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THE IMPACT OF MANIPULATED SUPPLEMENTATION ON METABOLIC PERFORMANCE AND WEIGHT LOSS

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ABSTRACT

This article analyzes the impacts of manipulated supplementation on metabolic performance and weight loss, based on a narrative review of the scientific literature. The research brings together recent studies investigating substances such as creatine, adenosine triphosphate (ATP), L-Carnitine, conjugated linoleic acid (CLA), and thermogenic compounds, often used in manipulated formulas to optimize physical performance and promote body fat burning. The results demonstrate that while some supplements have proven effects on muscle endurance and fatigue tolerance, such as creatine and ATP, other compounds, such as L-Carnitine and CLA, have controversial efficacy, with limited evidence of a direct impact on fat reduction. The study also highlights the risks associated with the indiscriminate use of thermogenics, especially those that act on the central nervous system, and warns of the importance of considering biological individuality, professional monitoring, and the origin of the products handled. It is concluded that manipulated supplementation can contribute to the objectives of weight loss and performance when inserted in an integrated care plan, with technical prescription and multidisciplinary support, and should not be treated as an isolated resource or substitute for healthy habits.

Keywords: Creatine. Performance. Slimming. Manipulated supplementation. Thermogenics.

INTRODUCTION

The growing appreciation of body aesthetics and metabolic health has contributed to the significant increase in the consumption of compounded supplements, especially among individuals who practice regular physical exercise, seeking faster results in weight loss and performance improvement, even though these resources do not always have sufficient scientific support to prove their efficacy and safety in the long term (Silva et al., 2019).

In the current scenario, there is a notable demand for substances with ergogenic properties, such as thermogenics, which act to increase the basal metabolic rate, promoting greater energy expenditure and facilitating the mobilization of body fat, although part of these compounds interfere with the central nervous system, which can pose health risks, especially when consumed without adequate guidance (Costa et al., 2012).

Another aspect that deserves attention refers to the use of substances such as L-Carnitine and Conjugated Linoleic Acid (CLA), often manipulated to compose personalized weight loss formulas, but which, despite their popularity in the fitness environment, still lack consistent scientific proof of their effectiveness in reducing body fat, including reports of adverse effects such as increased insulinemia and alteration of the lipid profile (Costa et al., 2012).

The ease of access to compounded supplements, added to the wide dissemination on social networks and by digital influencers, favors unbridled consumption, often without the proper professional prescription, which increases the risk of inappropriate use of these substances, increasing the possibility of unwanted side effects and lower-than-expected results in terms of health and weight loss (Silva et al., 2019).

Within this reality, a worrying paradox is observed: at the same time that individuals seek better physical performance and greater caloric burn through supplementation, they ignore fundamental aspects such as a balanced diet, a well-structured exercise routine and professional monitoring, which are indispensable elements to achieve and maintain healthy and sustainable results (Ferreira et al., 2001).

In addition to the thermogenic function, many of these products promise benefits such as increased disposition, reduced appetite, and preservation of muscle mass during the weight loss process, but the available studies are not yet sufficient to accurately state such effects in different populations, with different clinical conditions and eating and physical routines (Fambrini, 2022).

The mechanisms of action involved in the metabolic effects of manipulated supplements are diverse, varying according to the ingredients used, with some acting on the oxidation of fatty acids, others on insulin modulation or the stimulation of the

sympathetic nervous system, factors that can positively or negatively interfere with performance and body composition (Silva et al., 2019).

Although supplementation can contribute as an auxiliary tool, it is essential to consider that it does not replace the fundamental pillars of metabolic health, such as a balanced diet, quality sleep, and regular exercise, and extra care is needed when using substances with stimulating action, especially in individuals with a predisposition to cardiovascular or metabolic diseases (Costa et al., 2012).

It is important to highlight that, although some supplements such as creatine and ATP have more robust studies that indicate gains in muscle performance and endurance, their effects on weight loss are indirect, that is, related to the increase in the intensity and duration of training, and not necessarily to the burning of localized fat or the acceleration of metabolism in isolation (Araújo, 2020).

