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Whey Versus Casein Supplementation in Physically Active, Healthy Individuals

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Abstract

Purpose: Research shows the benefits of whey isolate protein powder and casein protein powder supplementation in regard to body composition and resting metabolic rate; however, minimal research exists comparing the effectiveness of whey to casein supplementation. **Methods**: Eighteen (18) physically trained, healthy individuals (23±3.1 yrs.; 171.7cm; 12 males; 6 females) completed a randomized two condition [Combat 100% Isolate (Whey) versus Combat 100% (Casein)] by two time point [Pre-, Post-] intervention. The intervention consisted of subjects supplementing on either whey or casein in conjunction with resistance training over an 8-week period. Pre and post testing included % body fat and metabolic rate. **Results**: A 2x2, repeated-measures analysis of variance (ANOVA) demonstrated non-significant ($p \geq 0.05$) effects on changes in % body fat and resting metabolic rate following the 8-week intervention. **Conclusions**: The data concludes no differences in the effects of whey versus casein protein supplementation in physically active, healthy individuals

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ABSTRACT

Purpose: Research shows the benefits of whey isolate protein powder and casein protein powder supplementation in regard to body composition and resting metabolic rate; however, minimal research exists comparing the effectiveness of whey to casein supplementation. **Methods**: Eighteen (18) physically trained, healthy individuals (23±3.1 yrs.; 171.7cm; 12 males; 6 females) completed a randomized two condition [Combat 100% Isolate (Whey) versus Combat 100% (Casein)] by two time point [Pre-, Post-] intervention. The intervention consisted of subjects supplementing on either whey or casein in conjunction with resistance training over an 8-week period. Pre and post testing included % body fat and metabolic rate. **Results**: A 2x2, repeated-measures analysis of variance (ANOVA) demonstrated non-significant ($p \geq 0.05$) effects on changes in % body fat and resting metabolic rate following the 8-week intervention. **Conclusions**: The data concludes no differences in the effects of whey versus casein protein supplementation in physically active, healthy individuals.

Key Words: protein, body composition, metabolism

INTRODUCTION

Protein is essential for a variety of physiological processes including recovery, metabolism, structure[1]. Amino acids are the building blocks of protein. They are linked together in polypeptides to form protein molecules and are described as the foundation of muscle.[1,2] The muscle activates during resistance exercise by micro-tearing in the muscle fiber. As a result, signals are then sent for muscle protein synthesis (MPS).[1] Whey (WH) and casein (CAS) protein are deduced from milk though the amino acid and accessibility is different regarding absorption rate, order, and timing once it is consumed.[1] Previous studies have shown protein consumption before and after exercise can aid in efficient MPS.[1,2,3] Sedentary populations and non-athletes typically have a diet lower in protein when compared to athletes.[2] Research has shown that athletes consume approximately one to two times the recommended daily allowance of protein.[2,3] The source of protein is important to consider due to variations in quality, as protein sources, amino acid contents, and grams differ between products.[2] Previous research demonstrated that athletes must consume an optimal amount of protein with proper timing to reap the benefits of body composition, resting metabolic rate (RMR), recovery, and performance improvements[4]. Many athletes use supplementation to meet their daily protein needs. For example, supplementation is considered beneficial for professional athletes who endure numerous training sessions throughout the week with limited time to eat whole, balanced meals.[5]

