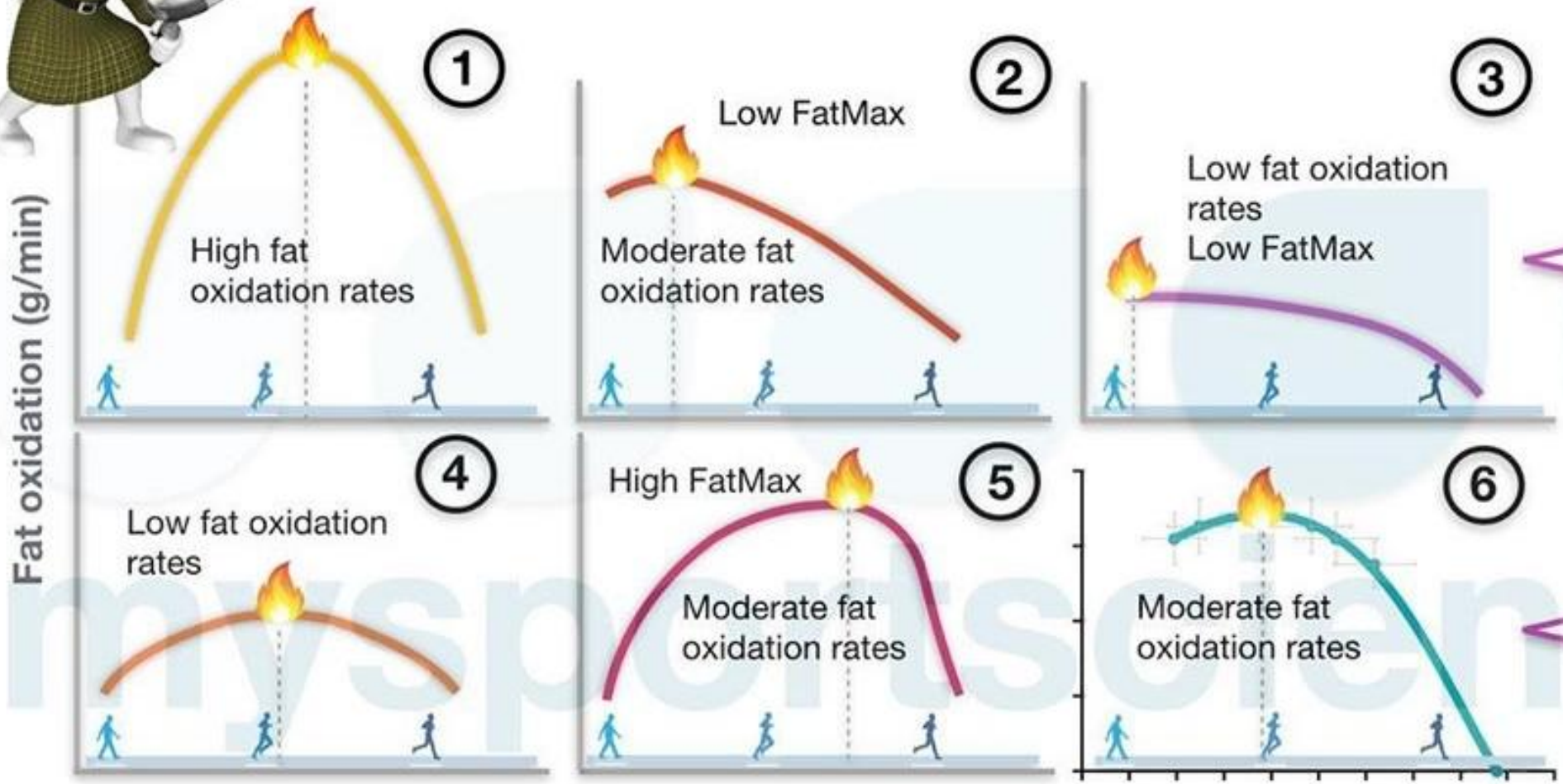
Finding your fat burning zone

Examples of "fat burning curves" of 6 individuals

mysportscience
Unlock the Power of Science to Optimise Performance

@jeukendrup

www.mysportscience.com

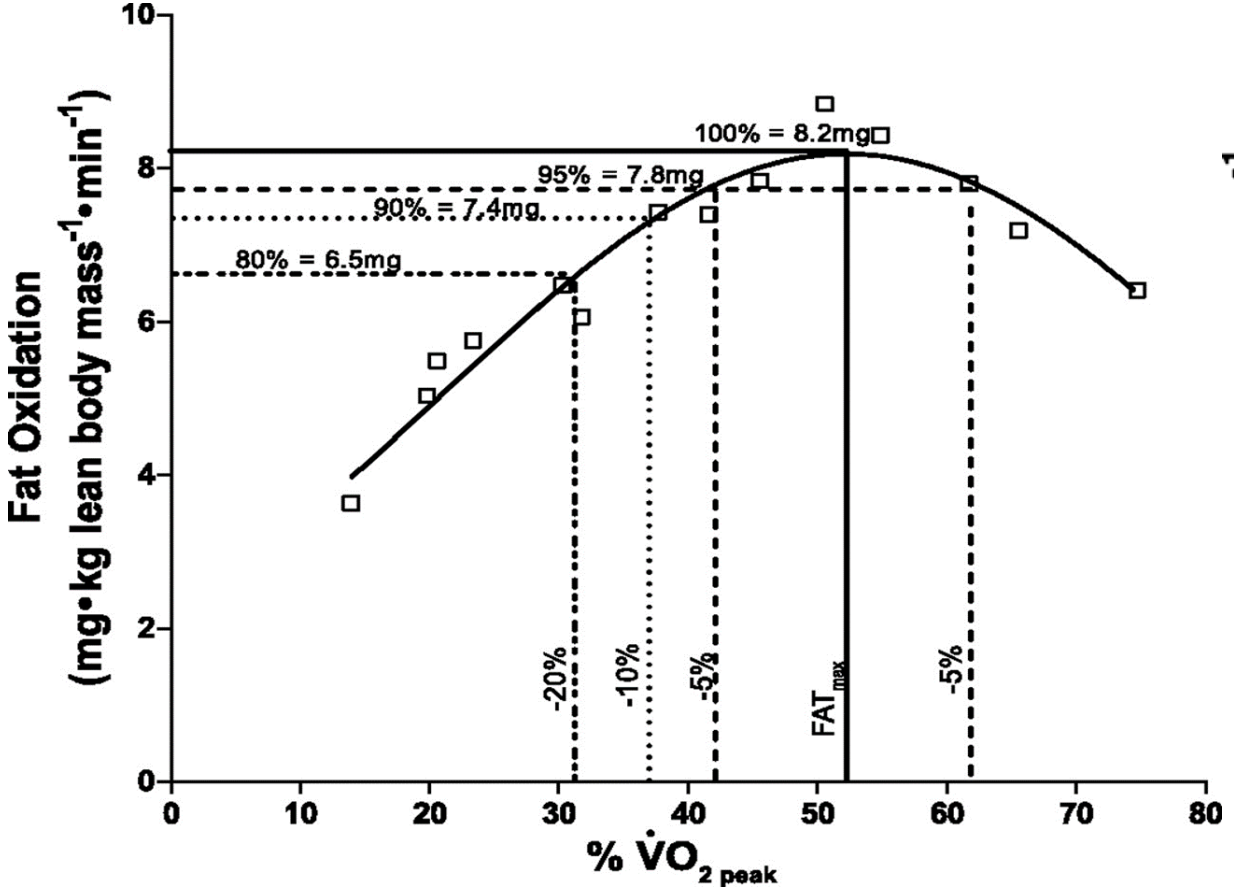


Even when all variables are controlled there is **large variation** in fat oxidation between individuals