On the other hand, there is a growing body of research that has investigated the effects of acute and chronic supplementation of substances such as disodium ATP, which has been shown to reduce the perception of exertion and improve fatigue tolerance, contributing to a longer performance during resistance exercise, which can favor total caloric expenditure and adherence to training (Fambrini, 2022).

Despite this positive evidence, it is necessary to consider that individual variability directly influences the response to supplementation, and factors such as age, sex, genetics, body composition, level of training, and type of diet impact the effectiveness of the substances used, which reinforces the need for an individualized protocol for each patient (Araújo, 2020).

In addition, it should be considered that the composition of compounded supplements varies according to the compounding pharmacy, and there may be divergences in the purity, dosage and quality of the active ingredients, which directly interferes with the expected results and consumer safety, making it essential to choose reliable and properly regulated establishments (Costa et al., 2012).

In Brazil, ANVISA establishes specific standards for the marketing and use of these products, but consumers do not always have access to complete technical information or understand the risks associated with continuous consumption without monitoring, which highlights the importance of health education in the context of the use of supplements (Brasil, 2010).

From an academic perspective, the study of manipulated supplementation should consider not only its physiological effects, but also the behavioral, social, and economic factors that motivate its use, and it is relevant to investigate how these practices are

inserted in the culture of performance and body aesthetics increasingly disseminated by the media and social networks (Silva et al., 2019).

Given this panorama, it is necessary to deepen the analysis of the impacts of manipulated supplementation on metabolic performance and weight loss, addressing the biochemical mechanisms involved, the existing clinical evidence and the implications for public health, to contribute to a safer and more effective prescription of these substances in the context of the professional practice of nutrition and physical education (Fambrini, 2022).

MANIPULATED SUPPLEMENTATION AND METABOLIC COMPOSITION

Manipulated supplementation has been consolidated as an alternative increasingly sought after by individuals who seek to optimize physical performance and achieve weight loss faster, being widely disseminated in gyms, offices and social networks as a personalized solution, although its use requires caution, since the physiological effects vary significantly according to the active ingredients manipulated, the doses used and the biological profile of each individual (Costa et al., 2012).

These supplements are prepared under individualized prescription, allowing the health professional to formulate specific combinations of compounds with ergogenic, lipolytic or energetic action, which enables the creation of strategies aimed at burning fat or increasing resistance, however, the absence of standardization and variability in the quality of raw materials among compounding pharmacies can compromise both the efficacy and safety of the products consumed (Brazil, 2010).

It is important to consider that most of the effects sought with manipulated supplementation are related to energy metabolism, involving biochemical pathways responsible for the production and use of ATP, fatty acid oxidation and muscle protein synthesis, these pathways being directly influenced by the macronutrients consumed and the intensity and frequency of physical activity performed, which requires constant professional monitoring (Fambrini, 2022).

Among the compounds frequently manipulated are metabolic stimulants that aim to increase thermogenesis and, consequently, basal caloric expenditure, although they do not always have solid scientific evidence, which makes an evidence-based approach indispensable to support the choice and prescription of these substances, especially when intended for weight loss and body recomposition (Silva et al., 2019).

The search for quick solutions has led many consumers to resort to manipulated formulas that combine different substances with promises of accelerated results, such as

short-term weight loss, increased energy during workouts and preservation of lean mass, but these promises are not always supported by the critical analysis of the scientific literature, which points to the importance of regular exercise and adequate nutrition as the main determinants of metabolic success (Costa et al., 2012).

Another factor that needs to be considered is the placebo effect associated with the use of manipulated supplements, which often motivates greater dedication to training and diet on the part of the individual, which in itself can result in positive changes in body composition, making it difficult to accurately assess the real efficacy of the substance used, especially in uncontrolled studies with low sampling (Silva et al., 2019).