Recent literature shows that WH and CAS has the best bioavailability when compared to other protein sources.[3] High protein diets may lead to increased muscle mass, especially in combination with resistance training.[2] Caloric restrictive diets have shown to reduce lean body mass as they may be deficient in protein.[6] It has been found that older professional athletes (30+ years) are susceptible to sarcopenia or age-related muscle loss.[6] Protein consumption with an accentuation on WH have shown to aid in the management of age-related and caloric restrictive muscle loss.[6] A previous study found CAS protein to be beneficial for male runners placed on carbohydrate-restricted diets as it increases glycemia but did not benefit male or female cyclists.[7] Both WH and CAS are considered safe and do not compromise the intestine microbiota in regards to body composition.[8] Milk has two fractions of protein, both WH and CAS. In previous studies, almost 20% of the protein found in milk is WH protein.[3,9] WH protein is considered a fast protein since it is water-soluble and is digested in the body quickly.[2,3] Previous research demonstrated the amino acids in WH protein are expedited in large amounts once an individual has consumed the product.[1,2,3] Otherwise, CAS is considered a slower protein due to its bioavailability and absorption rate.[2,3] CAS proteins are water-insoluble and coagulate; this results in the timing of the amino acid release to be considerably slower when compared to WH and remains in the body for an extended period of time.[2,3]

WH and CAS differences between fast and slow absorbing could affect body composition and resting metabolic rate (RMR) in response to physical training.[10] WH protein has shown better results compared to other proteins on the market, including soy protein supplementation.[11] Previous research demonstrated that WH supplementation stimulated muscle protein synthesis (MPS) greater than soy after resistance exercises.[11] The high leucine and other branch-chain amino acid (BCAA) content, including the fast digestion rate, could contribute to these results.[6] However, it is recommended that endurance athletes, below the average muscle mass, supplement with CAS protein based on previous studies.[12] Eight weeks of CAS protein supplementation in male soccer players has shown slight improvements in lean body mass (LBM).[12] Previous studies have also shown that protein supplementation can increase LBM and RMR.[1,5,6,14] Most research investigates sedentary adults, and there is limited research on the impacts of protein supplementation on physically trained, healthy individuals.[13] Therefore, we propose the current research to examine the differences of CAS or WH on body composition in physically trained adults. We hypothesize that WH will demonstrate greater improvements in body composition.

METHODOLOGY

Eighteen physically trained, healthy college-aged individuals (12 males; 6 females; age 23±3.1 yrs.; height 171.7cm;) completed a randomized, two conditions [Combat™ 100% Isolate (WH) versus Combat 100% (CAS)] by two-time point [Pre-, Post-] intervention. The subjects were recruited from both undergraduate and graduate program studies. Inclusion criteria included those who are physically active and resistance train at least three days per week for the last 2 months. Exclusion criteria included those who are not physically active, limited due to injury, and allergic to milk-based products. The intervention consisted of subjects supplementing only WH or CAS while completing a periodized-resistance training program over eight weeks. Subjects performed resistance training 3x per week, total-body workouts including squats, bench press, bent over rows, and deadlifts separated by 48 hours. The same exercises were performed for each of the training sessions. Subjects were provided rep schemes and were instructed to self-select intensities based on individual preference. Protein consumption included 60 grams per day (30 g morning and 30 g evening, prior to training on designated days). Participants were instructed to maintain current diet and log all food-intake via. Myfitnesspal App. Subjects were randomized and counterbalanced into a between-subjects study of either WH or CAS. Pre and post variables tested were weight and body fat percentage (BF%) utilizing a Bod Pod® (Cosmed, USA) and resting metabolic

rate (REE) using a Metabolic Cart (Parvomedics Inc., USA). Bod Pod testing requires subjects to sit in the chamber and be tested 2-3 times for the most accurate body composition. REE testing requires subjects to lie in the supine position for 20 minutes, while data is collected from the last 10 minutes of the testing procedure. Subjects reported to the laboratory for testing sessions between 0700 and 0900 hours in a fasted state (12 hours). The current study was approved by the University's Institutional Review Board and all subjects signed an informed consent.

RESULTS

A 2x2, repeated-measures analysis of variance (ANOVA) demonstrated non-significant ($p = 0.76$) effects on BF% (15.4±7.0 %. Whey pre-, 15.2±7.2 %. Whey post- vs. 20.4±10.9 %. Casein pre-, 20.9±11.0 % Casein post-). Analysis also demonstrated nonsignificant ($p = 0.34$) effects on REE (1994.4±239.8 kcal. Whey pre-, 1956.0±241.0 kcal. Whey post- vs. 1600.1±249.3 kcal. Casein pre-, 1626.4±218.6 kcal Casein post-) (See Table 1).