General advice about fat burning zones is impossible

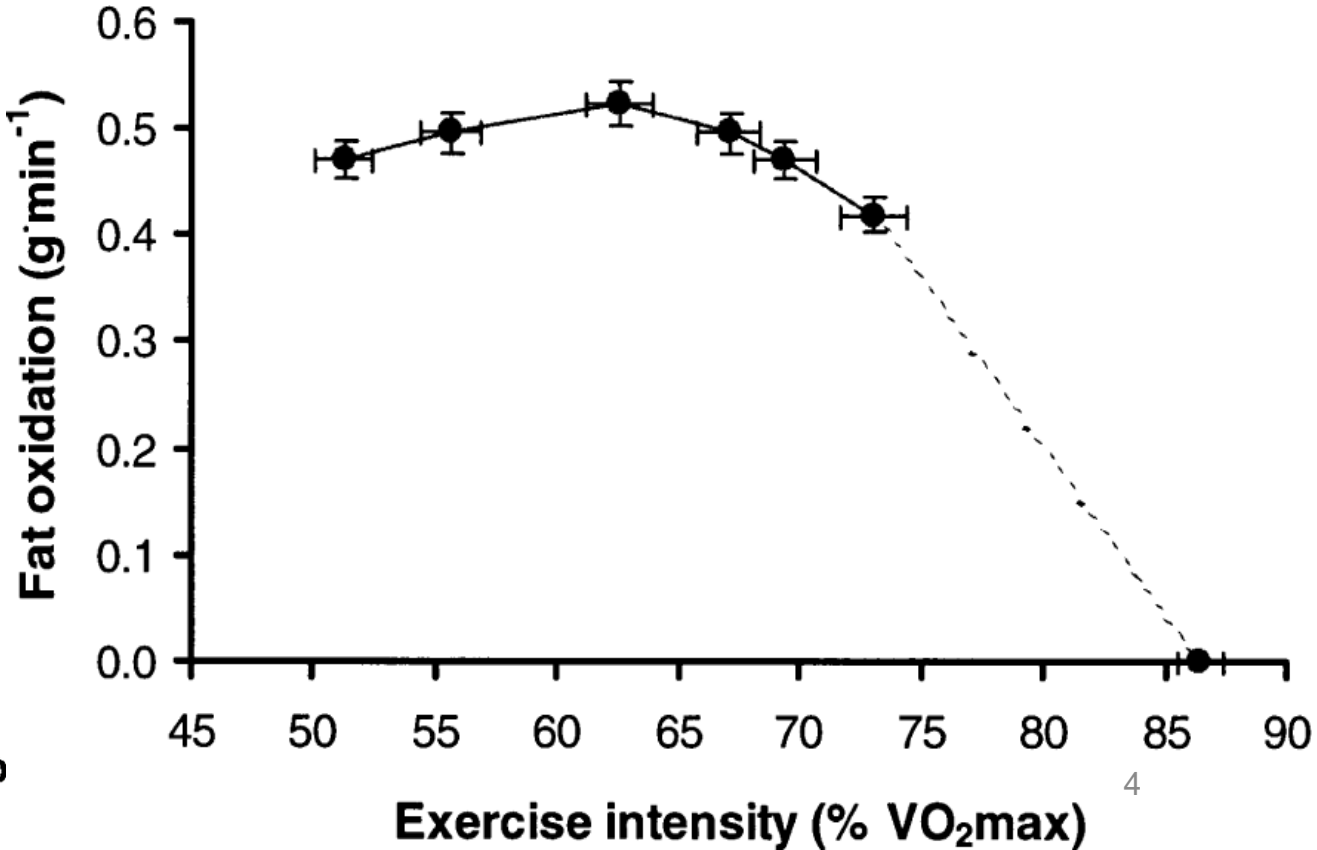
تمرین نکرده

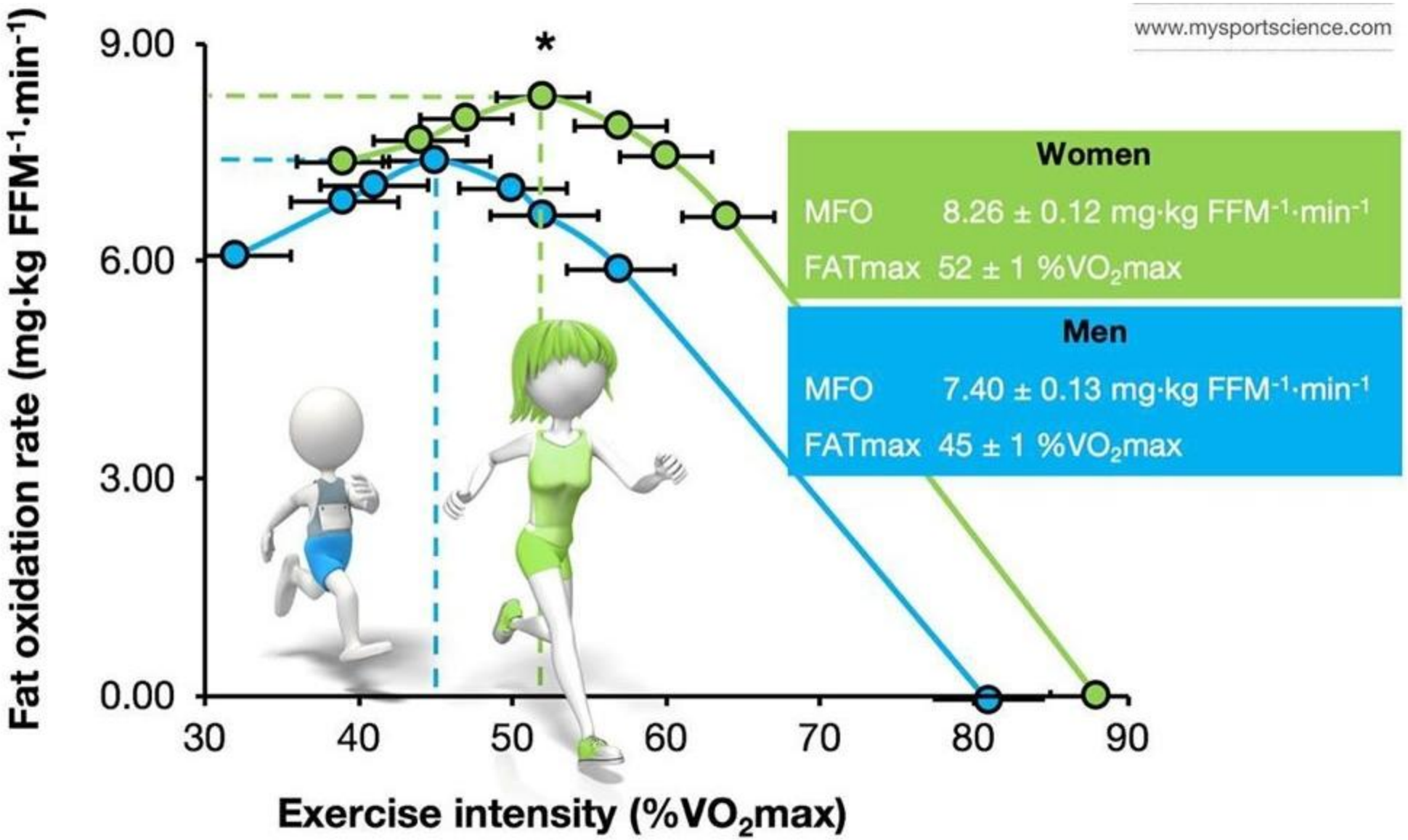
۵۰ تا ۵۵ درصد حداکثر اکسیژن مصرفی



تمرین کرده

۶۰ تا ۶۵ درصد حداکثر اکسیژن مصرفی





Studies have shown that women are slightly better at burning fat than men. In this graph fat oxidation is expressed per kg fat free mass. Differences are very small and it is questionable whether this has any physiological significance. (ajeukendrup)

تفاوت جنسیتی

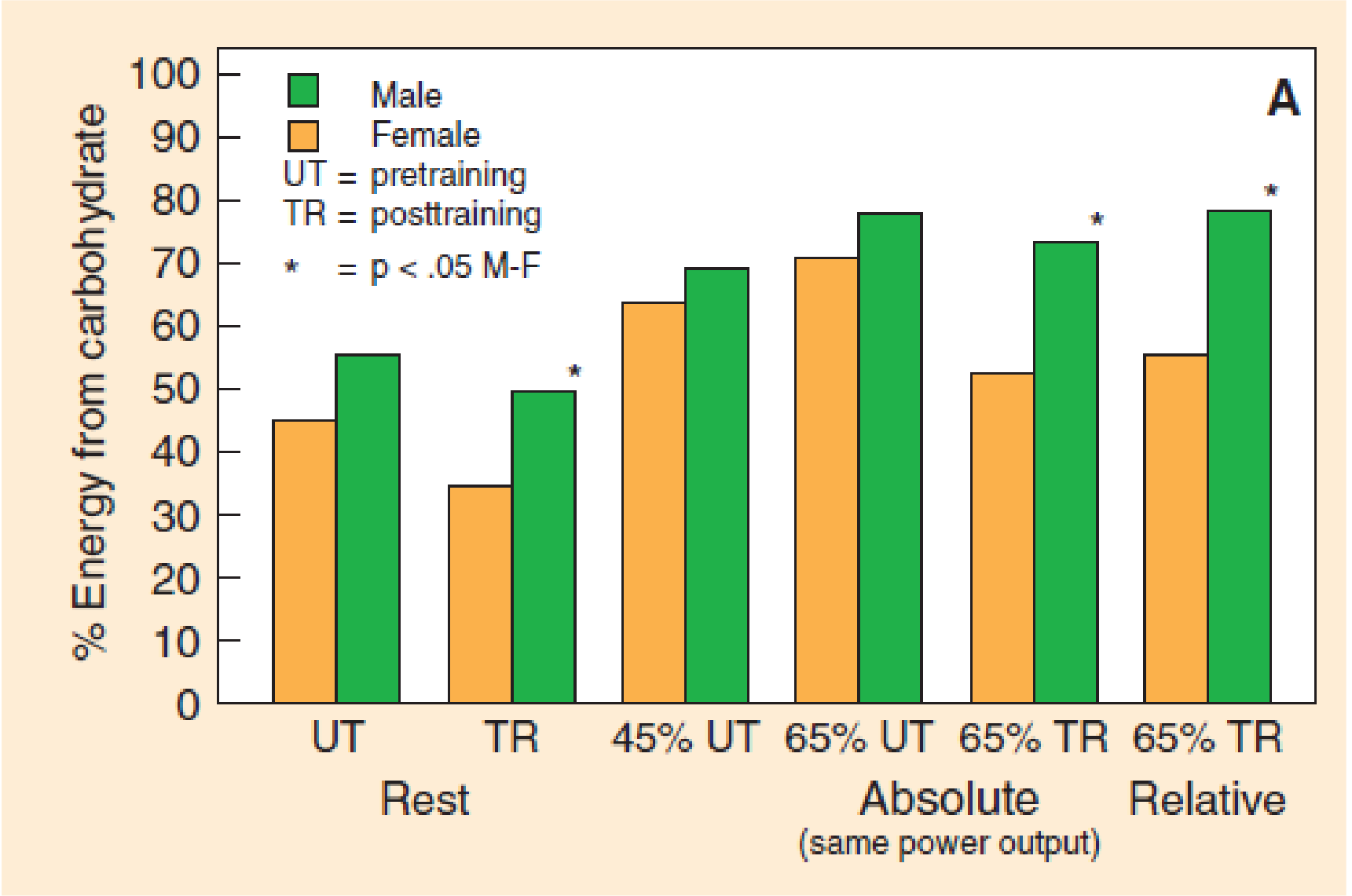
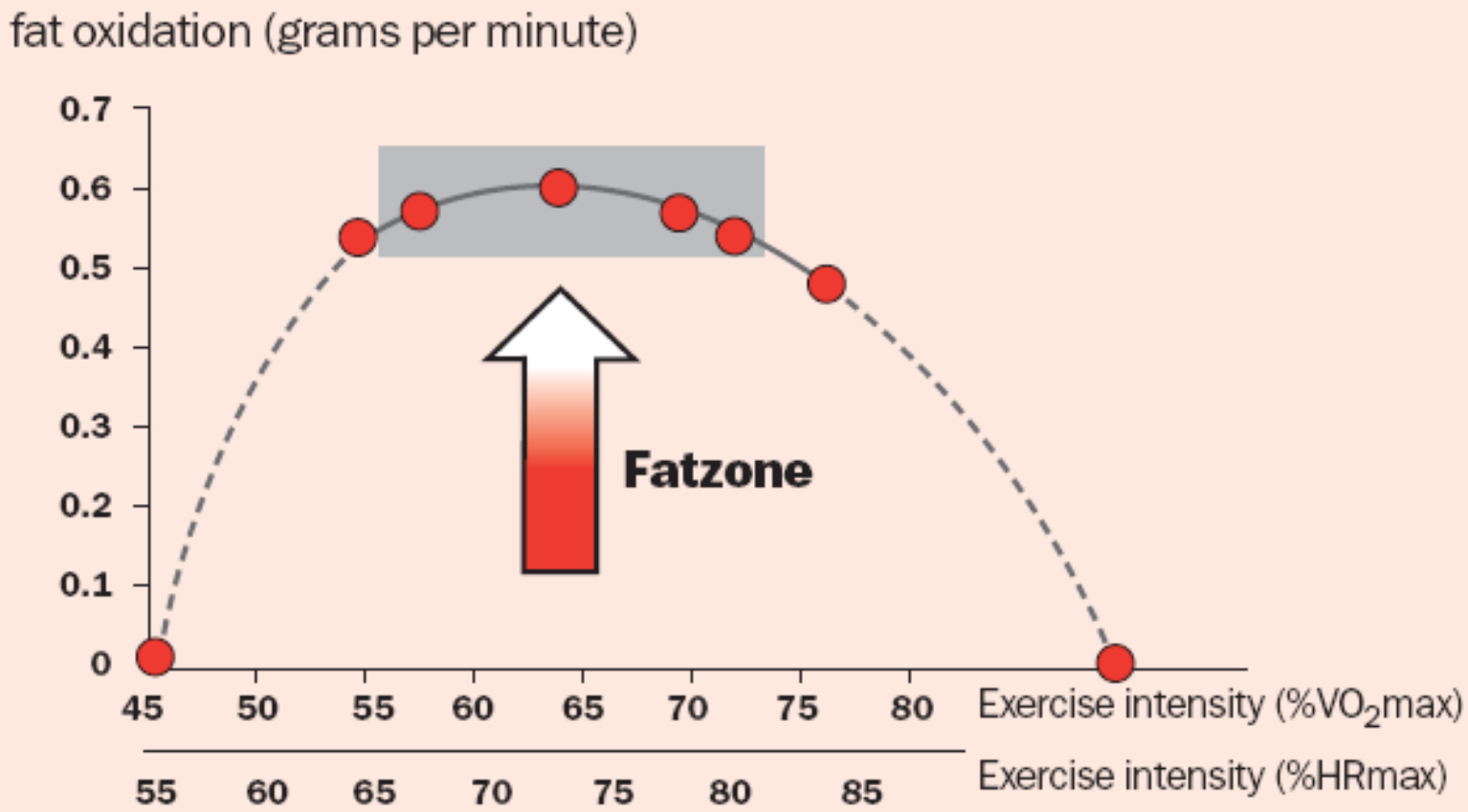