The bioactivity of the compounded compounds may suffer significant interference from hepatic metabolism, intestinal absorption rate, and interaction with other drugs or nutrients, which reinforces the need for careful supplementation planning, respecting the principles of pharmacokinetics and pharmacodynamics to ensure not only the desired result, but the preservation of the individual's organic integrity (Costa et al., 2012).

Among the most common objectives of manipulated supplementation are the acceleration of lipolysis, the improvement of performance during exercise and the reduction of fatigue, goals that require a deep understanding of the biochemical processes of the human body and the impacts of each active ingredient used, and joint action between nutritionists, physical educators and physicians is essential to promote responsible and informed use (Fambrini, 2022).

The lack of more specific regulations regarding the prescription and marketing of these products still represents a challenge for inspection and public health agencies, since the popularization of compounding pharmacies contributes to the indiscriminate use of standardized formulas sold as personalized, which can expose the consumer to unnecessary risks, especially in cases of self-medication and continuous use without professional supervision (Brasil, 2010).

Thus, it is necessary to reinforce that manipulated supplementation should be seen as a complementary tool, and not as an isolated solution for metabolic modulation or weight loss, as its success depends on a broader context, which involves an active lifestyle, balanced diet, sleep quality, and psychosocial factors that directly influence adherence to the diet plan and the practice of physical exercise (Silva et al., 2019).

THE EFFICACY OF L-CARNITINE AND CLA IN WEIGHT LOSS

Among the most widely used compounded supplements for weight loss purposes, L-Carnitine is often prescribed based on its function of transporting fatty acids into the

mitochondria, where they will be oxidized and converted into energy, but despite this promising biochemical basis, the scientific literature presents controversial results regarding its isolated effectiveness in reducing body fat, especially when not associated with dietary interventions and regular physical exercise practices (Costa et al., 2012).

In several studies, L-Carnitine has been shown to be ineffective in causing significant reductions in body fat when used alone, and it is common to observe that positive effects only occur when there is control of variables such as exercise intensity, type of diet and metabolic state of the individual, which demonstrates that its action cannot be generalized to all populations and contexts (Silva et al., 2019).

In addition, supplementation with L-Carnitine has been associated with side effects such as nausea, vomiting, cramps, and gastrointestinal discomfort in some people, which reinforces the importance of individualizing the prescription and qualified professional follow-up during continuous use, especially in patients with digestive sensitivity or a history of supplement intolerance (Costa et al., 2012).

Another compound widely present in compounded formulations aimed at weight loss is Conjugated Linoleic Acid (CLA), which has been studied for its effects on modulating body composition, since it is believed that it can reduce fat percentage by inhibiting lipogenesis and stimulating lipid oxidation, but the results are also inconsistent and often associated with unwanted metabolic changes (Costa et al., 2012).

Some authors report that the use of CLA can promote adverse effects, such as increased insulin resistance, increased fasting blood glucose, increased insulinemia, and reduced HDL-cholesterol levels, especially in individuals with metabolic syndrome, which shows that, although promising, the use of this supplement should be judicious and reserved for well-monitored and clinically monitored contexts (Costa et al., 2012).

The available data on CLA demonstrate that, even when there is weight loss, this reduction is not sustained linearly or uniformly among study participants, with a significant interindividual variation in the results obtained, which makes it difficult to standardize use protocols and limits conclusions about its real efficacy in clinical and sports environments (Silva et al., 2019).

It is necessary to highlight that both L-Carnitine and CLA are frequently used due to the influence of marketing strategies and empirical results reported by physical activity practitioners, but few consumers have access to complete technical information about these substances, which contributes to the dissemination of unrealistic expectations and, sometimes, the inappropriate or prolonged use of products without sufficient scientific support (Costa et al., 2012).

Despite the popularity of these compounds, much of the scientific literature still questions their efficacy in weight loss in isolation, pointing out that their use is only effective when combined with a low-calorie diet and structured physical activity, being irrelevant or even ineffective when consumed by sedentary individuals or those with disorganized eating habits (Silva et al., 2019).

