Importance of professional supervision for improving body composition in resistance-trained men: a preliminary non-randomized study

Importancia de la supervisión profesional para mejorar la composición corporal en hombres entrenados en fuerza: un estudio preliminar no aleatorizado

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Abstract

Introduction: Professional supervision in resistance training for body composition can optimize results at higher training levels. Objective: This study aimed to assess body composition (BC) changes over a fifteen-month resistance training (RT) program in resistance-trained men who exercised without professional supervision. Hypothesis: We hypothesized that participants with more than three consecutive years of RT experience who train without professional supervision would not show improvements in BC. Methods: We recruited 17 young men with more than three years of RT experience to participate in this single-group, non-randomized longitudinal study. Participants had the stated goal of increasing fat-free mass (FFM). Baseline measures of BC were obtained via dual-energy X-ray absorptiometry during a previous clinical trial (initial). After the 15-month unsupervised training period, individuals included in the analysis met certain inclusion criteria (responses to a validated questionnaire being able to lift > 1.5 times their body mass in the back squat exercise). Results: At the end of the study period, no significant changes were found in either in fat mass (Δ = -0.29 (2.16) [-1.40, 0.82] kg; P = 0.587; d_{unb} = -0.071 [-0.337, 0.191]) or in adjusted FFM (Δ = 0.19 (1.22) [-0.43, 0.82] kg; P = 0.516; d_{unb} = 0.029 [-0.061, 0.121]) when compared to baseline. This was likely due to poor management in self-regulating training and nutritional components.
Conclusions: In conclusion, our findings suggest that resistance-trained individuals (>3 consecutive years of RT) may not experience significant improvements in FFM after a 15-month unsupervised training program. Professional supervision and adherence to evidence-based recommendations may play a pivotal role in continual exercise-induced BC improvement.

Keywords

Organization and administration; hypertrophy; bodybuilding; strength training; fitness centers.

Resumen

Introducción: La supervisión profesional en el entrenamiento de fuerza para la composición corporal puede optimizar los resultados, sobre todo cuando el nivel es más avanzado. Objetivo: Este estudio tuvo como objetivo evaluar los cambios en la composición corporal durante un programa de entrenamiento de fuerza de quince meses en hombres entrenados que se ejercitaban sin supervisión profesional. Hipótesis: Los participantes con más de tres años consecutivos de experiencia en el entrenamiento de fuerza que entrenan sin supervisión profesional no mostrarían mejoras en la composición corporal. Métodos: Reclutamos a 17 hombres con más de tres años de experiencia para participar en este estudio longitudinal unigrupal, no aleatorizado. Los participantes tenían como objetivo aumentar el tejido muscular. Las mediciones basales de la composición corporal se obtuvieron mediante absorciometría dual de rayos X durante un ensayo clínico previo (inicial). Tras el período de entrenamiento no supervisado de 15 meses, los individuos incluidos en el análisis cumplieron con ciertos criterios de inclusión (respuestas a un cuestionario validado, capacidad para levantar más de 1,5 veces su masa corporal en el ejercicio de sentadilla). Resultados: Al final del estudio, no se observaron cambios significativos en la masa grasa (Δ = -0,29 (2,16) [-1,40, 0,82] kg; P = 0,587; dunb = -0,071 [-0,337, 0,191]) ni en la masa libre de grasa (MLG) ajustada (Δ = 0,19 (1,22) [-0,43, 0,82] kg; P = 0,516; dunb = 0,029 [-0,061, 0,121]) en comparación con el valor inicial. Esto probablemente se debió a una gestión deficiente del entrenamiento de autorregulación y de los componentes nutricionales. Conclusiones: Nuestros hallazgos sugieren que quienes tienen más de 3 años de entrenamiento de fuerza podrían no mejorar su masa muscular tras 15 meses de entrenamiento no supervisado. La supervisión profesional y la adhesión a recomendaciones basadas en la evidencia son claves para optimizar los resultados.

Palabras clave

Organización y administración; hipertrofia; fisicoculturismo; entrenamiento fuerza; centro fitness.