Figure 1: Exercise intensity and fat oxidation



Exercise intensity (expressed as %HRmax and %VO_2max) and fat oxidation. Fat oxidation increases from low to moderate exercise intensities, peaks at *Fatmax,* and decreases as the exercise intensity increases further. The grey area represents the Fatzone: a range of exercise intensities where fat oxidation is high.

دامنه تقریبی تعداد ضربان قلب در دقیقه حین فعالیت چقدر باشد؟

بهتر است از طریق روش ها فرمول ها محاسبه گردد اما

- برای کاهش وزن (چربی سوزی): ۱۴۰bpm
- برای بهبود قلبی – عروقی: ۱۶۰bpm

تقسیم بندی ورزش ها برای بیماران

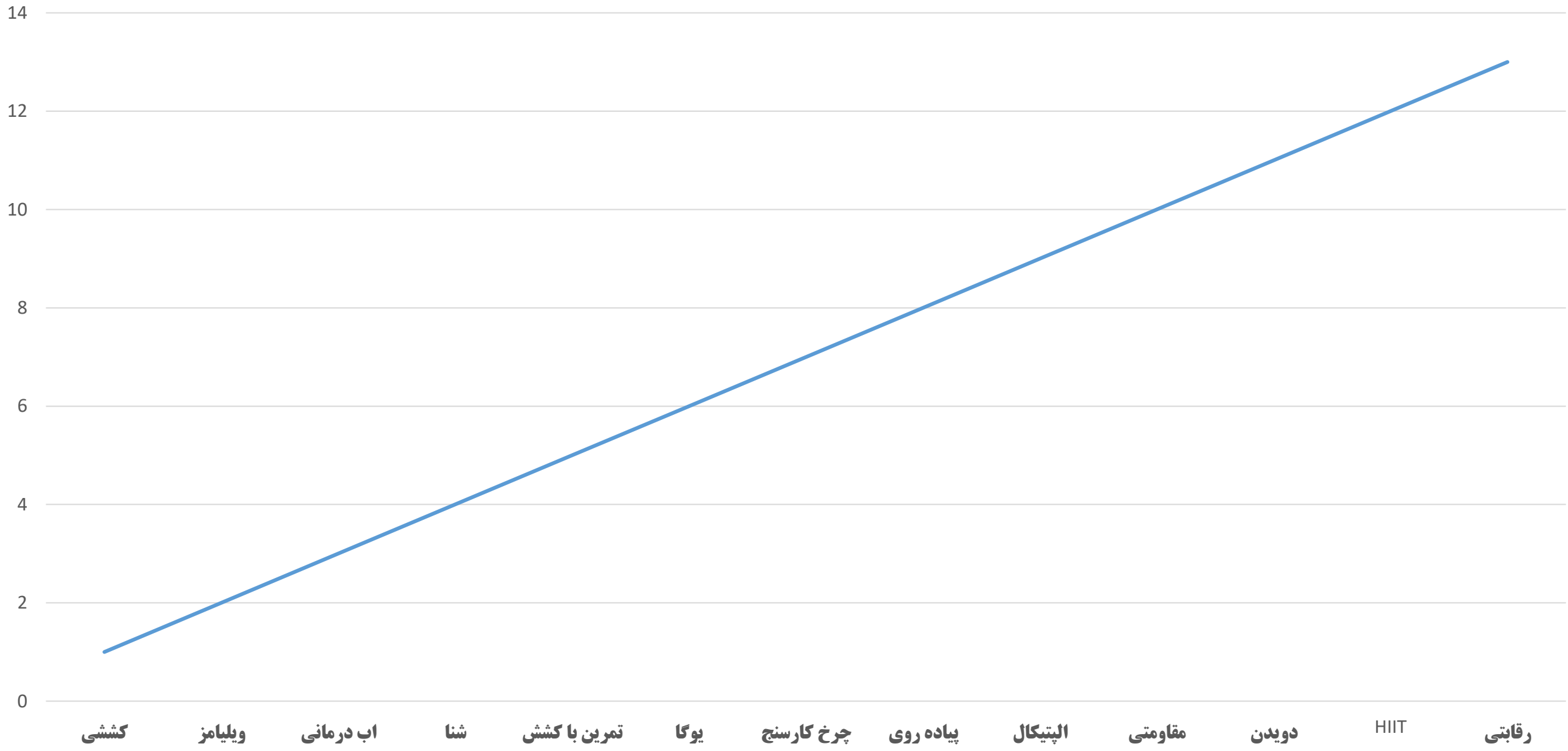
- بدون حمل وزن non weight bearing

مناسب برای:

1. برای افرادی با وزن بسیار بالا
2. دارای مشکلات مفاصل پا
3. دارای پوکی استخوان (مراحل پیشرفته)

- با حمل وزن weight bearing

ورزش ها بر اساس توانایی انجام



تمرینات کششی

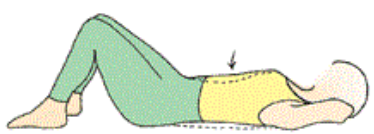
مزایا:

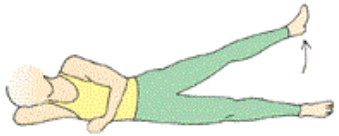
- قابل انجام برای طیف گسترده از افراد
- افزایش دامنه حرکتی و جلوگیری از آسیب
- افزایش قدرت و حجم عضلانی
- کم آسیب
- مناسب برای گرم کردن قبل از ورزش اصلی
- بدون نیاز به تجهیزات و هزینه

نکات:

- تمام کشش ها را با روش آرام و کنترل شده انجام دهید.
- تمام حرکات کششی ۷-۵ ثانیه بدون ضربه زدن تا آستانه درد انجام دهید.

حرکات ویلیامز

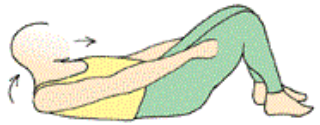

Pelvic tilt


Side-lying leg lift


Side-lying leg lift (cross over)

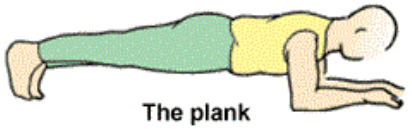

Quadriped arm/leg raises


Wall squat

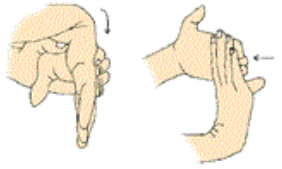

Partial curl


Diagonal curl


Dead bug


The plank


Pectoralis stretch


Wrist stretch


Upper trapezius stretch


Standing hamstring stretch


Quadriceps stretch


Standing calf stretch


Hip flexor stretch


Piriformis stretch


Hip adductor stretch


Trunk rotation


Double knee to chest

مزایا:

- مناسب برای پیشگیری و درمان کمر درد
- افزایش دهنده دامنه حرکتی
- عدم نیاز به تجهیزات
- قابل اجرا در خانه
- بدون هزینه