Therefore, the recommendation for the use of L-Carnitine and CLA for weight loss purposes should be made with caution, considering the individual's metabolic conditions, the risks associated with continuous use, the absence of proven long-term benefits, and the possibility of adverse effects that can compromise the patient's health instead of promoting it, contrary to the fundamental principles of rational supplementation (Costa et al., 2012).

Thus, although L-Carnitine and CLA are supplements widely used in manipulated formulations aimed at weight loss, the most consistent studies point out that their effects are limited, strongly depend on the context of use and should be closely monitored by health professionals, and it is essential to reinforce to the patient that such substances do not replace the pillars of body composition change, such as food, training and constancy (Silva et al., 2019).

CREATINE AND ATP: PERFORMANCE, ENERGY, AND MUSCULAR ENDURANCE

Creatine is widely recognized in the scientific and sports world as one of the most effective substances for increasing physical performance, especially in short-term and high-intensity exercises, being produced naturally by the body from the amino acids glycine, arginine and methionine, and can also be obtained through food and supplementation, which allows the increase of intramuscular stores of phosphocreatine and, consequently, more efficient ATP regeneration during physical activity (Araújo, 2020).

The performance of creatine is closely linked to the alactic anaerobic system, in which phosphocreatine contributes directly to the resynthesis of ATP at times of high energy demand, such as in the first seconds of an explosive exercise, and this mechanism is fundamental to sustain muscle strength, delay fatigue and improve the ability to perform high-intensity sets with fewer interruptions for rest (Araújo, 2020).

Studies show that creatine supplementation is associated with increased strength, power and muscle mass, especially when combined with resistance training, and these effects are the result not only of the biochemical action of the substance, but also of greater tolerance to effort and the possibility of performing more voluminous and intense workouts without early loss of performance (Fambrini, 2022).

The most widely used protocol for creatine supplementation involves an initial saturation phase, usually with an intake of 20g per day divided into four doses for five to seven days, followed by a maintenance phase with daily consumption between 3g and 5g, although there is evidence indicating the efficacy of protocols without a saturation phase, with positive results from continuous use in moderate doses (Araújo, 2020).

Regarding the safety of creatine, the specialized literature confirms that, when used properly, the substance does not present significant health risks, being well tolerated by most individuals and can be administered for long periods without damage to the kidneys or liver, as long as the user is healthy and there is professional monitoring throughout use.

In addition to creatine, another supplement that has drawn attention in the context of metabolic performance is adenosine triphosphate (ATP), a substance naturally present in cells and considered the main energy currency of the human body, being essential for carrying out any cellular activity, including those related to muscle contraction during physical exercise (Fambrini, 2022).

Oral ATP supplementation, especially with the commercial form known as Peak ATP®, has been studied with the aim of verifying its influence on muscle strength, resistance to fatigue and psychophysiological responses during resistance training, and there is evidence that, even in a single and acute dose, it can provide greater tolerance to exertion and a feeling of less fatigue during consecutive sets (Araújo, 2020).

In a recent study carried out with trained individuals, the intake of 400mg of ATP significantly reduced the perception of subjective effort (RPE) and drops in muscle strength in the final sets of exercise, without, however, promoting a direct increase in maximum strength indicators, which suggests that its action is more related to the maintenance of performance than to the immediate gain of power (Fambrini, 2022).

In addition, the results showed that ATP supplementation favored more positive affective responses during exercise, indicating greater pleasure and less discomfort during practice, which can positively impact adherence to training and, indirectly, the continuity of the weight loss process and improvement of body composition (Araújo, 2020).

These findings highlight that both creatine and ATP, when used strategically and monitored, can contribute significantly to the improvement of physical performance, especially in protocols aimed at weight loss with preservation of lean mass, being, therefore, supplements with greater support in the scientific literature compared to other substances with still controversial efficacy (Fambrini, 2022).