Introduction

Resistance training (RT) programs are often designed to improve body composition (BC), which in turn can improve body image (BI). Physically active individuals have been reported to be more satisfied with their BI compared to those who remain sedentary (Bibiloni et al., 2017). Thus, a positive relationship between physical activity levels and BI has been found in both men and women (Bassett-Gunter et al., 2017; Campbell & Hausenblas, 2009). However, some individuals who conceivably would be considered well-trained (i.e. perform RT regularly for> 3 consecutive years in 3-5 days/week) do not follow a structured training and/or nutrition program, which may hinder improvements in BC (San Mauro Martin et al., 2014). In fact, strength training aimed at hypertrophy should be performed based on current science to avoid premature depletion of adaptive reserves, increase training variability, prevent plateaus, and foster motivation (Prieto-González et al., 2022).

As one gains experience in RT, the initial strategies used to enhance fat-free mass (FFM) and reduce fat mass (FT) become increasingly less effective. Thus, it is necessary to adjust exercise programming and nutritional interventions to achieve continued results. For example, while novice trainees can sustain a large energy surplus and gain primarily fat-free mass (FFM), advanced exercisers must reduce the magnitude of the surplus to avoid excess increases in fat mass (Garthe et al., 2013; Rozenek et al., 2002). Furthermore, individuals get increasingly closer to their "genetic ceiling" with consistent RT and thus gains in strength and muscle mass slow considerably over time (Ratamess et al., 2009). This, in turn, negatively impacts motivation and makes them prone to use performance and image enhancing drugs (PIEDs) (Solakovic et al., 2016), thus increasing the risk of adverse health effects (Allison et al., 2016).

Motivation has been shown to remain high during the early phases of training due to robust improvements in strength and FFM levels, which favors adherence to the RT program based on intrinsic and extrinsic factors (Carron et al., 1996; Dogan, 2015; Moreno-Murcia et al., 2017). As a result, individuals who regularly attend fitness centers for the purpose of improving their FFM fall into a "vicious cycle" where misinformation, poor exercise programming, inadequate nutritional intake and lack of motivation may impair gains in muscle growth.

This study aimed to assess whether RT carried out over a 15-month period, without controlling for program variables or nutritional intake, has a significant effect on FFM in recreationally trained men. We hypothesized that participants with more than three consecutive years of RT experience who train without professional supervision would not show improvements in BC.

Method

Design and Procedures

We conducted a single-group non-randomized longitudinal study with repeated measures (before and after) design. The participants' BC was initially assessed using the Body Composition-Muscle Hypertrophy (Cod:04) framework developed at the University of Málaga. Fifteen months later, only those who met the following selection criteria based on their responses to a validated research questionnaire were allowed to participate in the second part of the study: i) participants who confirmed their continuity in their RT program from the initial assessment to the date of the second measurement in order to increase their muscle mass or strength level; and ii) participants who were able to lift >1.5 times their body mass in back squat (BS) exercises, after measuring their one repetition maximum (1RM).

Participants

An initial convenience sample of 34 resistance-trained participants (aged 18-35) with ≥3 years of training experience that participated in the aforementioned Body Composition-Muscle Hypertrophy project in 2018 were screened to determine if they met the following established selection criteria: 1) performing a continuous RT program with an average of 4 days per week since the first BC assessment and; 2) the ability to lift 1.5 x body mass (kg) as determined in a 1RM squat (SQ) test. Although participants can be classified as possessing an advanced level of training experience, none were competitive strength training athletes (e.g., bodybuilders, powerlifters, etc.). Seventeen participants met the inclusion criteria who were notified about all possible risks of the experiment and signed an informed consent form. The research protocol was reviewed and approved by the Research Ethics Committee of the University of Málaga (Code: 38-2019-h). The study followed the ethical principles of the Declaration of Helsinki (General Assembly of the World Medical, 2014).

Procedure

After qualifying for selection, participants scheduled an appointment at the laboratory to evaluate their body composition, which employed the same measurement protocol as the first evaluation (fifteen months before). Participants reported to the laboratory having refrained from performing any exercise other than activities of daily living for at least 48 hours before the reference test. The data were collected at the Medicine Laboratory facilities of the University of Málaga.