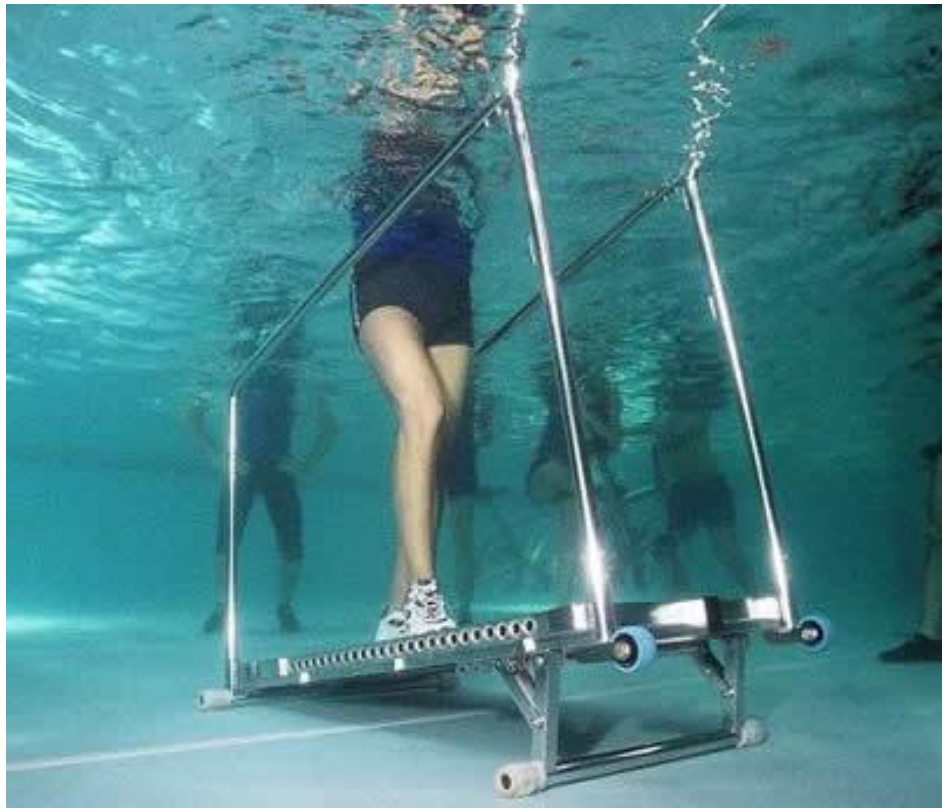
معایب:

- تاثیر ناچیز بر قلب و عروق
- تاثیر متابولیکی کم

آب درمانی

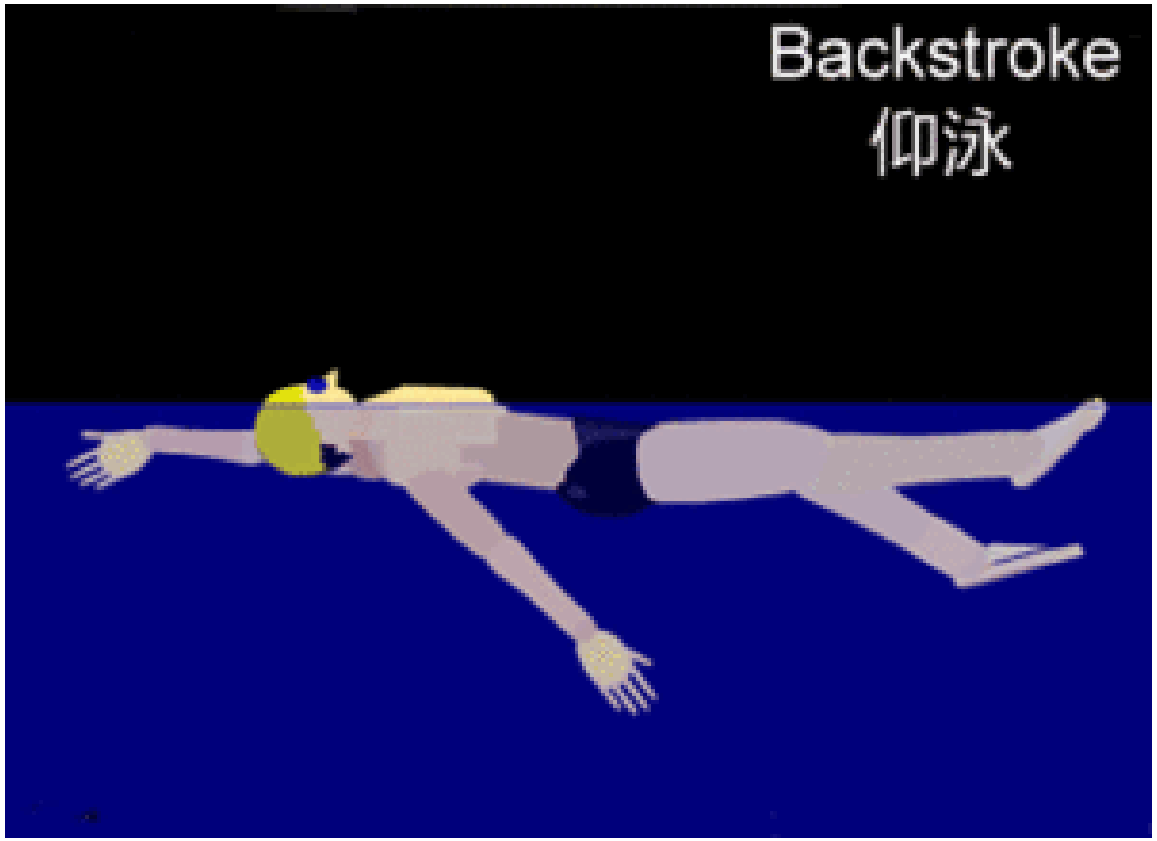
انجام حرکات ورزشی در آب

استفاده از تجهیزات در آب



شنا

- بهترین شنا از لحاظ قلبی، ماهیچه ای و تنفسی شنای کرال پشت است.



مزایا:

- قابل انجام برای طیف گسترده از افراد (بویژه افراد مسن و بیمار)
- جلوگیری از آسیب و مناسب برای افراد آسیب دیده

معایب:

- کلر ممکن است برای افراد دارای بیماری های تنفسی مضر باشد.
- باید امکان لیز خوردگی افراد پیش بینی شود.
- برای افراد دارای زخم (مانند دیابتی های دارای زخم) به دلیل عفونت مناسب نیست.
- هزینه بالا

تمرینات با کش

مزایا:

- امکان استفاده در منزل
- تنوع در حرکات
- تجهیزات کم
- تقویت عضلانی خوب

معایب:

- تاثیر کم بر قلب و عروق
- تاثیر متابولیکی کم

یوگا

مزایا:

- امکان انجام در منزل
- تجهیزات کم
- قابلیت کم کردن استرس (ریلکسیشن)
- هزینه کم

معایب:

- تاثیر ناچیز بر قلب و عروق
- تاثیر متابولیکی کم

چرخ کارسنج و دوچرخه سواری

مزایا:

- بدون حمل وزن و مناسب برای آسیب ها
- تاثیر قلبی عروقی خوب
- تاثیر متابولیکی خوب
- مفرح بودن
- امکان دریافت نور آفتاب برای ویتامین دی

معایب:

- نیاز به تجهیزات و فضا
- احتمال افتادگی از دوچرخه

پیاده روی

فواید:

- قابل انجام برای بسیاری از افراد
- نیاز به امکانات کم
- کم خطر و کم آسیب
- شدت در دامنه بهترین چربی سوزی
- امکان انجام گروهی
- هزینه پایین
- مفرح بودن
- استفاده از نور آفتاب برای ویتامین دی
- چربی سوزی مناسب

الپتیکال

تمرینات با وزنه (مقاومتی)

مزایا:

- بهترین ورزش برای افزایش قدرت و حجم عضلات
- فواید متابولیکی خوب نظیر کاهش قند خون

معایب:

- عدم بهبود قابل توجه در قلب و عروق
- تنوع کم
- عدم امکان ورزش کردن گروهی
- احتمال اسیب
- نیاز به امکانات
- دارای هزینه

نکات:

- قبل از شروع حتما گرم کنید.
- برای ریکاوری روزهای غیرمتوالی تمرین کنید.
- از شدت های پایین ۱۲-۱۵ تکرار بیشینه استفاده شود.
- به صورت تدریجی اضافه بار رعایت شود.
- به دلیل حفظ تعادل، دستگاه بهتر از وزنه آزاد است.
- از انقباضات ایستا استفاده نشود.
- مایعات مصرف شود.

دویدن

مزایا:

- مناسب برای بهبود قلب و عروق و ریه
- چربی سوزی مناسب
- نیاز به امکانات کم
- مفرح بودن
- امکان انجام گروهی
- استفاده از نور آفتاب

معایب:

- فشار به مفاصل به دلیل نقطه پرواز
- برای افراد در معرض پوکی استخوان مناسب نیست.

HIIT

مزایا:

- ایجاد EPOC
- عضله سازی
- افزایش متابولیسم استراحت
- بهبود قلب و عروق سریع
- صرفه جویی در زمان
- امکانات کم

نقاط ضعف:

- نیاز به آمادگی جسمانی بالا
- آسیب زا

ورزش رقابتی

مزایا:

- بهره بردن از فواید اجتماعی ورزش
- تنوع
- افزایش نا خودآگاه شدت ورزش

معایب:

- آسیب پذیری بسیار بالا به دلیل عدم آمادگی جسمانی
- برای افراد تازه کار و نا آماده مناسب نیست.

برتری های ورزش نسبت به رژیم غذایی در کاهش وزن

- با ورزش کاهش چربی احشایی دو برابر بیشتر از رژیم غذایی است.
- با رژیم غذایی ممکن است علاوه بر چربی بافت غیر چربی نیز از دست برود که این به ضرر ماست.
- برخی تحقیقات نشان دادند که ورزش می تواند در بهبود سطح تغذیه ای هم نقش داشته باشد.
- در کودکان و نوجوانان چاق دستکاری تغذیه ممکن است روی رشد کودک تاثیر بگذارد لذا ورزش بهتر است.

آیا در این زمینه تفاوتی بین زنان و مردان وجود دارد؟

www.medscape.com

From Exercise and Sport Sciences Reviews

Physical Activity and Hormonal Regulation of Appetite: Sex Differences and Weight Control

ToddA. Hagobian; Barry Braun

Posted: 01/25/2010; Exerc Sport Sci Rev. 2010;38(1):25-30. © 2010

Abstract and Introduction

Abstract

Physical activity is an important contributor to regulation of energy balance and body composition. In this article, we separate the impact of exercise from the confounding influence of energy imbalance and highlight sex differences in hormonal and appetite responses to physical activity. The evolving story may influence our thinking regarding the use of physical activity to manage body composition.

نوع ورزش

Impact of Different Training Modalities on Anthropometric and Metabolic Characteristics in Overweight/Obese Subjects: A Systematic Review and Network Meta-Analysis

Lukas Schwingshackl[1]*, Sofia Dias[2], Barbara Strasser[3], Georg Hoffmann[1]

1 Department of Nutritional Sciences, Faculty of Life Sciences, University of Vienna, Vienna, Austria, 2 School of Social and Community Medicine, University of Bristol, Bristol, United Kingdom, 3 Institute of Nutritional Sciences and Physiology, University for Health Sciences, Medical Informatics and Technology, Hall in Tirol, Austria

Abstract

Background: The aim of this systematic review of randomized controlled trials was to compare the effects of aerobic training (AET), resistance training (RT), and combined aerobic and resistance training (CT) on anthropometric parameters, blood lipids, and cardiorespiratory fitness in overweight and obese subjects.