THERMOGENICS AND THEIR HEALTH RISKS

Thermogenic supplements are among the most sought after by people who want to lose weight quickly, being widely advertised as metabolism accelerators and fat oxidation promoters, however, many of these products contain stimulant substances that act directly on the central nervous system, which can trigger worrying side effects, especially when used without proper prescription or for prolonged periods (Silva et al., 2019).

Substances such as ephedrine, caffeine in high doses and 1,3-dimethylamylamine, commonly found in compounded thermogenic supplements, are responsible for increasing alertness, reducing the perception of fatigue and stimulating lipolysis, however, these same properties can cause adverse reactions such as tachycardia, high blood pressure, insomnia, anxiety and, in extreme cases, cardiac arrhythmias and risk of sudden death (Silva et al., 2019).

Although caffeine, in isolation, presents beneficial effects when administered in a controlled manner, its action is highly individualized, and the effects vary according to the sensitivity of each organism, and it is possible to observe intolerance even with moderate doses, which justifies the need for prior tests and professional follow-up before including this compound in any supplementation plan (Silva et al., 2019).

One of the most popular compounds among thermogenics is L-Carnitine, whose action on lipid oxidation has been widely studied, although there is still no consistent evidence about its direct effectiveness in weight loss, in addition, the literature points out that, when consumed in high doses or by individuals with metabolic dysfunctions, it can trigger effects such as nausea, gastrointestinal discomfort and increased TMAO production, a metabolite associated with cardiovascular risk (Costa et al., 2012).

In addition to the physiological adverse effects, it is important to highlight the behavioral risk related to the use of thermogenics, as many individuals believe that the ingestion of these substances is sufficient to achieve weight loss, neglecting the importance of a balanced diet, regular physical exercise, and adequate rest, which compromises health in general and perpetuates ineffective and potentially dangerous practices (Silva et al., 2019).

The popularization of thermogenics in the domestic market is driven by marketing campaigns that associate their effects with rapid and expressive results in body aesthetics, however, these messages rarely mention the risks involved, which contributes to the indiscriminate use of the products, including by adolescents and people with a history of chronic diseases, increasing the need for stricter regulation and inspection (Brasil, 2010).

It is relevant to note that thermogenic supplements can also cause rebound effects, that is, a slowdown in metabolism after the end of use, which favors later weight gain and makes the weight loss process even more difficult to maintain, creating a vicious cycle of continuous use, frustration with the results and return to old eating patterns (Silva et al., 2019).

Also, studies show that many supplements marketed as thermogenics contain substances not declared on the labels, including synthetic ingredients with intense stimulating action, which increases the risk of liver toxicity and unpredictable adverse reactions, especially in people who already use other medications or have undiagnosed clinical conditions (Silva et al., 2019).

The performance of agencies such as ANVISA is essential to ensure the quality and safety of the products available on the market, and it is the responsibility of health professionals to guide their patients regarding the origin of the compounded supplements, the need for periodic laboratory analyses and the importance of avoiding self-medication, even in the face of easy access to products through the internet and compounding pharmacies (Brasil, 2010).

Therefore, although thermogenic supplements may have specific effects on metabolic acceleration and lipolysis, their use must be carefully evaluated within an individualized context, considering cardiovascular, neurophysiological, and behavioral risks, and reinforcing that true metabolic transformation is built with constancy, dietary balance, structured training, and professional monitoring (Silva et al., 2019).

CONSIDERATIONS ON BIOLOGICAL INDIVIDUALITY AND SAFETY IN USE

The body's response to manipulated supplementation varies significantly among individuals, being influenced by factors such as age, sex, body composition, genetics, health status and level of physical training, so any protocol for the use of these substances must take into account biological individuality, as what is effective and safe for one person may not produce the same effect or even generate adverse reactions in another (Silva et al., 2019).

