



## Effect of CoQ10 on Anaerobic Performance in Elite Wrestlers

Mohsen Ebrahimi & Mehdi Rezanejad Ladary

To cite this article: Mohsen Ebrahimi & Mehdi Rezanejad Ladary (2016) Effect of CoQ10 on Anaerobic Performance in Elite Wrestlers, International Journal of Wrestling Science, 6:2, 86-89, DOI: [10.1080/21615667.2016.1278489](https://doi.org/10.1080/21615667.2016.1278489)

To link to this article: <https://doi.org/10.1080/21615667.2016.1278489>



Published online: 22 Jun 2017.



Submit your article to this journal [↗](#)



Article views: 47



View related articles [↗](#)



View Crossmark data [↗](#)

# Effect of CoQ10 on Anaerobic Performance in Elite Wrestlers

Mohsen Ebrahimi<sup>1</sup> and Mehdi Rezanejad Ladary<sup>1</sup>

**ABSTRACT.** This study aimed at investigating the effect of a single dose of Coenzyme Q10 (CoQ10), also known as ubiquinone, on anaerobic power, agility, speed, muscular strength, and muscular endurance in professional freestyle wrestlers. A total of 14 elite wrestlers (age:  $20.36 \pm 3.00$  years; weight:  $73.43 \pm 11.58$  kg; height:  $1.71 \pm 0.05$  m; and body mass index:  $24.93 \pm 2.68$  kg/m<sup>2</sup>) of Babol Township were recruited as subjects. The subjects were randomly divided into two groups ( $n = 7$ ). Both groups consumed CoQ10 (200 mg) or placebo (starch) in the form of capsules using a double-blind, counterbalanced crossover design with a week interval. Two hours following consumption of the capsules, the following tests were conducted: handgrip dynamometer, chin up, Illinois Agility Run Test, 35-meter run, and the Running-Based Anaerobic Sprint Test (RAST). Results were indicative of significant improvements in speed ( $p = .016$ ), agility ( $p = .032$ ), average anaerobic power ( $p = .048$ ), and minimum anaerobic power ( $p = .044$ ). However, no significant changes were found in the amount of grip strength ( $p = .449$ ), muscular endurance ( $p = .282$ ), peak anaerobic power ( $p = .096$ ), and fatigue index ( $p = .363$ ). The results of this study showed that acute consumption of CoQ10 supplement can improve some anaerobic performance variables in elite wrestlers.

**Keywords:** nutrition, anaerobic performance, wrestler, CoQ10, ergogenic aid

## INTRODUCTION

Growing advances in sports sciences and the new findings from research have led to an astounding jump in the ability of athletes. Taking findings from sports-science research, including the application of the principles of nutrition and the use of dietary supplements are almost required for success in modern sport. Thus, the majority of professional athletes in various disciplines utilize dietary supplements to maximize their performance (Knapik et al., 2016; Seifbarghi, Halabchi, Mazaheri, & Djafarian, 2015). Recently, Coenzyme Q10 (CoQ10), also known as ubiquinone, has attracted considerable attention as a dietary supplement in combating some of the damages induced by free radicals (Linnane et al., 2002). This substance plays several important roles in the body, including the following: transferring electrons in the mitochondrial respiratory chain;

producing adenosine triphosphate (ATP); supporting the regeneration of other antioxidants; influencing the stability, fluidity, and permeability of cell membranes; and stimulating cell growth and inhibiting its death (Ernster & Dallner, 1995). Given the role of CoQ10 in the electron transport chain and aerobic energy production, its supplementation can enhance aerobic performance. Numerous studies have confirmed this effect (Gharahdaghi, Shabkhiz, Azarboo, & Keyhanian, 2013; Mizuno et al., 2008; Ylikoski, Piirainen, Hanninen, & Penttinen, 1997). On the other hand, there is no clear consensus concerning the effect of CoQ10 on anaerobic performance and short-term activities. In fact, while some researchers have found a positive effect of CoQ10 on anaerobic performance, others were unable to confirm these results. Gökbel, Gül, Belviranl, and Okudan (2010) suggested that 8 weeks of supplementation with CoQ10 may show performance-enhancing effects during the repeated bouts of supramaximal exercise. In another example, Alf, Schmidt, and Siebrecht (2013) demonstrated that CoQ10 supplementation enhances peak power production in trained athletes. Others have seen significant effects of CoQ10 on lower-body muscular strength (Fallah, Alijani, & Rahimi, 2014).

