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## **ABSTRACT:**

**PURPOSE:** To compare the timing of creatine monohydrate supplementation in isometric strength in male college soccer players.

METHODS: Fifteen male college soccer players were supplemented with creatine monohydrate for 26 days with a load phase (5 days 20 g creatine/d) and a maintenance phase (21 days 5 g creatine/d). In the maintenance phase subjects were assigned, in a randomized and double blind form, to either consume 5 g of creatine before training and 5 g of altodextrin after training (CRB) or 5 g of maltodextrin before training and 5 g of creatine after training (CRA) diluted in flavored water. At the same time a physical conditionin rogram was carried out (resistance training + soccer training 2 d/week; soccer training only 3 d/week). Before and after intervention, players were evaluated trough dynamometry to evaluate isometric strength in arm, back, legs and forearms. Similarly, nutritional intake was evaluated (before and after) through 24H recalls. The strength and nutritional variables were compared by group (CRB vs CRA) and by time (PRE vs POST).

RESULTS: There were no significant differences in strength variables between groups at the beginning or at the end of the study. However, CRB group had a significant increase in leg strength at the end of the study. The CRA group also had significant changes at the end of the study; an increase in back strength and leg strength was observed (Table 1). No other strength variable had significant changes. In the nutritional variables, there were no significant differences between groups at the beginning or at the end of the study. Nonetheless, CRA group showed a significant decrease in energy and total protein intake (Table 1).

**CONCLUSIONS:** The results of this study suggest that consuming creatine monohydrate after training could be related with an increase in back and leg isometric strength, onsidering that energy intake and protein intake for these players decreased and they still had a significant increase in strength.

## INTRODUCTION

Creatine supplementation has become popular among athletes as an ergogenic aid. Many studies have shown that creatine can improve exercise performance and improve training conditioning<sup>1</sup>. Creatine has been commonly used by athletes in high-intensity intermittent sports, such as soccer, due to studies consistently showing to increase performance in these type of sports<sup>2</sup>. Even though creatine is probably the most studied supplement for improving athletes' performance, it is still uncertain whether creatine supplementation before or after training is most effective<sup>3,4</sup>. The purpose of this study was to compare the effects of the supplementation timing with creatine monohydrate in isometric strength in university soccer players.

## METHODS

## Subjects

We evaluated 15 college male soccer players (age 21 ±1.4 y, weight 67.0 ±11.0 kg, height 173 ±5.6 cm, BMI 22 ±3.6 [kg/m<sup>2</sup>]).

### Nutrition

Nutritional intake was evaluated at the beginning and at the end of the study through 24-h dietary recalls. We estimated energy (kcal), protein (PRO), carbohydrates (CHO), and fat intake, all in grams.

### Strength

Before and after the supplementation and conditioning program, players were evaluated trough dynamometry to evaluate the strength in arms, back, legs and forearms. A physical conditioning program was carried out in which 2 days per week players had a strength training for 60 minutes + 120 minutes of their regular training, and 3 days per week they trained 120 minutes of their usual training.

# **CREATINE MONOHYDRATE SUPPLEMENTATION AFTER TRAININGS INCREASES ISOMETRIC STRENGTH IN MALE COLLEGE SOCCER PLAYERS**

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### **Creatine Supplementation**

The athletes were supplemented with 20 g of creatine for the first five days. For the next 21 days, they were assigned, in a randomized, counterbalanced and double blind form, to either consume 5 g of creatine before training and 5 g of maltodextrin after training (CRB) or 5 g of maltodextrin before training and 5 g of creatine after training (CRA) diluted in 200 ml of flavored water. The days without training, subjects ingested 5 g of creatine at any moment of the day.

### Statistical analysis

The nutritional and strength variables were compared between groups (CRB and CRA) and at the beginning and at the end of the study. Independent variables were analyzed with either t-student test or U-MannWhitney test. Dependent variables were analyzed with either t-paired test or Wilcoxon test. All of the variables were deemed significantly different at a level of  $p \le 0.05$ .

## RESULTS

Both CRB and CRA groups showed a significant increase in leg strength at the end of the study (Table 1). Conversely, only CRA group showed a significant increase in back strength. The other measures did not change by time, and were not significantly different by group at any moment (Table 1). There were no significant differences for nutrient intake between groups at any moment. However, CRA group significantly decreased their energy and protein consumption at the end of the study (Table 2). The other nutrients showed no significant changes through time, and some showed a trend for significant differences(p<0.1) (Table 2).

**Table 1.** Strength variables compared between groups, and between baseline and final evaluations.

Strength	Baseline			Final			n	2
	CRB	CRA	<b>p</b> (CRB vs CRA)	CRB	CRA	<b>p</b> (CRB vs CRA)	۲ (CRB by time)	P (CRA by time)
Arms	37.0 ±4	35.0 ± 4	0.49	37.7 ± 3	35.6 ± 4	0.50	0.42	0.68
Back	98.7 ± 19	93.1 ± 14	0.55	97.5 ± 18	102.3 ± 13	0.58	0.75	0.05
Legs	85.0 ± 16	85.4 ± 12	0.88	104.2 ± 17	100.0 ± 7	0.60	0.04	0.02
R Forearm	43.3 ± 8	44.0 ± 6	0.86	42.6 ± 6	41.7 ± 6	0.80	0.62	0.28
L Forearm	41.6 ± 7	40.2 ± 7	0.73	41.3 ± 6	39.3 ± 6	0.31	0.68	0.72

Nutrition	Baseline				р	р		
	CRB	CRA	<b>p</b> (CRB vs CRA)	CRB	CRA	<b>p</b> (CRB vs CRA)	(CRB by time)	(CRA by time)
Kcal	3312 ± 1137	3541 ± 783	0.65	2558 ± 428	2793 ± 813	0.51	0.10	0.02
CHO (g)	479.0 ± 181	443.3 ± 86	0.64	359.4 ± 85	344.6 ± 79	0.73	0.09	0.07
PRO (g)	94.0 ± 41	122.8 ± 60	0.65	64.2 ± 19	95 ± 64	0.86	0.55	0.05
FAT (g)	154.9 ± 57	167.1 ± 46	0.26	135.4 ± 41	131.9 ± 32	0.23	0.07	0.10
CHO (g/kg)	7.1 ± 3	6.6 ± 2	0.69	5.4 ± 2	5.0 ± 1	0.68	0.10	0.10
PRO (g/kg)	1.4 ± 1	1.9 ± 1	0.79	0.9 ± 0.3	1.4 ± 1	0.94	0.49	0.07
FAT (g/kg)	2.3 ± 1	2.5 ± 1	0.33	2 ± 0.5	1.9 ± 1	0.56	0.07	0.10

CHO: Carbohydrates; CRB: Creatine before exercise; CRA: Creatine after exercise; PRO: Protein.

## CONCLUSIONS

The results of this study suggest that consuming creatine monohydrate after training may be related with an increase in back and leg strength, considering that energy and protein intake for these players decreased and they still had a significant increase in strength.

## REFERENCES

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