The absorption, metabolism and excretion of the compounds present in supplements are directly related to the body's ability to process and use these substances, which can be compromised by pre-existing conditions such as liver, kidney, endocrinological or metabolic dysfunctions, making it essential to carry out clinical and laboratory tests before starting any supplementation, especially when manipulated (Costa et al., 2012).

Safety in the use of compounded supplements is also directly linked to the origin of the products, the quality of the raw materials and the rigor in the manipulation, and it is essential that pharmacies are properly regularized, with quality control, traceability of batches and technical responsibility, as cross-contamination, dosage error or lack of purity of the ingredients can compromise the health of the consumer (Brasil, 2010).

Adequate dosage is another important aspect to ensure the benefits of supplementation, as both excess and deficiency in the intake of certain compounds can generate physiological imbalances, and many unwanted effects reported in the literature result from empirical use or based on information of dubious origin, such as internet forums or informal indications (Silva et al., 2019).

Guidance by qualified professionals, such as nutritionists, physicians and pharmacists, is the basis for a safe and effective conduct in the use of compounded supplements, as only these professionals have the necessary training to interpret exams, evaluate clinical history and prescribe compounds in a way that is consistent with the individual's goals and needs, avoiding unnecessary risks and ensuring the optimization of results (Costa et al., 2012).

In addition to clinical follow-up, the individual must be aware that supplementation does not replace healthy habits and that, alone, it is not capable of producing significant transformations in body composition or physical performance, being a complementary resource that must be inserted in a larger plan, which involves a balanced diet, regular physical activity, stress control and quality sleep (Silva et al., 2019).

The construction of a healthy and functional body requires time, discipline and consistency, factors that cannot be artificially accelerated without risks, and it is essential to demystify the idea of immediate solutions promoted by supplements, especially compounded ones, which carry with them an aura of exclusivity and personalization, but which, if used without criteria, can pose serious threats to health (Costa et al., 2012).

In the sports environment, it is common to find athletes and bodybuilders who use several formulas manipulated simultaneously, often without knowledge of the combined effects between the active ingredients, which increases the risks and makes it difficult to track adverse effects, in addition to compromising the metabolic balance of the body, which starts to operate under an excessive load of chemical stimuli (Silva et al., 2019).

Therefore, health education should be part of the process of prescribing and monitoring supplementation, allowing the individual to understand the mechanisms of action of the compounds, the expected benefits, the potential risks and the warning signs that require suspension of use or review of the adopted strategy, thus building a safer, more

responsible and conscious relationship with the manipulated resources (Costa et al., 2012).

METHODOLOGY

This study was developed through a narrative review of the literature, with the objective of understanding the effects of manipulated supplementation on metabolic performance and weight loss processes, gathering and analyzing scientific evidence published in recent years, in order to offer a critical and in-depth view of the main compounds used, their promises and associated risks.

The choice of the narrative review as a methodological design is due to its flexibility in data collection and analysis, allowing the gathering of information from different types of studies, with varying levels of evidence, which makes it possible to explore in greater depth the physiological, clinical and social aspects related to the use of manipulated supplements in different contexts (Costa et al., 2012).

The PubMed, SciELO, Google Scholar, Virtual Health Library (VHL), and ResearchGate databases were used as research sources, considering publications in Portuguese and English, and prioritizing studies focused on L-Carnitine supplementation, CLA, creatine, ATP, and manipulated thermogenic compounds.

The inclusion criteria adopted for the selection of studies involved the relevance of the theme, the presence of results related to physical performance and weight loss, clarity in the presentation of data and the availability of full texts, with duplicate articles, publications with inconsistent methodology or lack of discussion about the mechanisms of action of the substances analyzed being excluded (Costa et al., 2012).

The analysis of the collected material was done qualitatively, through a careful and interpretative reading of the texts, seeking to identify convergences and divergences in the scientific findings on the effects of manipulated supplementation, highlighting the reported benefits, possible adverse effects, and limitations of studies that support the use of these substances in nutritional and sports protocols (Silva et al., 2019).