<sup>1</sup>Department of Physical Education and Sports Sciences, Semnan University, Semnan, Iran

Correspondence should be addressed to Mohsen Ebrahimi, Department of Physical Education and Sports Sciences, Semnan University, Semnan, Iran. E-mail: mebrahimi@semnan.ac.ir

A study with soccer players did not show significant improvement of anaerobic performance as a result of CoQ10 supplementation. Four weeks of CoQ10 supplementation was studied, showing that CoQ10 increases aerobic capacity and performance in high-intensity aerobic interval tests and, yet, finding no significant impacts on the power indices (e.g., average and peak power and fatigue index) and maximum speed (Gharahdaghi et al., 2013). Bloomer, Canale, McCarthy, and Farney (2012) observed no effect of CoQ10 on either a graded exercise treadmill test or a repeated cycle sprint test with trained individuals. Due to the limited and inconclusive results of the previous studies on the effects of CoQ10 on agility, muscular strength, endurance, and speed and considering that anaerobic performance plays an important role in wrestling, this study is aimed to evaluate the effects of CoQ10 on the anaerobic performance indices in wrestlers.

## MATERIALS AND METHODS

### Subjects

A total of 14 persons among freestyle elite wrestlers of Babol Township in Iran with at least one of the following experiences were selected: having been invited to a national team camp or having been a participant in a World Championship, Asian Championship, International Cup Championship, or the national (Iran) championship. All of the wrestlers were being trained to be selected for the national team. None of them had consumed sports supplements or drugs nor had any serious injuries in the last 6 months. Characteristics of these subjects are listed in Table 1. This study followed the declaration of Helsinki regarding human subjects, and all subjects signed an informed consent form before participation in the study.

### Experimental Design

This study was done using a double-blind, counterbalanced crossover design. Subjects were randomly divided into two groups of 7 individuals. In the first week, one group consumed CoQ10 supplement and the other a placebo, and then a week later vice versa. The amount of supplement was 200 mg in the form of gel capsules (manufactured by Nutralife Co., a subsidiary of EIG Canada, Toronto, Canada), and the

placebo containing starch was used with the same color, shape, and size. In order to allow for absorption of CoQ10 by the body, the tests were conducted 2 hours after consumption (Cooke et al., 2008). The wrestlers were asked to abstain from consuming meat and fish and to refrain from doing heavy activities at least 24 and 48 hours before the tests, respectively, while continuing routine activity.

### Assessments

After 10 minutes of light warm-up, strength was measured with a hydraulic grip dynamometer (Saehan Corporation, Model SH5001, Yangdeok\_Dong, Masan, South Korea) using the highest value attained from three trials using the dominant hand. Then, a chin-up test was performed by executing as many repetitions as possible to measure their upper-body muscular endurance. The third test was running a 35-meter sprint to measure speed. The fourth test was the Illinois Agility Run to evaluate agility. The final test was the Running-Based Anaerobic Sprint Test (RAST), which is a series of six 35-meter sprints with a 10-second rest between each sprint. The times for each sprint, along with the wrestler's body weight are then used to calculate total power, maximal power, minimal power, and power decline. The rest interval between the tests was approximately 10 minutes; the test conditions were similar in the two measurements and all performance tests were supervised by the same individual, using the test protocols outlined by Mackenzie (2005).

### Statistical Analysis

The Shapiro–Wilk test was used to assess normality of data distribution for each variable. Also, paired *t* tests and Wilcoxon tests at  $p \leq .05$  were applied to analyze the data.

## RESULTS

The results from the five tests performed under the conditions of ingestion of CoQ10 or placebo are shown in Table 2. Application of the Shapiro–Wilk test showed that the data for the chin up test, fatigue index, and peak power were not normally distributed; therefore, the Wilcoxon test was used in the analysis of these variables. There were significant differences found in test performances with better performances shown in speed from the 35-meter sprint ( $p = .016$ ), the Illinois Agility Run test ( $p = .032$ ), the RAST mean anaerobic power ( $p = .048$ ), and the RAST minimum anaerobic power ( $p = .044$ ) under CoQ10 when compared with the placebo condition. However, no significant differences were found in the handgrip strength ( $p = .449$ ), the chin-up muscular endurance test ( $p = .282$ ), the RAST peak anaerobic power ( $p = .096$ ), and the RAST fatigue index ( $p = .363$ ).