Questionnaire

A questionnaire consisting of 9 items was developed to determine whether participants qualified to participate in the second part of the study. This instrument was evaluated for content and face validity based on expert judgment. The experts consisted of 11 individuals holding master's or doctorate degrees in physical activity sciences and sport pedagogy with research experience in sports training or questionnaire application and analysis, thereby meeting many of the selection criteria proposed by Skjong and Wentworth (Skjong & Wentworth, 2000). Content validity was quantified by agreement among judges to establish the Content Validity Ratio (CVR) of each item to finally obtain the Content Validity Index (CVI) for the entire instrument, based on Lawshe (Lawshe, 1975) and the later recommendations by Tristán López (Tristán-López, 2008). The lower the CVI (closer to 0) the less consensus about the instrument existed among experts while the higher the CVI (closer to 1) the higher the experts' agreement (a score of at least 0.79 was necessary to deem the instrument as valid). The CVR was expected to be higher than 0.5823 for the item to be accepted; otherwise, it had to be removed (Lawshe, 1975; Tristán, 2008). The proposed questionnaire along with its instructions and study purpose was separately shared with each expert. In addition, linguistic and grammatical preferences were requested from academic peers to improve the interpretation of the instrument (face validity).

Table 1. Content Validity Ratio of the Suggested Items

Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
1.00	0.91	0.45*	1.00	0.91	0.91	1.00	0.91	0.55*
Total CVI of the instrument= 0.948								

* Does not comply with CVR

After validation by a panel of experts, the instrument was reduced to 7 items as 2 proposed items did not score sufficiently (see Table 1). Based on the final instrument, a pilot study was conducted with 61 university sports science students who had more than six months of RT experience and were members of different university sports teams. These students were asked to answer the questionnaire and provide recommendations for better understanding of the item wordings. However, participants did not make any suggestions about the instrument.

The pilot study data then were used to analyze the instrument's construct validity with respect to its internal consistency. The Exploratory Factor Analysis (EFA) was initially used to obtain instrument dimensions. Based on the maximum likelihood with varimax rotation method (Lloret-Segura et al., 2014), we determined that the instrument is mainly made up of two dimensions: the first dimension was named "continuity in training" comprising items 1 and 7 and the second dimension was named "training and supplementation" comprising items 2, 3, 4 and 5. Item 6 did not fit into the above variables. However, it was not removed from the instrument as it was deemed essential for subject selection and data analysis.

Given the dichotomy in most of the responses, the internal consistency of the two separate variables was examined using the KR-20 coefficient, obtaining an index of 0.62 for Factor 1 and 0.41 for Factor 2 which indicates moderate reliability in each case (Martínez-Arias, 1995). The definitive instrument of the above process was used for the purpose of the present research (see Annex 1). All participants were contacted via e-mail or telephone to answer the online questionnaire using Google Forms, but were unaware of its purpose.

Assessment of One Repetition Maximum (1RM)

The 1-RM was evaluated in the SQ performed on a Smith machine (Gervasport, Madrid, Spain) to verify that participants lifted 1.5 times their body mass as specified in the inclusion criteria (Vargas et al., 2018; Vargas-Molina, Petro, et al., 2020). In brief, the participants performed a general warm-up before the test, which consisted of light cardiovascular exercise that lasted approximately 7 to 10 minutes. A specific warm-up set of the SQ was performed for 12 to 15 repetitions at approximately 40% of the 1RM, followed by 2 to 3 sets of 2 to 3 repetitions at a load corresponding to approximately 60% to 80% of 1RM. The participants then performed a series of one repetition lifts of increasing weight to determine 1RM. A rest period of three to five minutes was provided between each successive attempt. The participants were required to reach the parallel in the 1RM SQ; the confirmation of the squat depth was verified by a linear encoder. The participants made as many attempts as necessary until failing the repetition, using the protocol described by McGuigan (2016). All test sessions were supervised by the research team to achieve a consensus for success in each test.

Body composition

Body mass and body composition were assessed using a Hologic QDR 4500 Dual-energy X-ray Absorptiometry (DXA) scanner (Hologic Inc., Bedford, MA, USA). Each subject was scanned by a certified technician. The distinguished bone and soft tissue, edge detection and regional demarcations were assessed by computer algorithms with APEX 3.0 Software (APEX Corporation Software, Pittsburg, PA, USA). For each scan, participants wore sports clothes and were asked to remove all materials that could attenuate the X-ray beam, including jewelry. The calibration of the densitometer was checked daily against a standard calibration block supplied by the manufacturer. The abdominal region was delineated by an upper horizontal border located at half of the distance between the acromion processes and the external portion of the iliac crests, a lower border determined by the external portion of the iliac crests, and the lateral borders extending to the edge of the abdominal soft tissue. All trunk tissue within this standardized height region was selected for analysis. To determine intertester reliability, two different observers selected the area for each subject manually (CV = 0.415%). Based on the Heymsfield et al. (Heymsfield et al., 2002) model, FFM values were adjusted by subtracting the fat-free adipose tissue (FFAT) component according to the formula: (FM / 0.85) x 0.15.