Methods: Electronic searches for randomized controlled trials were performed in MEDLINE, EMBASE and the Cochrane Trial Register. Inclusion criteria were: Body Mass Index: ≥25 kg/m^2, 19+ years of age, supervised exercise training, and a minimum intervention period of 8 weeks. Anthropometric outcomes, blood lipids, and cardiorespiratory fitness parameters were included. Pooled effects were calculated by inverse-variance random effect pairwise meta-analyses and Bayesian random effects network meta-analyses.

Findings: 15 trials enrolling 741 participants were included in the meta-analysis. Compared to RT, AET resulted in a significantly more pronounced reduction of body weight [mean differences (MD): -1.15 kg, $p=0.04$], waist circumference [MD: -1.10 cm, $p=0.004$], and fat mass [MD: -1.15 kg, $p=0.001$] respectively. RT was more effective than AET in improving lean body mass [MD: 1.26 kg, $p<0.00001$]. When comparing CT with RT, MD in change of body weight [MD: -2.03 kg, $p<0.0001$], waist circumference [MD: -1.57 cm, $p=0.0002$], and fat mass [MD: -1.88 kg, $p<0.00001$] were all in favor of CT. Results from the network meta-analyses confirmed these findings.

Conclusion: Evidence from both pairwise and network meta-analyses suggests that CT is the most efficacious means to reduce anthropometric outcomes and should be recommended in the prevention and treatment of overweight, and obesity whenever possible.

Citation: Schwingshackl L, Dias S, Strasser B, Hoffmann G (2013) Impact of Different Training Modalities on Anthropometric and Metabolic Characteristics in Overweight/Obese Subjects: A Systematic Review and Network Meta-Analysis. PLoS ONE 8(12): e82853. doi:10.1371/journal.pone.0082853

Editor: Conrad P. Earnest, University of Bath, United Kingdom

Received April 19, 2013; **Accepted** October 29, 2013; **Published** December 17, 2013

Funding: The authors have no support or funding to report.

Competing Interests: The authors have declared that no competing interests exist.

* E-mail: lukasschwingshackl@univie.ac.at

تردمیل بهتر است یا چرخ کارسنج؟

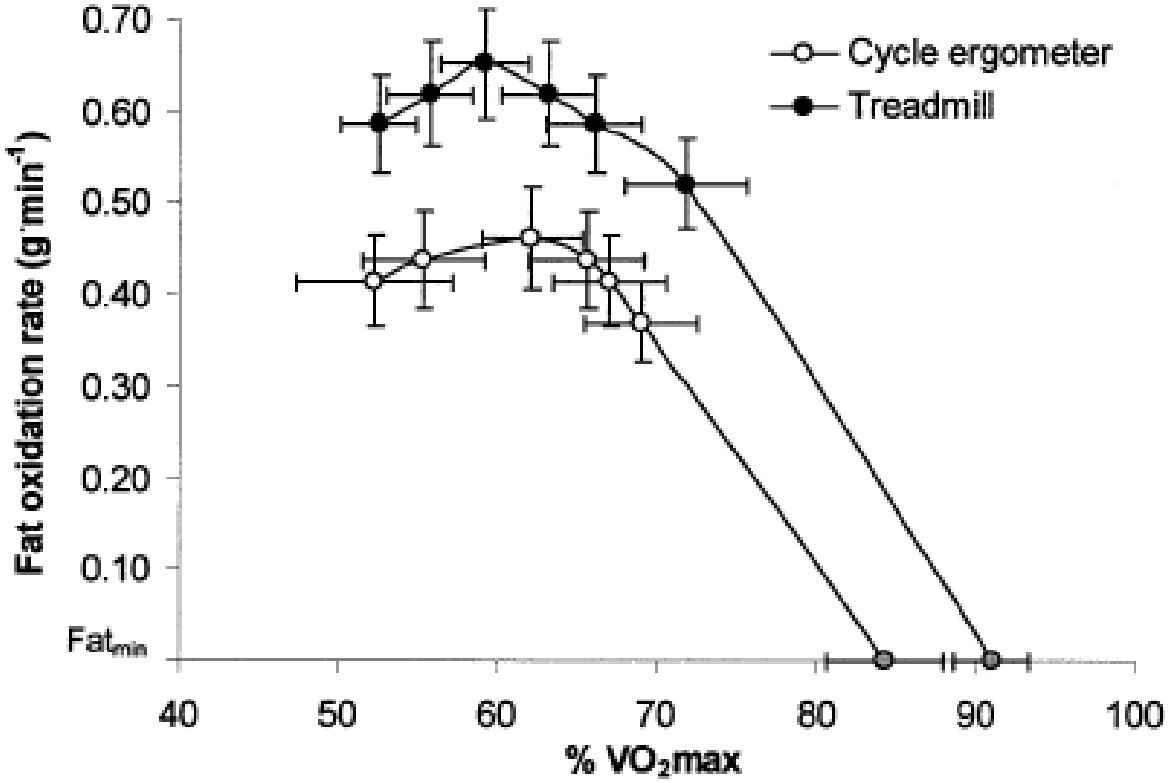


Fig 1. Fat oxidation *v* exercise intensity, expressed as a percentage of maximal oxygen uptake (Vo_2max) during cycle-ergometer–based and treadmill-based protocol. Values are mean ± SEM; n = 12.

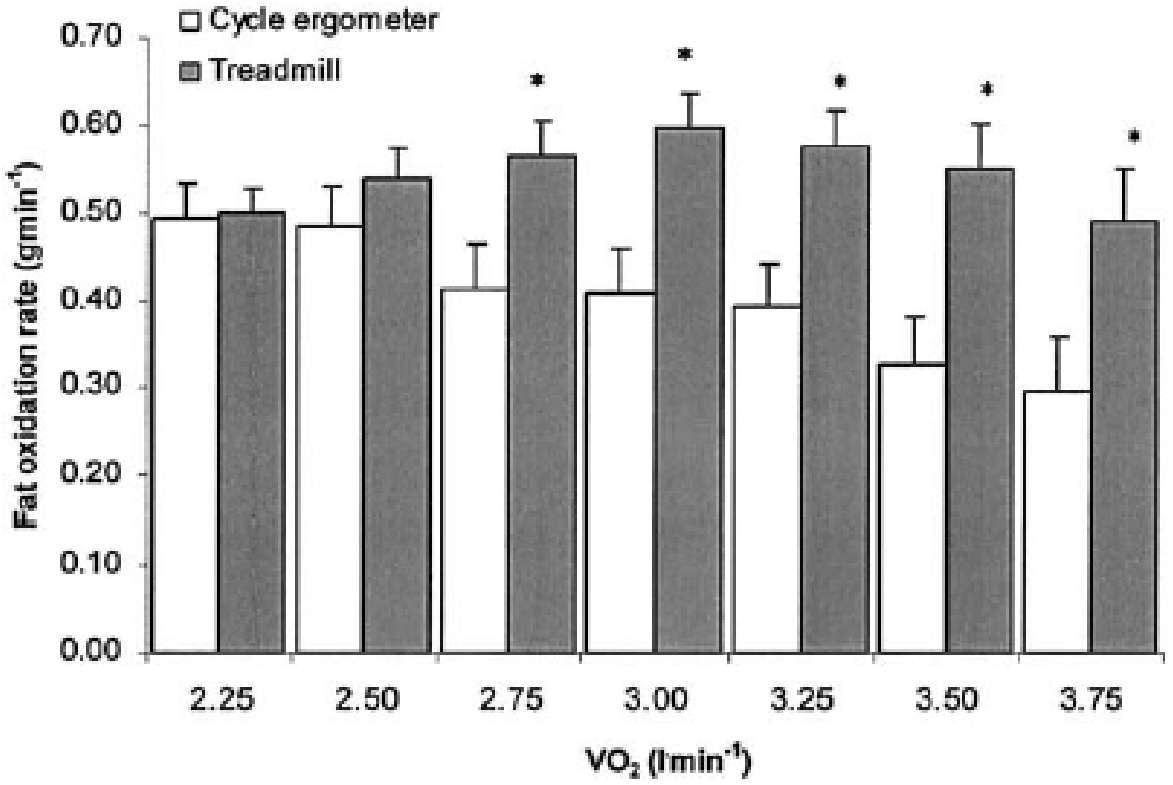


Fig 2. Average fat oxidation rates during cycle-ergometer and treadmill test at intensities between 50% and 80% of the maximal oxygen uptake (Vo_2max). Values are mean ± SEM; n = 12; *significantly different from cycle-ergometer test.

Juul Achten, Michelle C Venables, Asker E Jeukendrup, Fat oxidation rates are higher during running compared with cycling over a wide range of intensities, Metabolism,52(6), 2003, 747-752.

