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point-of-view

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Body Recomposition: would it be possible to induce fat loss and muscle hypertrophy at the same time?

Recomposição Corporal: seria possível induzir emagrecimento e hipertrofia muscular ao mesmo tempo?

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Abstract - Adipose tissue reduction and lean mass increase are frequent goals in exercise programs aimed at health and aesthetics. In this context, when postulating the need for an energy deficit for weight loss and a caloric surplus for muscle hypertrophy, was developed the idea that it would not be possible for both phenomena to exist simultaneously. Contrarily, the term "Body Recomposition" (BR) emerges in the literature, a phenomenon in which weight loss and muscle hypertrophy occur at the same time. BR has already been observed using different techniques for analyzing body composition, from doubly indirect methods to magnetic resonance imaging, and in different population groups, namely: adolescents, sedentary or physically active adults, the elderly and people with excess weight, as well as practitioners of sports, including bodybuilding. BR occurs with precise nutritional adjustment, with protein consumption above the recommended daily intake (0.8 g/kg), in ranges between 2.4 and 3.4 g/kg of body mass/day. Different types of exercises can lead to BR, from strength training, through high-intensity circuit training, high-intensity interval training, and even concurrent training – most often with a high weekly frequency.

Key words: Caloric restriction; Weight loss; Musculoskeletal system; Body composition; Exercise.

Resumo - *Redução de tecido adiposo e aumento de massa magra se constituem como objetivos frequentes em programas de exercícios voltados à saúde e à estética. Nesse contexto, ao se postular a necessidade de déficit energético para o emagrecimento e superavit calórico para a hipertrofia muscular, desenvolveu-se a ideia de que não seria possível a existência de ambos os fenômenos de forma simultânea. Contrariamente, emerge na literatura o termo "Recomposição Corporal" (RC), fenômeno no qual ocorre emagrecimento e hipertrofia muscular ao mesmo tempo. A RC já foi observada com emprego de diferentes técnicas de análise da composição corporal, desde métodos duplamente indiretos até ressonância nuclear magnética, e em diversos grupos populacionais, a saber: adolescentes, adultos sedentários ou fisicamente ativos, idosos e pessoas com excesso de peso, além de praticantes de modalidades esportivas, inclusive fisiculturismo. A RC ocorre com ajuste nutricional preciso, com consumo de proteínas acima da ingestão diária recomendada (0,8 g/kg), em faixas entre 2,4 e 3,4 g/kg de massa corporal/dia. Diferentes tipos de exercícios físicos podem conduzir à RC, desde o treinamento de força, passando pelo treinamento em circuito em alta intensidade, treinamento intervalado de alta intensidade e, inclusive, treinamento concorrente – na maioria das vezes com elevada frequência semanal.*

Palavras-chave: *Restrição calórica; Perda de peso; Sistema musculoesquelético; Composição corporal; Exercício físico.*

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INTRODUCTION

It is suggested that weight loss and fat reduction result from several mechanisms that go through (i) energy restriction, with adjustment of eating habits, and/or (ii) increase in energy expenditure, with the inclusion or increase of physical activities, which would promote caloric deficit. Furthermore, it is understood that weight loss is a chronic, complex and multifactorial phenomenon and that acute events, such as increased lipolysis or lipid oxidation, do not necessarily contribute to the reduction of subcutaneous or visceral fat[1].

In addition to weight loss, many physical exercise practitioners also aim for muscle hypertrophy, given that aesthetics is one of the main reasons for adherence and maintenance of physical exercise in gyms. The stimulus for the increase in muscle tissue stems from extensive biochemical signals arising from mechanical and metabolic stresses[2]. As in the weight loss process, not always acute responses, such as an increase in myofibrillar protein synthesis[3] or greater electromyographic activity in a given muscle group[4], will explain the chronic effects, in this case, muscle hypertrophy. The most common ways to induce muscle hypertrophy involve the practice of physical exercises, especially strength training[3,4]. Complementarily, in addition to the stimuli with physical exercises, some studies highlight the need for a caloric surplus, although this aspect is not consensual[5].