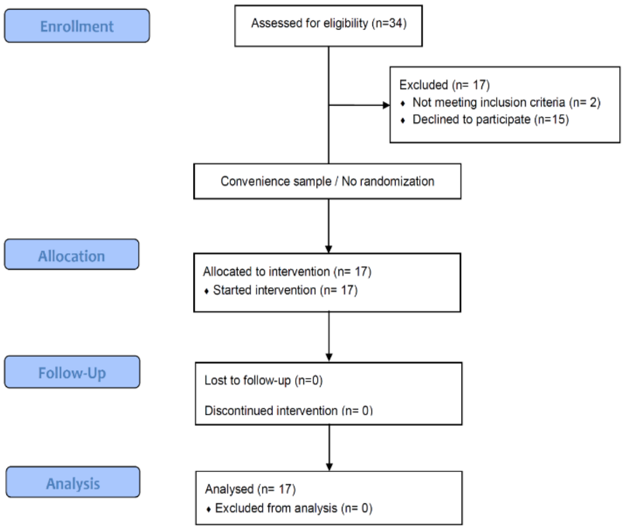
Data analysis

Results are expressed as mean ± standard deviation. The normality of data was checked using the Shapiro-Wilk test. The paired sample t-test was used to establish the difference in means (initial [t_1] vs final [t_2] assessment) and change in FFM and FM ($\Delta = t_2 - t_1$). Effect size was calculated as unbiased Cohen's *d* (d_{unb}), considering a result of ≤0.3 as a small effect, 0.5 as a moderate effect and ≥ 0.8 as a large effect. 95% confidence intervals were reported for all tests. Analyses were performed using the IBM SPSS Statistics v25 software (IBM Corp., Armonk, NY, USA).

Results

In response to the questionnaire, seventeen (n=17) participants reported to have trained continuously over the 15-month period with a training frequency of 3 to 5 times per week. Two individuals (12%) reported having performed low- or moderate-intensity endurance training once per week while one participant (6%) played volleyball once a week. The rest of individuals (82%) reported that they did not engage in any structured form of endurance exercise in addition to RT. Moreover, none of the participants reported any injuries or other reasons for stopping training (e.g., for a period of ≥2 weeks in a row). Thus, after the selection process, seventeen men (age 28 ± 6.4 years; body mass 76.5 ± 8.9 kg; height 177.7 ± 8.2 cm; BMI 24.2 ± 2.3 kg·m-2; SQ 121.41 ± 12.3 kg) met the established inclusion criteria and participated in the training intervention. A flow diagram of the process is shown in Figure 1.

Figure 1. Consort Diagram Flow.



The descriptive characteristics of the study participants are shown in Table 2.

Table 2. Baseline characters of study participants

	x̄	SD	95% confidence interval	
			Lower Limit	Upper limit
Age (years)	28.0	6.4	24.7	31.3
Body mass (kg)	76.6	9.0	72.0	81.2
Height (cm)	177.8	8.3	173.5	182.0
BMI ($kg·m^{-2}$)	24.2	2.3	23.0	25.4

All participants reported sufficient protein consumption (≈ 2 g·kg-1·day-1) and also showed a general awareness about evidence-based nutritional recommendations to promote muscle growth (Iraki et al., 2019). In regard to supplement consumption (see Table 3), several of the participants reported the use of putative muscle-building supplements to enhance training adaptations; specifically, seven (41%) reported regular consumption of whey protein isolate while three (17%) reported consuming creatine monohydrate. All participants denied taking pharmacological ergogenic aids. Moreover, participants confirmed that neither their training nor nutrition was supervised by professionals specialized in these areas.

Table 3. Frequency of supplement intake among study participants.

Answers	fi	hi
NO	10	59%
Whey protein	4	23%
Whey protein/ Creatine	3	18%

fi: absolute frequency; hi: relative frequency.

FFM adjustment by subtracting FFAT is summarized in Table 4.