شدت ورزش؟

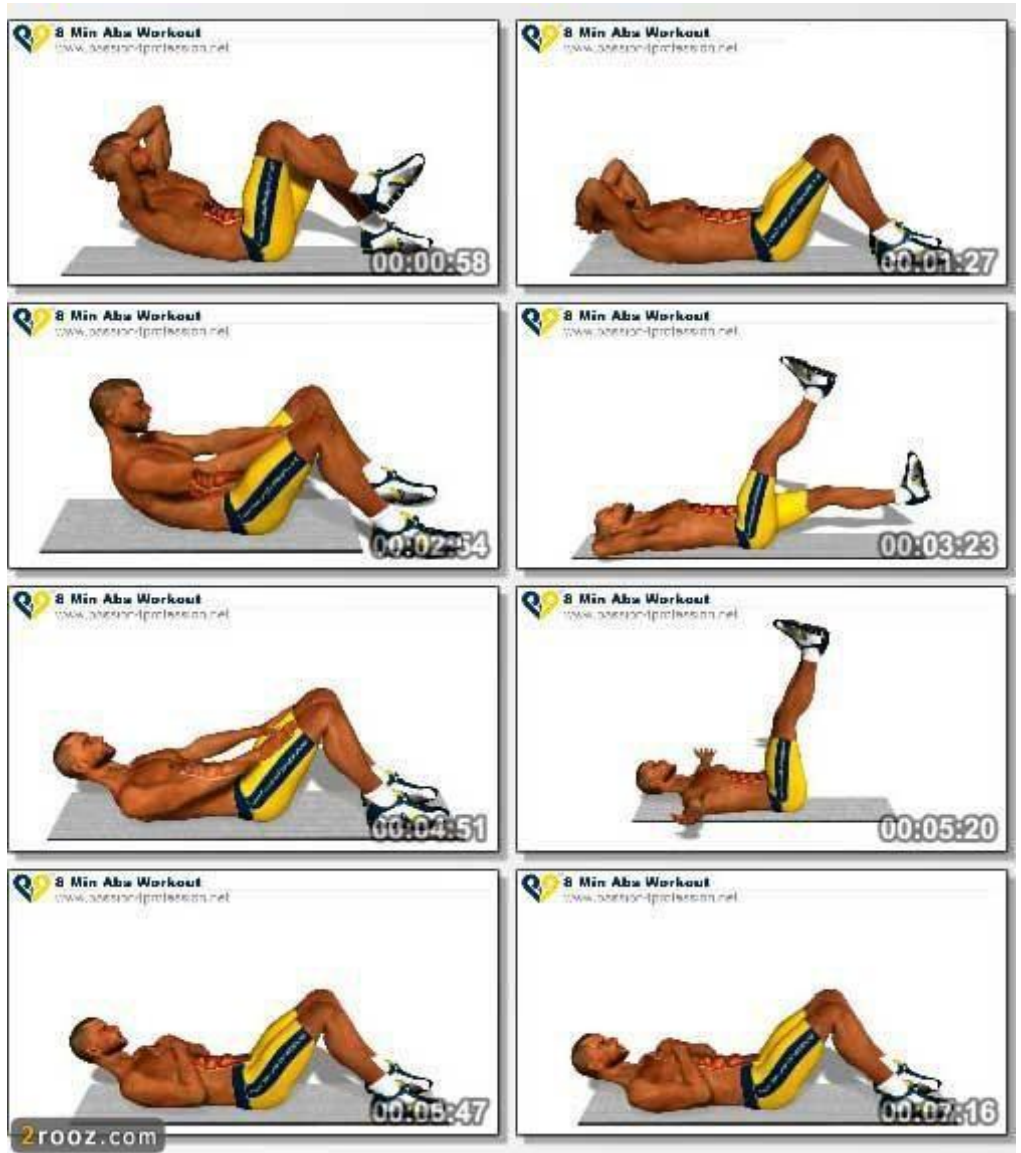
Effect of exercise training intensity on abdominal visceral fat and body composition

Brian A. Irving, et al. Department of Human Services, University of Virginia, Charlottesville, Virginia 22908. *Med Sci Sports Exerc*. 2008 November ; 40(11): 1863–1872.

Abstract

The metabolic syndrome is a complex clustering of metabolic defects associated with physical inactivity, abdominal adiposity, and aging. **Purpose—**To examine the effects of exercise training intensity on abdominal visceral fat (AVF) and body composition in obese women with the metabolic syndrome. **Methods—**Twenty-seven middle-aged, obese women (mean ± SD; age: 51 ± 9 years and body mass index: 34 ± 6 kg/m2) with the metabolic syndrome completed one-of-three 16-week aerobic exercise interventions: (i) No Exercise Training (Control): Seven participants maintained their existing levels of physical activity, (ii) Low-Intensity Exercise Training (LIET): eleven participants exercised 5 days · week-1 at an intensity ≤ lactate threshold (LT) (iii) High-Intensity Exercise Training (HIET): nine participants exercised 3 days · week-1 at an intensity > LT and 2 days ·week-1 ≤ LT. Exercise time was adjusted to maintain caloric expenditure (400 kcal·session-1). Single-slice computed tomography scans obtained at the L4-L5 disc-space and mid-thigh were used to determine abdominal fat and thigh muscle cross-sectional areas. Percent body fat was assessed by air displacement plethysmography. **Results—**HIET significantly reduced total abdominal fat ($p<0.001$), abdominal subcutaneous fat ($p=0.034$) and AVF ($p=0.010$). There were no significant changes observed in any of these parameters within the Control or LIET conditions. **Conclusions—**The present data indicate that body composition changes are affected by intensity of exercise training with HIET more effective for reducing total abdominal fat, subcutaneous abdominal fat and AVF in obese women with the metabolic syndrome.

آیا تمرینات شکمی موجب کاهش چربی شکمی می شود؟

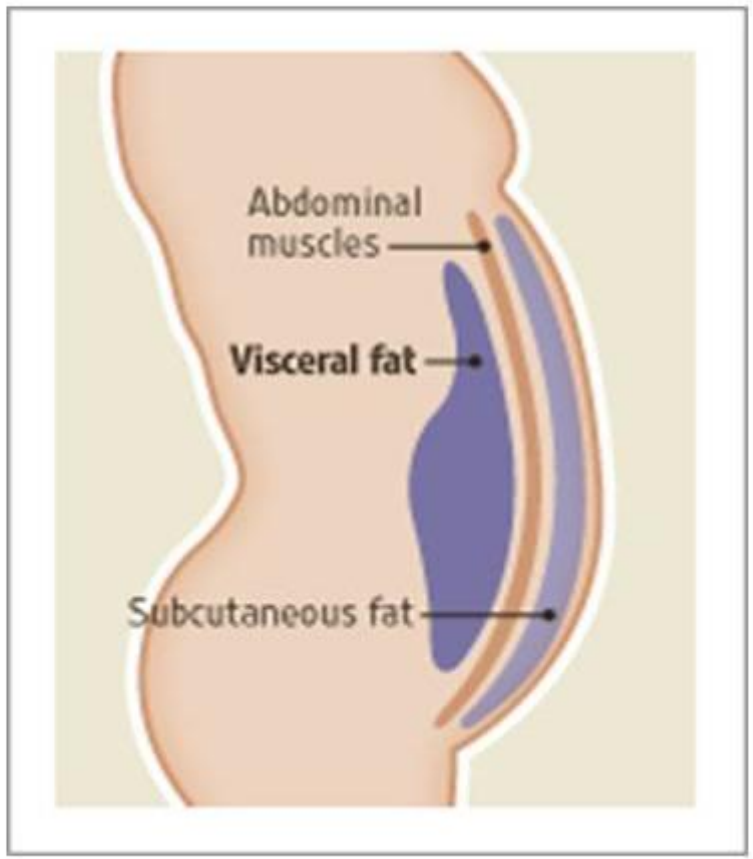


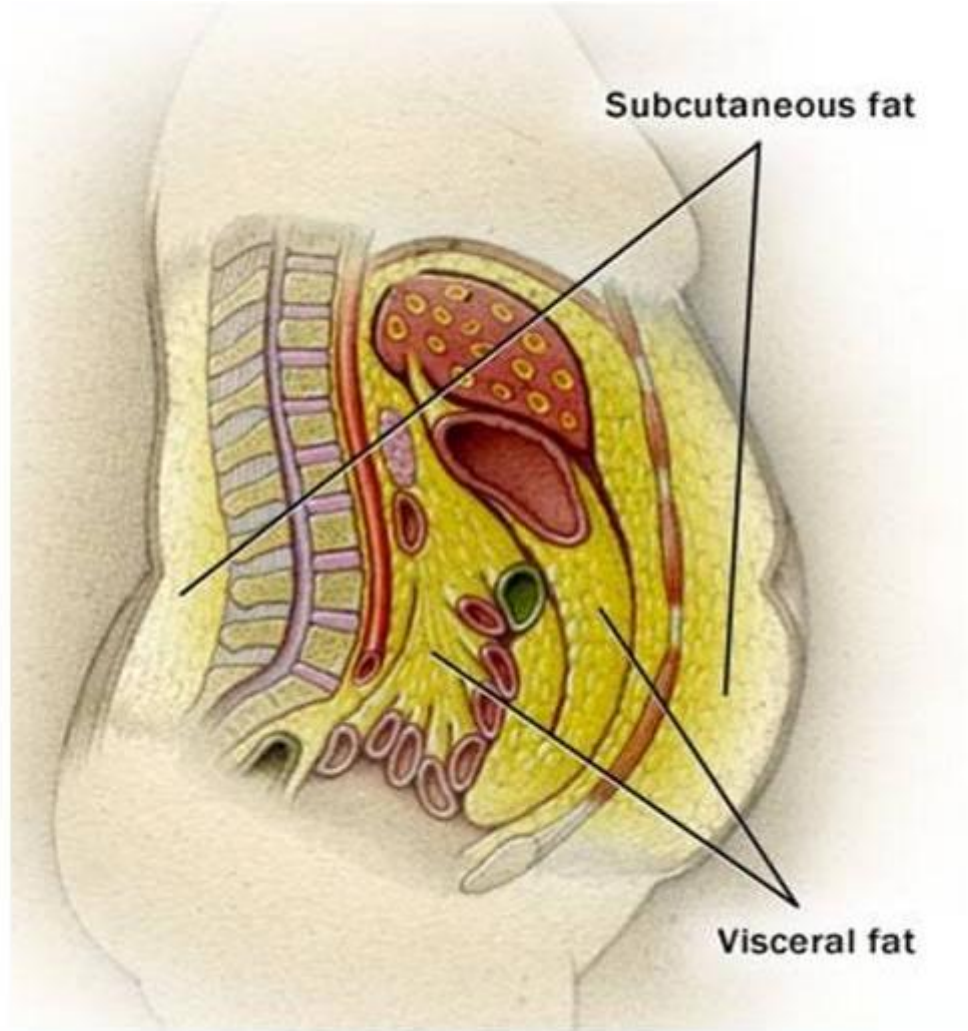
The effect of abdominal exercise on abdominal fat.

J Strength Cond Res. 2011 Sep;25(9):2559-64. Vispute SS[1], Smith JD, LeCheminant JD, Hurley KS. [1]Department of Kinesiology & Health Education, Southern Illinois University Edwardsville, Edwardsville, Illinois, USA. svispute@uic.edu

Abstract

The purpose of this study was to investigate the effect of abdominal exercises on abdominal fat. Twenty-four healthy, sedentary participants (14 men and 10 women), between 18 and 40 years, were randomly assigned to 1 of the following 2 groups: control group (CG) or abdominal exercise group (AG). Anthropometrics, body composition, and abdominal muscular endurance were tested before and after training. The AG performed 7 abdominal exercises, for 2 sets of 10 repetitions, on 5 d·wk(-1) for 6 weeks. The CG received no intervention, and all participants maintained an isocaloric diet throughout the study. Significance was set at p = 0.05 for all tests. There was no significant effect of abdominal exercises on body weight, body fat percentage, android fat percentage, android fat, abdominal circumference, abdominal skinfold and suprailiac skinfold measurements. The AG performed significantly greater amount of curl-up repetitions (47 ± 13) compared to the CG (32 ± 9) on the posttest. Six weeks of abdominal exercise training alone was not sufficient to reduce abdominal subcutaneous fat and other measures of body composition. Nevertheless, abdominal exercise training significantly improved muscular endurance to a greater extent than the CG.