It was also decided to include studies that question the efficacy of certain compounded compounds, in order to ensure impartiality to the analysis and allow a more comprehensive evaluation of existing controversies, since the discourse on supplements, especially in non-academic environments, is often biased by commercial interests or popular beliefs that have not been scientifically validated.

In addition, health legislation and guidelines issued by agencies such as ANVISA were consulted, in order to contextualize the use of compounded supplements in Brazil,

considering the legal requirements for commercialization, the safety of the products and the need for prescription by a qualified professional, points that directly interfere with the quality of the results achieved with these substances (Brasil, 2010).

The methodology adopted allowed the study to reach a general, but critical, overview of the main compounded supplements used for weight loss and metabolic performance improvement, highlighting both the advances in research and the gaps that still exist, which need to be filled by future investigations with greater methodological control and representative samples (Silva et al., 2019).

RESULTS AND DISCUSSION

The studies analyzed revealed that the efficacy of manipulated supplementation in weight loss and metabolic performance depends directly on the substance used, the dose administered, the exercise routine and the individual profile of each user, with creatine being one of the few substances with ample scientific proof about the increase in strength, endurance and physical performance in high-intensity and short-term activities (Araújo, 2020).

The use of creatine promoted an increase in muscle mass in bodybuilders who followed protocols with post- or pre-workout supplementation, with similar results in both groups, showing that the ergogenic effect of the substance is more related to its regular presence in the body than to the exact moment of ingestion, highlighting the fact that positive effects were observed even without initial saturation (Araújo, 2020).

Similar results were observed in studies with ATP supplementation, which demonstrated improved resistance to fatigue, reduced subjective perception of exertion and maintenance of strength throughout resistance training, suggesting that ATP can be an effective resource to increase training volume, an important factor for those seeking weight loss and increased total energy expenditure during exercise (Fambrini, 2022).

On the other hand, data regarding the use of L-Carnitine and CLA were less consistent, with many studies showing no significant effect on body fat loss when these substances were administered alone, even with dietary control and regular physical exercise, which indicates that their use as the only weight loss strategy does not find solid support in the literature.

In addition to limited efficacy, CLA has been associated with metabolic side effects in individuals with metabolic syndrome, such as increased insulin resistance, elevated fasting blood glucose, and reduced HDL-cholesterol, raising concerns about the safety of its long-

term use, especially in patients with a history of glycemic abnormalities or a predisposition to cardiovascular disease.

As for thermogenic supplements, it was observed that their action on lipid metabolism is often attributed to stimulating compounds, such as caffeine, which can promote increased caloric expenditure and reduced fatigue during training, however, these effects are accompanied by risks, such as tachycardia, insomnia and increased blood pressure, especially in sensitive individuals or those who already have some degree of cardiovascular alteration (Silva et al., 2019).

The literature also warns of the lack of standardization of compounded formulas, which compromises the reproducibility of the results and increases the possibility of adverse reactions, since different pharmacies may use varying concentrations of the same compounds, in addition to the possibility of combination with other substances with synergistic or antagonistic action, making it difficult to clinically evaluate the efficacy of each active ingredient alone (Brazil, 2010).

The indiscriminate use of compounded supplements was another recurrent factor in the studies reviewed, showing that many consumers use these substances based on informal guidance or without professional monitoring, which in addition to compromising the expected results, significantly increases the risks of unwanted effects, generating a false sense of security because they are legally marketed products (Silva et al., 2019).

Despite some promising evidence, especially with creatine and ATP, the authors are unanimous in stating that manipulated supplementation only produces satisfactory results when it is inserted in a context of global intervention, which involves a balanced diet, regular exercise, sleep quality, and constant professional monitoring, being ineffective or even harmful when used as a substitute for these practices (Costa et al., 2012).

Thus, the results of the present review indicate that, although some manipulated substances have positive effects on performance and body composition, their efficacy depends on multiple variables and their use should be carried out with extreme caution, respecting biological individuality, the clinical context, and the principles of responsible prescription, to avoid unnecessary risks and achieve real and sustainable benefits (Silva et al., 2019).