Considering that the need for a caloric deficit for weight loss and a surplus for muscle hypertrophy is recognized, the idea was developed that it would not be possible for both phenomena to exist simultaneously – as "metabolic antagonism" would occur. However, in recent years, a new term has emerged in the technical-scientific environment that modifies this understanding: "Body Recomposition" (BR), which refers to the phenomenon in which there is a decrease in body fat and an increase in muscle mass at the same time[6].

The first article that mentions the BR was published in 2020, entitled "Body recomposition: can trained individuals build muscle and lose fat at the same time?"[6]. Although previous studies had already verified the possibility of occurrence of BR, only more recent investigations have discussed this outcome more clearly in different scenarios, from situations related to sports training, as in the case of pre-competitive preparation in bodybuilders[6] to interventions aimed at the practice of physical exercise for health[7].

To measure the BR, interventions have used different techniques for analyzing body composition. It is considered that the process of choosing the technique involves aspects such as availability during the research, technical competence, technical error of measurement, exposure to harmful agents (such as radiation), complexity (such as muscle biopsy), and imprecision in the measurement of body tissues. In any case, the studies carried out to date have observed BR using several techniques: from estimation with ultrasound[8], through tetrapolar electrical bioimpedance[9], dual-energy x-ray absorptiometry (DXA)[6], air displacement plethysmography (BodPod)[10], muscle biopsies[11] and even magnetic resonance imaging[12]. In this context, some studies have determined body composition using a four-compartment model[8], and have indicated coefficients of variation of 1.2% for the BodPod, 1.9% for electrical bioimpedance, and 0.8% for DEXA for repeated measurements on subsequent days[5].

Another aspect is about which population groups can benefit from BR. At first, it is usual for two groups to stand out. The first is composed of people who start or make regular use of androgenic anabolic steroids[6], given that it would be easier to gain muscle mass and decrease body fat with the administration of exogenous testosterone. In this sense, a randomized clinical study with 50 non-obese military adults (Placebo = 26 and Testosterone = 24) in caloric restriction of 45% concerning the baseline (2432 kcal) performed 3 sessions of aerobic exercises per day added to a calisthenics exercise session every 3-4 days, concluded that 28 days of administration of 200 mg of testosterone enanthate per week provided an increase of 2.5 kg in lean mass (exclusively in the experimental group) and a reduction close to 4.5 kg in body fat in both groups[11].

The second group is composed of people with a high percentage of body fat who are exposed to caloric restriction plus physical exercise. This thought is supported by the large amount of fat, which would be more easily reduced when compared to another group with lower percentages[8]. However, it is important to point out that BR has already been observed in adolescents[13] and elderly people[9], in sedentary individuals of both sexes[13] to sportsmen of different modalities[10], including bodybuilders[6,14]. That is there are no restrictions on age, sex, or training status to observe BR.

Broadly, the BR process involves three distinct contexts: (1) muscle mass increase with body fat maintenance, (2) body fat reduction with muscle mass maintenance, and (3) muscle mass increase with fat reduction body. Evidently, situations 1 and 2 are more recurrent and known; however, it should be noted that the third context is also possible[6]. In this sense, the change in lifestyle needs to consider two adjustments: a change in food structure and physical exercise.

How can BR be induced? Although many investigations to promote weight loss resort to the energy deficit induced by caloric restriction, this practice needs to be applied with professional attention, especially to mitigate or avoid the weight cycling and the loss of lean mass[5]. Broadly, there is a need to articulate nutritional adjustments with the simultaneous performance of physical exercises. From a nutritional perspective, as relevant as caloric restriction or excess (respectively for weight loss and muscle hypertrophy), one of the central points for BR is about increasing protein intake. In this sense, a systematic review with meta-analysis identified that protein intake above the recommended daily intake of 0.8 g/kg seems to be relevant for maintenance and, mainly, increases in muscle mass during caloric restriction[2]. Several original studies have tested different amounts and, apparently, values between 2.4 g/kg[8] and 3.4 g/kg per day[10] seem to promote the best results.