Abdominal muscles
Visceral fat
Subcutaneous fat


Subcutaneous fat
Visceral fat

ورزش در محیط گرم و سرد؟

Environment

It is known that exercise in a hot environment will increase glycogen use and reduce fat oxidation, and something similar can be observed at high altitude.

Similarly, when it is extremely cold, and especially when shivering, carbohydrate metabolism appears to be stimulated at the expense of fat metabolism.

دلایل فیزیولوژیکی

- افزایش جریان خون به پوست برای دفع گرما و متعاقب آن کاهش جریان خون به بافت چربی و بافت عضلانی در محیط گرم
- کاهش برونده قلبی به دلیل کاهش حجم پلاسما که منجر به کاهش اکسیژن رسانی می شود.

Effect of ambient temperature on fat oxidation during an incremental cycling exercise test

CARLOS RUÍZ-MORENO1, JORGE GUTIÉRREZ-HELLÍN2, JAIME GONZÁLEZ-GARCÍA 1, VERÓNICA GIRÁLDEZ-COSTAS 1, DIEGO BRITO DE SOUZA1, & JUAN DEL COSO 3

Abstract

Aim: The objective of this current research was to compare fat oxidation rates during an incremental cycling exercise test in a temperate vs. hot environment. **Methods**: Twelve healthy young participants were recruited for a randomized crossover experimental design. Each participant performed a VO2max test in a thermoneutral environment followed by two cycling ramp test trials, one in a temperate environment (18.3°C) and another in a hot environment (36.3°C). The ramp test consisted of 3-min stages of increasing intensity (+10% of VO2max) while gas exchange, heart rate and perceived exertion were measured. **Results**: During exercise, there was a main effect of the environment temperature on fat oxidation rate (F = 9.35, P = 0.014). The rate of fat oxidation was lower in the heat at 30% VO2max (0.42 ± 0.15 vs.0.37 ± 0.13 g/min; P = 0.042), 60% VO2max (0.37 ± 0.27 vs.0.23 ± 0.23 g/min; P = 0.018) and 70% VO2max (0.22 ± 0.26 vs.0.12 ± 0.26 g/min; P = 0.007). In addition, there was a tendency for a lower maximal fat oxidation rate in the heat (0.55 ± 0.2 vs.0.48 ± 0.2 g/min; P = 0.052) and it occurred at a lower exercise intensity (44 ± 14 vs.38% ± 8% VO2max; P = 0.004). The total amount of fat oxidised was lower in the heat (5.8 ± 2.6 vs 4.6 ± 2.8 g; P = 0.002). The ambient temperature also produced main effects on heart rate (F = 15.18, P = 0.005) and tympanic temperature (F = 25.23, P = 0.001) with no effect on energy expenditure (F = 0.01, P = 0.945). **Conclusion**: A hot environment notably reduced fat oxidation rates during a ramp exercise test. Exercising in the heat should not be recommended for those individuals seeking to increase fat oxidation during exercise.

Keywords: Adiposity, indirect calorimetry, body temperature, substrate oxidation, body fat loss

European Journal of Sport Science, 2021 Vol. 21, No. 8, 1140–1147

European Journal of Sport Science, 2021 Vol. 21, No. 8, 1140–1147

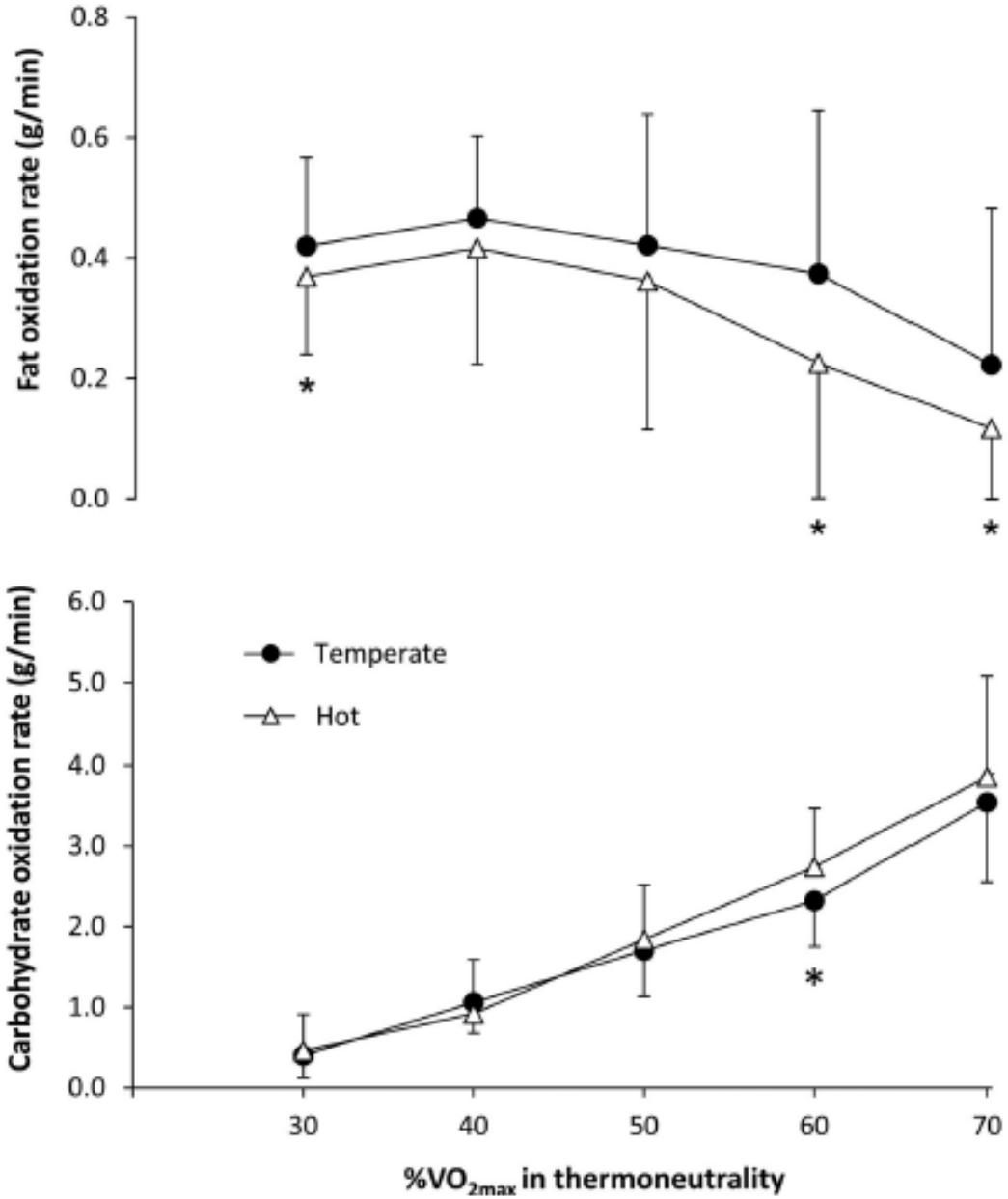


Figure 1. Rates of fat and carbohydrate oxidation during an incremental exercise test in a temperate vs. hot environment. Data are mean ± standard deviation for 12 healthy active individuals Data are mean ± standard deviation for 12 healthy active individuals who exercised at different exercise intensities relative to their VO_{2max}, obtained in a thermoneutral environment. (*) Hot different from thermoneutral at $P < 0.05$.

نکته

- ورزش در محیط گرم با کاهش اشتها و دریافت انرژی در وعده غذایی بعدی همراه است.