Table 1. Pre and post results (Mean±SD) for weight, body fat%, and REE

	Weight (kg)		BF (%)		REE (kcal)	
	PRE	POST	PRE	POST	PRE	POST
Whey n=9:	81.1±9.2	81.7±8.8	15.4±7.0	15.2±7.2	1994.4±239.8	1956.0±241.0
Casein n=9:	73.5±12.9	74.5±16.8	20.4±10.9	20.9±11.0	1600.1±249.3	1626.4±218.6

*Denotes significant differences between conditions ($p \leq 0.05$).

DISCUSSION

Contrary to the stated hypothesis, it was found that WH protein consumption did not significantly affect body composition or RMR when compared to CAS. Previous research on CAS and WH protein has shown that both proteins may increase post-exercise RMR.[1]. In a previous study, the increases in RMR results may be a result of post-exercise oxygen consumption (EPOC) due to the proximity of post-exercise testing, and the subjects may report higher levels of RMR than they would post-exercise, which is different compared to current research as the subjects were tested before and after intervention.[10] Previous research investigated the effects of both CAS and WH on body composition.[1] The previous research found significant decreases in BF% in addition to increases in lean body mass (LBM) and a reduction of fat mass.[1] The results of the previously mentioned study may have varied due to the use of DEXA or the strength and conditioning program utilized when compared to current research. A review of the evidence from controlled clinical trials stated that there is no transparent verification of increases in thermogenesis which would improve body composition when comparing CAS to WH; this is aligned with the current research.[15] WH protein shows increases in LBM while decreasing fat mass found in a previous study. The results may be due to the intervention length or subject populations used as it differed from current research.[16]

Contrary to what was found in our study, CAS demonstrated significant increases in LBM, decreased fat mass, and body fat percentage after 12 weeks in overweight police officers.[14] The previous study used tactical subjects and skinfolds for BF%, whereas our research had active subjects and used a more reliable form of measuring BF% with the Bod Pod®. The current study utilized 60 grams (g) of protein daily; one inquiry that might emerge is if the additional protein could create positive outcomes in LBM. After six weeks in a pilot study that compared WH and rice protein, significant findings were reported in mixed martial artists after using 75g of WH protein per day.[5] Timing of supplementation is a significant factor to consider for desired adaptations. Previous research has demonstrated and utilized a different time approach than our study with only CAS protein.

Two supplementation timing methods used on 14 healthy untrained subjects were as follows. In the Time-Focused Supplement, (TFR) regimen, subjects take supplements in the morning and evening before training. The timeshare replacement regimen (TDR) includes one dose in the morning and the second 5 hours after exercise in the evening.[17] The daily dose of the supplement contains approximately 70 grams of protein (82 grams) and less than one gram of carbohydrates and fat.[17] TDR increases LBM compared to TFR.[17] The previous research is aligned with the current research as this study utilized the TFR regiment, which could have affected the results, although the subjects differed between previous and current research.

Lastly, a previous study investigated the impacts of CAS or WH protein supplementation pre-sleep on morning RMR and exercise performance with physically active women.[18] The results in the previous study favored a high dosage of 48g CAS pre-sleep supplementation as it was shown to likely increase morning RMR.[18] The results were not the same as current research

due to the testing methodology as the focus of current research was not investigating pre-sleep protein, and RMR testing was conducted during the day compared to previous research that tested subjects in the morning.

CONCLUSION

The results of the current study have shown no difference between WH and CAS protein after an eight-week exercise intervention on body composition or RMR in a physically active population. Future research is warranted, as this current study has limitations including control groups, hydration status, and generalization to the other populations.

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