TABLE 1 Characteristics of the Subjects

	<i>Mean ± SD</i>
Age (year)	20.36 ± 3.00
Weight (Kg)	73.43 ± 11.58
Height (m)	1.71 ± 0.05
BMI (kg/m <sup>2</sup> )	24.93 ± 2.68

TABLE 2 Test Results from Placebo and CoQ10 Supplementation (Mean  $\pm$  SD)

	<i>Placebo</i>	<i>CoQ10</i>	<i>t or Z</i>	<i>p</i>
Handgrip test (kg)	56.80 $\pm$ 8.44	55.80 $\pm$ 8.19	-0.781	.449
Chin-up test (repetitions)	18.57 $\pm$ 10.01	19.86 $\pm$ 7.56	-1.075	.282
35-meter run test (s)	5.57 $\pm$ 0.35	5.34 $\pm$ 0.26	2.763	.016*
Illinois Agility Run test (s)	18.53 $\pm$ 1.06	17.92 $\pm$ 0.73	2.393	.032*
RAST peak power (watts)	510.86 $\pm$ 121.88	554.25 $\pm$ 111.67	-1.664	.096
RAST mean power (watts)	386.92 $\pm$ 75.90	425.39 $\pm$ 71.87	-2.187	.048*
RAST minimum power (watts)	284.41 $\pm$ 61.51	322.11 $\pm$ 61.92	-2.235	.044*
RAST fatigue index (watts/sec)	6.13 $\pm$ 2.85	6.46 $\pm$ 2.53	-0.910	.363

\*Significant differences between placebo and CoQ10 ( $p \leq .05$ ).

## DISCUSSION

In most of the studies on CoQ10, only its long-term effects on muscular concentrations have been studied (Alf et al., 2013; Gökbel et al., 2010; Mizuno et al., 2008). However, in the study by Cooke et al. (2008), muscle CoQ10 concentrations have been shown to be enhanced within 2 hours after its acute consumption (200 mg), while their levels remained higher even after 2 weeks of supplementation compared to the day before supplementation, while the concentrations were reduced at the end of the supplementation period in comparison to 2 hours after acute supplementation.

The results of this investigation revealed that CoQ10 consumption does not improve muscular strength or muscular endurance. This finding is in agreement with the findings of Fallah et al. (2014), indicating a lack of improvement in upper body strength through the ingestion of CoQ10. Additionally, there is agreement with previous research where no significant change was found in muscular endurance during a 50-repetition isokinetic leg-extension test (Cooke et al., 2008).

In the present study, CoQ10 supplementation was associated with a significantly better performance in the 35-meter sprint. In addition, significantly better performance was observed in agility. The current research is the first study to examine the impact of acute CoQ10 supplementation on agility. Hence, no other studies exist to compare with this finding. The changes of both sprint and agility may be due to an increase in ATP and that creatine phosphate resynthesizes via aerobic mechanism.

In this study, CoQ10 caused significant increases in the average and minimum anaerobic power. The results showed a tendency to increase peak power but did not reach a significant level. These findings are incongruent with the results obtained in other studies that reported a lack of anaerobic power improvement after long-term supplementation of CoQ10 (Cooke et al., 2008; Fallah et al., 2014; Gharahdaghi et al., 2013). However, following 8 weeks of supplementation with CoQ10 (100 mg/day), Gökbel et al. (2010) reported a significant increase in the average anaerobic power in the supplementation group at the fifth stage

of the Wingate test in healthy untrained men. A significant enhancement has been shown in power output during an intense cycling test following 2 weeks of consumption of a 100 mg CoQ10 supplement and 5 g of creatine per day in male athletes (Yasukawa et al., 2006). Moreover, Alf et al. (2013) studied the effect of the daily consumption of 300 mg CoQ10 on Olympic athletes for 6 weeks and showed a higher peak power production in the group receiving the supplements compared to the placebo group (Alf et al., 2013). The reason for the changes in the average and minimum anaerobic power in our study may be due to the better recovery and ATP synthesis in the 10-second rest times during the RAST test because of CoQ10 supplementation. CoQ10 supplements have been shown to improve peak performance in repetitive activities (Gökbel et al., 2010). It may be that the reason for the peak anaerobic power that is not significant in this study is the lower dose of the CoQ10 supplement used in the present study.