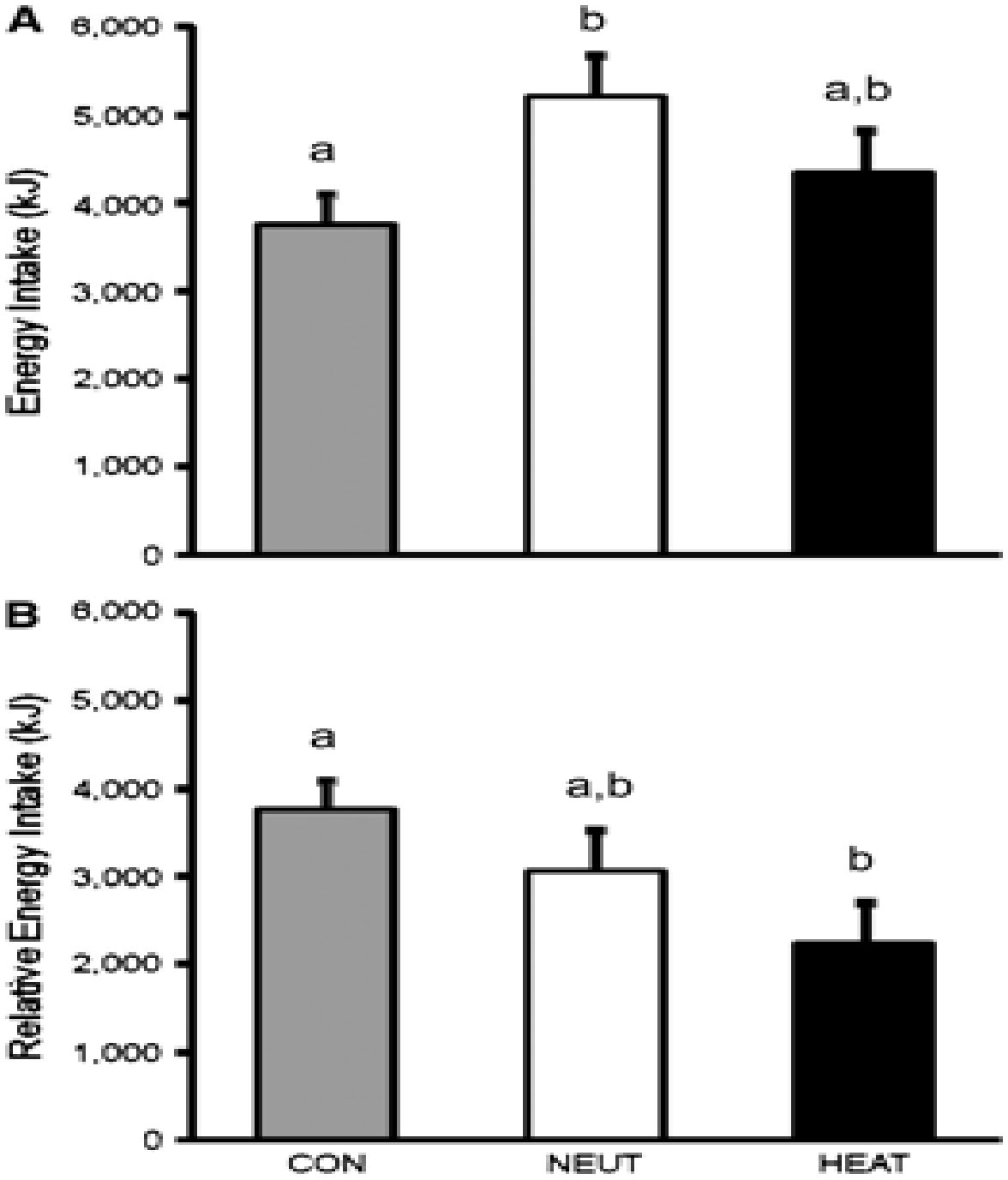


FIGURE 1 Mean (±SE) results showing the effect of exercise in the heat (HEAT), the effect of exercise in a neutral environmental temperature (NEUT), or a resting control (CON) on (A) total energy intake and (B) relative energy intake in the postexercise meal (n = 11). Values that do not share a common superscript letter are significantly different, $P < 0.05$ (post hoc pairwise comparisons with Bonferroni adjustment when the significant main effect of trial was indicated by repeated-measures ANOVA).

Am J Clin Nutr, Volume 90, Issue 5, November 2009, Pages 1215–1221

نکته

- انجام ورزش و فعالیت بدنی هنگام غوطه ور بودن در آب خنک، موجب افزایش انرژی مصرفی می شود اما دریافت انرژی در وعده های غذایی بعدی هم افزایش می یابد.

Cold-Water Effects on Energy Balance in Healthy Women During Aqua-Cycling

Background: While the popularity of aquatic physical activities continues to grow among women, the effects on energy expenditure (EE) and appetite control remain unknown. The objective of this study was to examine the effect of water temperature during aqua-cycling session on EE, rate of perceived exertion, energy intake, appetite sensations, and food reward in healthy premenopausal women. Methods: Participants completed three experimental sessions, in the postprandial condition, in a randomized order: a land control session (CON), an aqua-cycling session in 18 °C (EXO18), and an aqua-cycling session in 27 °C (EXO27). The EE, food intake, appetite sensations, and food reward were investigated for each condition. Results: EXO18 induced a significant increase in EE ($p < .001$) and oxygen consumption ($p < .01$) compared with EXO27. The carbohydrate oxidation was higher in EXO18 session compared with EXO27 and CON ($p < .05$ and $p < .001$, respectively). While fat oxidation was higher in exercise sessions compared with CONT ($p < .01$), no difference was observed between EXO18 and EXO27. Exercise sessions did not alter absolute energy intake session but induced a decrease in relative energy intake ($p < .001$) and in hunger, desire to eat, and prospective food consumption compared with CON ($p < .001$). The authors also show here that cold-water exposure can increase EE while rate of perceived exertion is lower at the end of exercise session compared with same exercise at 27 °C ($p < .05$).Conclusion: An exposure to a moderately cold-water during aqua-cycling is an efficient strategy to promote increased EE and decreased hunger, which may be effective for energy balance management in healthy premenopausal women.

Lore Metz Laurie Isacco Kristine Beaulieu S. Nicole Fearnbach Bruno Pereira David Thivel Martine Duclos International Journal of Sport Nutrition and Exercise Metabolism. 2021 Volume 31: Issue 3

آیا استفاده از سنا باعث کاهش وزن می شود؟ کاهش چربی چطور؟

عوارض استفاده مکرر از سونا

- فشار زیاد به کلیه ها (برای بیماران دارای نارسایی کلیوی خطرناک است)
- فشار به قلب و احتمال ایست قلبی یا سکته قلبی
- احتمال سکته مغزی
- عوارض ناشی از افزایش غلظت خون

آیا ناشتا ورزش کردن برای کاهش وزن بهتر است؟

Schoenfeld et al. Journal of the International Society of Sports Nutrition 2014, 11:54
http://www.jissn.com/content/11/1/54

jissn
journal of the international society of sports nutrition

RESEARCH ARTICLE Open Access

Body composition changes associated with fasted versus non-fasted aerobic exercise

Brad Jon Schoenfeld[1*], Alan Albert Aragon[2], Colin D Wilborn[3], James W Krieger[4] and Gul T Sonmez[1]

Abstract

It has been hypothesized that performing aerobic exercise after an overnight fast accelerates the loss of body fat. The purpose of this study was to investigate changes in fat mass and fat-free mass following four weeks of volume-equated fasted versus fed aerobic exercise in young women adhering to a hypocaloric diet. Twenty healthy young female volunteers were randomly assigned to 1 of 2 experimental groups: a fasted training (FASTED) group that performed exercise after an overnight fast (n = 10) or a post-prandial training (FED) group that consumed a meal prior to exercise (n = 10). Training consisted of 1 hour of steady-state aerobic exercise performed 3 days per week. Subjects were provided with customized dietary plans designed to induce a caloric deficit. Nutritional counseling was provided throughout the study period to help ensure dietary adherence and self-reported food intake was monitored on a regular basis. A meal replacement shake was provided either immediately prior to exercise for the FED group or immediately following exercise for the FASTED group, with this nutritional provision carried out under the supervision of a research assistant. Both groups showed a significant loss of weight (P = 0.0005) and fat mass (P = 0.02) from baseline, but no significant between-group differences were noted in any outcome measure. These findings indicate that body composition changes associated with aerobic exercise in conjunction with a hypocaloric diet are similar regardless whether or not an individual is fasted prior to training.

Br J Nutr. 2016 Oct;116(7):1153-1164. Epub 2016 Sep 9.

Effects of aerobic exercise performed in fasted v. fed state on fat and carbohydrate metabolism in adults: a systematic review and meta-analysis.

Vieira AF[1], Costa RR[2], Macedo RC[2], Coconcelli L[2], Kruel LF[2].

⊕ Author information

Abstract

This study aimed to verify the effect of aerobic exercise performed in the fasted v. fed states on fat and carbohydrate metabolism in adults. Searches were conducted in March 2015, and updated in July 2016, using PubMed®, Scopus and Cochrane databases (terms: 'fasting', 'exercise', 'aerobic exercise', 'substrate', 'energy metabolism', 'fat', 'glucose', 'insulin' and 'adult') and references from selected studies. Trials that compared the metabolic effects of aerobic exercise (duration ≤120 min) performed in the fasted v. fed states in adults were accepted. The outcomes evaluated were fat oxidation during exercise and the plasma concentrations of insulin, glucose and NEFA before and immediately after exercise; two independent reviewers extracted the data (A. F. V. and L. C.). The results were presented as weighted mean differences between treatments, with 95 % CI. Of 10 405 articles identified, twenty-seven studies - with a total of 273 participants - were included. There was a significant increase in fat oxidation during exercise performed in the fasted, compared with fed, state (-3·08 g; 95 % CI -5·38, -0·79; I 2 39·1 %). The weighted mean difference of NEFA concentrations was not significantly different between states (0·00 mmol/l; 95 % CI -0·07, 0·08; I 2 72·7 %). However, the weighted mean differences of glucose (0·78 mmol/l; 95 % CI 0·43, 1·14; I 2 90·8 %) and insulin concentrations (104·5 pmol/l; 95 % CI 70·8, 138·2; I 2 94·5 %) were significantly higher for exercise performed in the fed state. We conclude that aerobic exercise performed in the fasted state induces higher fat oxidation than exercise performed in the fed state.

KEYWORDS: IMTG; intramuscular TAG; Energy metabolism; Exercise; Fasting; Reviews

PMID: 27609363 DOI: 10.1017/S0007114516003160

Daniel Hackett and Amanda D. Hagstrom. **Effect of Overnight Fasted Exercise on Weight Loss and Body Composition: A Systematic Review and Meta-Analysis.** J. Funct. Morphol. Kinesiol. **2017**, 2, 43;

Practical Applications

Our review of a small number of studies does not support the use of fasted exercise for weight loss and positive changes in body composition. Furthermore, our findings also suggest there is no detrimental effect on body mass and body composition with utilizing this practice.

Our review of a small number of studies does not support the use of fasted exercise for weight loss and positive changes in body composition. Furthermore, our findings also suggest there is no detrimental effect on body mass and body composition with utilizing this practice. Future research studies on this topic should use interventions of larger exercise volumes and durations to allow significant changes in weight loss and body composition. Also, for future-fasted versus fed exercise studies, the dietary habits of participants need to be well controlled. This could be achieved through prescribing participants specific diets and monitoring their compliance at regular time points throughout the intervention (e.g., three-day weighed food record or iPhone app). Acutely, fasted exercise has been shown to increase fat oxidation and the subsequent use of fatty acids as a fuel source, potentially inducing improvements in insulin sensitivity which may have important implications for type 2 diabetes and insulin-resistant patients [44]. Until further research on this topic is performed, it appears individuals can participate in whichever form of exercise that they prefer in either fasted or fed states when targeting improvements in body composition.

Daniel Hackett and Amanda D. Hagstrom. Effect of Overnight Fasted Exercise on Weight Loss and Body Composition: A Systematic Review and Meta-Analysis. Journal of *Functional Morphology and Kinesiology.* 2017, 2, 43;

چقدر ورزش کنیم؟

Fat oxidation rates are on average 0.5 grams per min at the optimal exercise intensity. So in order to oxidize 1 kg of fat mass, more than 33 hours of exercise is required.

Dietary effects

A diet high in carbohydrate will suppress fat oxidation, and a diet low in carbohydrate will result in high fat oxidation rates. Ingesting carbohydrate in the hours before exercise will raise insulin and subsequently suppress fat oxidation by up to 35%(5) or thereabouts. This effect of insulin on fat oxidation may last as long as six to eight hours after a meal, and this means that the highest fat oxidation rates can be achieved after an overnight fast.