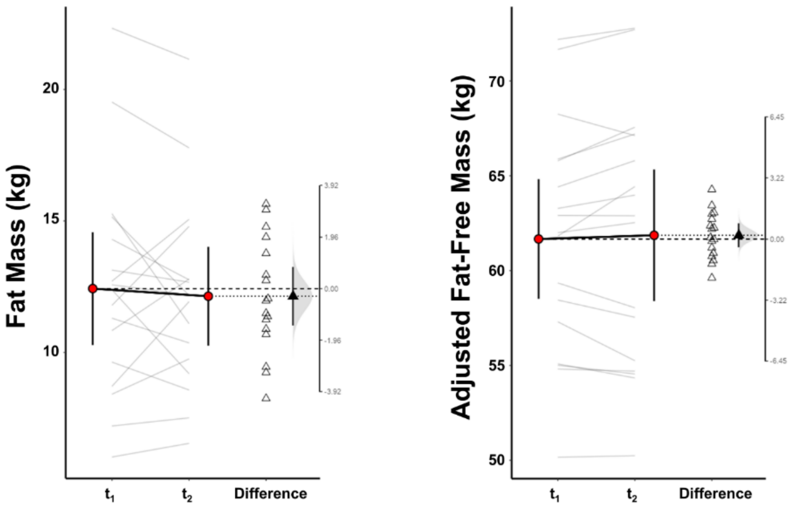
Table 4. Body composition data at initial and final assessments.

Variable	Initial (t_1)		Final (t_2)	
	x̄ (SD)	95% CI (min, max)	x̄ (SD)	95% CI (min, max)
FM (kg)	12.42 (4.17)	10.28, 14.57	12.13 (3.65)	10.25, 14.01
FFM (kg)	63.85 (6.60)	60.46, 67.25	64.00 (7.04)	60.38, 67.62
FFAT (kg)	2.19 (0.73)	1.81, 2.57	2.14 (0.64)	1.80, 2.47
Adjusted FFM (kg)	61.66 (6.13)	58.51, 64.82	61.86 (6.74)	58.39, 65.32

Fat-free adipose tissue (FFAT) was calculated according to the expression (FM / 0.85) x 0.15

The results of body composition variables are expressed as Δ (SD) [95% CI]; *P* value; d_{unb} [95% CI]. DXA assessment at the end of the unsupervised training period revealed no significant changes either in FM (Δ = -0.29 (2.16) [-1.40, 0.82] kg; *P* = 0.587; d_{unb} = -0.071 [-0.337, 0.191]) or in adjusted FFM (Δ = 0.19 (1.22) [-0.43, 0.82] kg; *P* = 0.516; d_{unb} = 0.029 [-0.061, 0.121]) in relation to baseline. Figure 2 shows paired results between initial and final measurements.

Figure 2. Results before and after on FM and adjusted FFM. Paired data are shown as lines. The difference between the initial (t1) and final (t2) means is plotted on a floating difference axis, whose zero is aligned with the pretest mean. The filled dark triangle marks the difference on that axis and the 95% CI on that difference is displayed. The differences are shown as open triangles on the difference axis.



Discussion

This study aimed to assess the effect of a 15-month period of unsupervised RT and nutrition on FFM changes in individuals with > 3 years of RT experience. Consistent with our initial hypothesis, participants did not show significant changes in BC from baseline at the end of the study period. We are able to confirm a plateau since the increases in FFM were negligible among participants.

Although the reasons for the observed plateau remains undetermined, it can be speculated that despite having a general understanding of the science of exercise and nutrition, the participants did not know how to put the information into practice; therefore, self-direction in their training and nutrition programs may have played a contributory role. Significant improvements in body composition are routinely seen during the initial weeks of dedicated training (Gentil et al., 2013; Seynnes et al., 2007). However, customized strategies on an individual basis are required for continued progress over time. In this regard, it can be beneficial for these individuals to seek professional advice from professionals in personal training and human nutrition. Evidence indicates that supervision by a fitness professional leads to substantial changes in FFM, strength and muscle power compared to self-directed training (Coutts et al., 2004; Dias et al., 2017; Mazzetti et al., 2000; Storer et al., 2014). In addition to receiving better programming, this may be at least in part due a tendency for individuals to train harder when supervised (Steele et al., 2017), which is of consequence given that intensity of effort is considered a primary factor in enhancing RT-induced muscular adaptations (Fisher, 2013). Moreover, professional supervision promotes adherence and optimizes results in both elderly and sedentary adults (Faulkner et al., 2014; Lacroix et al., 2017; Mann et al., 2018).