FINAL CONSIDERATIONS

The analysis of the use of manipulated supplementation showed that, although this resource has become widely popular among people seeking weight loss and improved

metabolic performance, its results still depend on numerous factors associated with biological individuality, training routine, diet, and adequate professional monitoring.

It has been found that compounded supplements are often used with high expectations, often fueled by promises of quick and expressive results, however, the actual impact of these substances on the body varies widely and does not always correspond to the expectations projected by the market or by isolated experiences of other users.

Among the substances evaluated, creatine and ATP demonstrated greater consistency in terms of efficacy and safety, especially when inserted in well-structured training protocols, allowing gains in endurance, strength, and muscle recovery, aspects that can indirectly contribute to sustainable weight loss.

On the other hand, compounds such as L-Carnitine and CLA presented limited evidence regarding the reduction of body fat, and their efficacy depends on other factors, such as diet control and regular physical exercise, in addition to being associated, in some cases, with possible metabolic adverse effects that require caution.

In the case of thermogenics, it was evident that the risks outweigh the benefits in certain situations, especially due to the potential to cause adverse reactions in the cardiovascular and central nervous systems, and it is necessary to establish strict limits for their use, in addition to reinforcing the need for individualized professional prescription.

The absence of standardization in the compounded formulas, associated with the facilitated commercialization of these products, contributes to a scenario of indiscriminate use, which disregards technical criteria, weakens consumer safety, and hinders the traceability of effects, both positive and negative.

This context highlights the importance of health education and the performance of trained professionals, capable of guiding the patient in an ethical and reasoned manner, promoting the conscious use of available resources and avoiding practices that may put health at risk in the name of immediate results.

Manipulated supplementation should not be seen as an isolated solution for weight loss or performance improvement, but rather as a complementary tool that can, when well used, enhance results within a broad and well-structured plan of lifestyle changes.

The construction of real and lasting results depends, above all, on constancy, discipline, and the understanding that the process of body transformation requires time, care, and respect for individual limits, and it is counterproductive to seek shortcuts without the proper scientific basis and professional monitoring.

Thus, it is concluded that manipulated supplementation has the potential to contribute to performance and weight loss in some specific contexts, as long as its use is

based on technical criteria, guided by qualified professionals, and aligned with healthy and sustainable self-care practices.

REFERENCES

1. Araújo, A. de P. C. (2020). *The importance of creatine for muscle endurance and performance exercises*. Centro Universitário UNIESP. https://www.iesp.edu.br

2. Brazil. Agência Nacional de Vigilância Sanitária – ANVISA. (2010). *Alimentos complementares: Requisitos sanitários*. Ministério da Saúde. https://www.gov.br/anvisa

3. Costa, N. M., Raizel, R., Santini, E., & Reis Filho, A. D. dos. (2012). Suplementos alimentares para perda de peso: Eficácia questionável. *Revista Brasileira de Nutrição Esportiva, 6*(31), 25–32. http://www.rbne.com.br

4. Fambrini, D. L. (2022). *Efeito agudo da suplementação oral de trifosfato de adenosina (ATP) no desempenho muscular e respostas psicofisiológicas em adultos* [Dissertação de mestrado, Universidade Estadual do Norte do Paraná]. Repositório Institucional da UENP. https://uenp.edu.br

5. Ferreira, A. M. D., Ribeiro, B. G., & Soares, E. de A. (2001). Consumo de carboidratos e lipídios no desempenho de exercícios de ultra-resistência. *Revista Brasileira de Medicina do Esporte, 7*(2), 67–76. https://doi.org/10.1590/S1517-86922001000200005

6. Silva, M. K., Santos, D. dos, & Oliveira, D. M. de. (2019). Os suplementos termogênicos reduzem peso ou prejudicam a saúde? *Salusvita, 38*(1), 213–223. https://secure.unisagrado.edu.br