Regarding the types of physical exercises, many possibilities are identified to provide BR. There are interventions applying exclusively strength training, especially resistance training. In a classic study, Antonio et al.[10] recruited 43 trained people of both sexes, who were randomly allocated into two groups (Normal: Intake of up to 2.3 g/kg/day of protein or High Protein: intake of 3.4 g /kg/day) and exposed to 8 weeks of resistance training, with five sessions per week on a model with split routines[1] (Session A: chest, shoulder and triceps, Session B: hips and legs, Session C: back and biceps). In the intervention, three sets were performed per exercise (chest: 3 exercises, shoulders: 3 exercises, triceps: 2 exercises, back: 4 exercises, biceps: 3 exercises, and lower limbs: 5 exercises) and every three workouts there were changes in the ranges of repetitions, which were 15 reps, 12 to 10 reps, 8 to 5 reps. At the end of the 2 months of training,

[1] Nomenclature usually adopted by practitioners and professionals in the field of bodybuilding

the Normal and High Protein groups reduced 0.3 kg and 1.6 kg of fat (with significant differences between moments and between groups) and increased 1.5 and 1.9 kg of fat-free mass ($p<0.05$ between moments)[10].

Another strategy that is effective in inducing BR is constituted by high-intensity circuit training. In one of the studies, obese women (47% body fat) were exposed to 10 months of progressively organized intervention, with 3 sessions per week, and had 94% adherence. The sessions for the first 7 weeks lasted 23 minutes, with an effort:pause ratio of 1:2 (mean heart rate (HR) of 72±7.9% of maximum HR, lactate concentration of 8.99±1.09 mmol), and between weeks 21 and 40 they reached 41 minutes, with an effort:pause ratio of 2:1 (mean heart rate (HR) of 87.5±4.7% of maximum HR (HRmax), lactate concentration of 11.99 ±1.4 mmol). In addition to a 10% increase in resting metabolism (1,451±145.4 to 1,597±160.9 kcal), there were 5.9% reductions in weight and 16.6% in body fat, with a simultaneous increase of 3.8% in fat-free mass[7].

High-intensity interval training (HIIT) has also become a valid strategy for inducing BR, both in conjunction with weight training[14] and performed in isolation[15]. In a classic study with obese and inactive men (24.7±4.8 years and Body Mass Index = 28.4±0.5), the effects of a repeated sprints training (RST) with a 12-week intervention (3x/week, 20 min/session). Participants were exposed to RST progressively reaching 60 x 8-second sprints with a load corresponding to that of 80-90% of HRmax and cadence of 120 to 130 revolution per minute (rpm) intercepted by 12-second recoveries with equal resistance at 20-30 rpm. At the end of the three months of training, there was a 13% reduction in carbohydrate oxidation and a 13% increase in fat oxidation at rest (improving the metabolic flexibility), a decrease in respiratory quotient (Pre = 0.85±0.01; Post = 0.83±0.01; $p<0.05$), in addition to a 2.2% increase in fat-free mass, as well as a 3.7% reduction in waist circumference and a 6.7% reduction in adipose mass[15].

There are also interventions with concurrent training in various combinations. In physically active obese people, Longland et al.[8] applied 4 weeks of exercises, with 6 sessions per week (two of weight training, two of HIIT, one of plyometrics, and another of moderate continuous exercise). Increases of 1.2 kg in lean mass and a reduction of 4.8 kg in fat mass were recorded, both statistically significant. With bodybuilders, eight weeks of concurrent training (bodybuilding and HIIT, 4x/wk) associated with the intake of 2.5 g/kg/day of protein promoted an increase in fat-free mass (+2.1 kg) and decrease in body fat (-1.1 kg), even with a caloric surplus[14].

FINAL COMMENTS

As final consideration it is pointed out that Body Recomposition is a term that has emerged in the scientific literature in the areas of Sports Medicine and Physical Education and deserves attention, while it is emphasized that this phenomenon is not recent. In opposition to what is usually postulated, studies indicate the possibility of reducing body fat in energy surplus[7,14] and muscle hypertrophy in caloric restriction[5,8], in addition to the simultaneous occurrence of both phenomena. Finally, it is pointed out that body recomposition can occur in different groups and with different types of exercises - especially when associated with nutritional adjustments that involve increased protein intake.

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

This research is in accordance with the standards set by the Declaration of Helsinki

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the manuscript: FBDV. Wrote the paper: FBDV.

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