Nevertheless, the cost of professional advice (i.e., personal training) is not affordable for the entire population. There are several lower-cost alternatives for guiding training and nutritional practices to help achieve fitness-related objectives, such as purchasing only one monthly in-person session or hiring an online trainer. Other tools to monitor physical exercise and nutrition are becoming increasingly popular. For example, a supervised training protocol that involves a body mass management program using the Polar FT60 Heart Rate Monitor (Polar Electro Oy, Kemple, Finland) along with educational resources (an explanatory booklet with an overview of the program, user's manual, diet diary, tape measure, and "calorie counting" book) was shown to produce a greater reduction in FM and waist circumference compared to control (Byrne et al., 2006). In addition, the use of mobile applications has been shown to be a viable strategy for promoting goal achievement and adherence to exercise and nutrition programs (Fukuoka et al., 2010; Teixeira et al., 2018; Turner-McGrievy et al., 2013; Valenzuela et al., 2018). These types of monitoring systems facilitate the ability to track important RT variables without the need for in-person supervision.

Moreover, the rating of perceived exertion (RPE) (Robertson et al., 2003) scale has been shown to be a reliable gauge of exercise intensity that correlates with the extent of blood lactate concentration (Vargas-Molina, Martin-Rivera, et al., 2020). When used in conjunction with repetitions in reserve (RIR) (Zourdos et al., 2016), these tools can help an individual to self-regulate workload and effort in the absence of professional supervision (Helms et al., 2016). Thus, including low-cost technological tools to help manage training volume, recovery time and optimal energy and nutrient intake may be an effective means to individualize protocols and stave off a plateau in results (Angleri et al., 2020; Macnaughton et al., 2016; Witard et al., 2016).

A lack of achieving results in one's fitness program may lead to the misuse of PIEDs such as androgenic anabolic steroids (AAS) (González-Martí et al., 2017). Several studies have demonstrated that the use of AAS is largely due to BI dissatisfaction (Blouin & Goldfield, 1995; Hildebrandt et al., 2007; Ntoumanis et al., 2014; Zahnow et al., 2020). The abuse of AAS can cause serious kidney conditions (El-Reshaid et al., 2018), cardiovascular diseases (Liu & Wu, 2019; Nieminen et al., 1996; White et al., 2018) and reproductive health issues (Armstrong et al., 2018), among other physiological and psychological complications (Nieschlag & Vorona, 2015; Westerman et al., 2016). As a public health matter, exercise and nutrition professionals should be informed about the identification of the typology of PIEDs (Dennington et al., 2008; Kimergård, 2014; Zahnow et al., 2018).

Given the evidence, it can be inferred that the most effective way to achieve long-term improvements in BC is through professional supervision. Unfortunately, self-directed participants often perform the same training programs for months on end, failing to elicit a sufficient stimulus for further adaptation. In other cases, they seek to emulate the programs of professional athletes, which can overtax their recovery ability, impairing results and increasing the risk of musculoskeletal injuries. The presence of a training partner with similar goals can be helpful in this regard. However, although having a training partner can improve exercise adherence (Beverly & Wray, 2010; Osuka et al., 2017; Wallace et al., 1995), we are not aware of any experimental data indicating that it favors the achievement of BC goals in trained participants. More research is needed to clarify the potential effect of training partners while taking into account factors such as educational background, training experience and level of motivation.

Our study has several limitations that must be considered when attempting to draw applied conclusions. First and foremost, the lack of a control group precludes our ability to establish a cause-effect relationship; further research is warranted using a true experimental design that directly compares supervised versus unsupervised training groups to allow for causal inference (Marsden & Torgerson, 2012). Secondly, further research is needed to establish the starting point of the stagnation phenomenon since this requires several measures throughout the individual's progress. Finally, we did not obtain information as to nutritional intake or other lifestyle factors that might influence results. Therefore, the discussion of results was based solely on the information provided by the validated questionnaire.

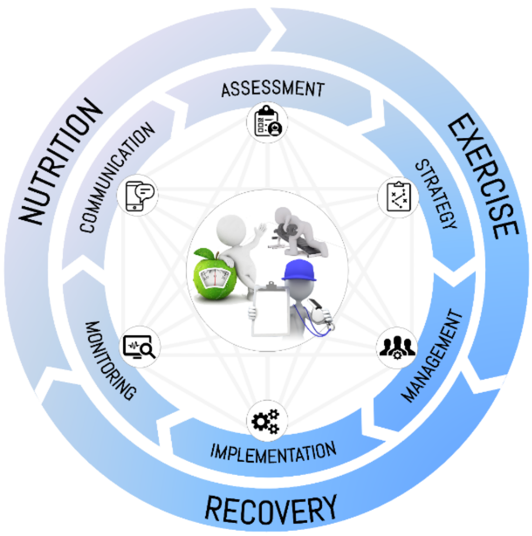
Conclusions

Participants with more than three consecutive years of RT experience may find it difficult to improve BC over a 15-month unsupervised training program, conceivably due to lack of systematic manipulation of variables in their training and nutrition program. Professional supervision and adherence to evidence-based recommendations may play a pivotal role in successful and constant BC improvement.

Practical applications

Despite continuous training, one of the main reasons for the absence of BC changes in advanced RT exercisers seems to be a lack of knowledge regarding exercise and nutritional strategies. These individuals may therefore benefit from seeking out qualified fitness professionals to help prescribe programming, either on a regular or periodic basis. Alternatively, the use of mobile applications and new technologies can help to promote adherence via manipulating program variables. The use of the double RPE - RIR scale and self-regulated training is recommended to help ensure sufficient effort is applied during training. Finally, all the aforementioned strategies should be integrated into a dynamic and constant process that ideally involves: i) an initial assessment of physical fitness, morpho-physiological characteristics and experience/knowledge of the individual; ii) design of a training strategy based on goals and abilities; iii) a transdisciplinary approach that provides information about the guidelines needed to carry out the process; iv) proper implementation of the program; v) monitoring and supervision of progress to appropriately adjust the program variables, and vi) constant feedback and communication (Figure 3).

Figure 3. Nutrition, recovery and exercise. Importance of professional supervision for changing body composition. Individualized, periodized and programmed exercise, nutrition and recovery are the key components to achieve changes in body composition. This process encompasses a transdisciplinary approach of permanent feedback between main actors (clients and exercise & nutrition professionals).



Acknowledgements

Conflicts of interest

D.A.B. has conducted academic-sponsored research in sport and exercise sciences, serves as the NSCA Colombia Board Advisor, and has received honoraria for sales of muscular performance and body composition equipment, and speaking on exercise sciences at international conferences and private courses. BJS formerly served on the scientific advisory board for Tonal Corporation, a manufacturer of fitness equipment. The other authors declare no conflict of interest. All authors are responsible for the content of this article.

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Annex 1.

The purpose of this questionnaire is to confirm the continuity during your strength training with the purpose of increasing the muscle mass or your strength levels during the course of the initial assessments performed previously and the current date.

Below is a list of questions, so we ask you to answer them as precisely as possible. We appreciate your cooperation. The answers to this questionnaire will remain confidential.

Full name: ________________________________ Age: _________
Date of birth: ______________________________
Sex (mark with an X): Male_____ Female ____

Ad Hoc questionnaire on continuing strength training and supplementation.

	Questions	Answer options
1	Did you interrupt your training from the initial evaluation and the current date for three weeks or more?	YES / NO
2	Did you train regularly 3 or more days per week? If so, mark with an X how many days.	YES / NO 3 days 4 days 5 days More days
3	During the course of the two evaluations did you consume at least 2 g of protein per kg of body mass per day?	YES / NO
4	Have you regularly consumed sports supplements such as creatine monohydrate, protein, multivitamins, stimulants or any other?	YES / NO
5	During the course (time) of the two evaluations, did you regularly engage in cardiovascular exercise or other sports practice such as running, cycling, aerobics, swimming, among others? If yes, please indicate the type of sport you did	YES / NO Type of cardiovascular practice: ______________
6	In the year prior to the start of the initial assessment and to the current date, have you taken performance and image enhancing drugs (e.g., anabolic steroids, peptide hormones, or other) or hallucinogenic drugs during the course of the two assessments?	YES / NO
7	Since the initial assessments and to date, have you suffered any musculoskeletal injuries or illnesses that have interrupted your training for more than two weeks?	YES / NO