In the present study, CoQ10 supplements caused no significant changes in the fatigue index; however, it has been shown that, at the end of 8 weeks of supplementation with CoQ10, muscle fatigue occurs in higher workloads in the CoQ10 group (Bonetti, Solito, Carmosino, Bargossi, & Fiorella, 2000). In line with this research, CoQ10 supplements can reduce fatigue and can improve physical performance, and, thus, they suggested CoQ10 supplements may prevent physical fatigue (Mizuno et al., 2008). Perhaps, the difference between the results obtained in this study and those of the previous research is due to the types of tests employed and the fitness levels of their subjects.

Regarding the possible mechanisms associated with CoQ10 effects on muscle performance, it has been suggested that the antioxidant effect of CoQ10 may be involved, and that the increased maximum workload at exhaustion is related to the protective activity of CoQ10 on the muscular membrane (Bonetti et al., 2000). A study has also shown that CoQ10 supplementation can increase the stroke volume, ejection fraction, and cardiac output in chronic heart-failure patients (DiNicolantonio, Bhutani, McCarty, & O'Keefe, 2015); however, there is no study with similar results using athletes. Also, Demirci and Beytut (2014) have indicated that CoQ10 can prevent the

accumulation of lactic acid during the exercise performances of endurance skiing athletes. The CoQ10 effect on lactic-acid accumulation has not been investigated in short-term activities. However, during rest intervals in some tests (e.g., RAST), ATP regeneration and lactate removal via an aerobic system may be improved by CoQ10.

## CONCLUSIONS

The results of this investigation revealed the positive effect of acute consumption of CoQ10 on some physical-fitness indices in elite wrestlers without any side effects. To our knowledge, this is first research that examines the effects of CoQ10 on the exercise performance in wrestlers. A practical application of this study is that wrestlers may use CoQ10 to enhance their anaerobic performance.

## ACKNOWLEDGMENTS

No external funding was used for doing of this study. Herein, it is appreciated to all wrestlers and their coaches (Mahmood Hasannia, Ali Shokripur, and Ali Khorasani) of the city of Babol that have cooperated with the authors in this study.

## REFERENCES

- Alf, D., Schmidt, M. E., & Siebrecht, S. C. (2013). Ubiquinol supplementation enhances peak power production in trained athletes: A double-blind, placebo controlled study. *Journal of the International Society of Sports Nutrition*, 10, 24. doi:10.1186/1550-2783-10-24
- Bloomer, R. J., Canale, R. E., McCarthy, C. G., & Farney, T. M. (2012). Impact of oral ubiquinol on blood oxidative stress and exercise performance. *Oxidative Medicine and Cellular Longevity*, 2012, 465020. doi:10.1155/2012/465020
- Bonetti, A., Solito, F., Carosino, G., Bargossi, A., & Fiorella, P. (2000). Effect of ubidecarenone oral treatment on aerobic power in middle-aged trained subjects. *Journal of Sports Medicine and Physical Fitness*, 40(1), 51–57.
- Cooke, M., Iosia, M., Buford, T., Shelmadine, B., Hudson, G., Kerkisick, C.,... Willoughby, D. (2008). Effects of acute and 14-day coenzyme Q10 supplementation on exercise performance in both trained and untrained individuals. *Journal of the International Society of Sports Nutrition*, 5(1), 1–14.
- Demirci, N., & Beytut, E. (2014). Effects of oral coenzyme Q10 on preventing the accumulation of lactic acid developing during the exercise performances of endurance skiing athletes. *American Journal of Sports Science*, 2(3), 65–70.
- DiNicolantonio, J. J., Bhutani, J., McCarty, M. F., & O'Keefe, J. H. (2015). Coenzyme Q10 for the treatment of heart failure: A review of the literature. *Open Heart*, 2(1), e000326. doi:10.1136/openhrt-2015-000326
- Ernster, L., & Dallner, G. (1995). Biochemical, physiological and medical aspects of ubiquinone function. *Biochimica et Biophysica Acta (BBA)-Molecular Basis of Disease*, 1271(1), 195–204.
- Fallah, F., Alijani, E., & Rahimi, A. (2014). The effect of short-time supplementation with Vitamin E and Q10 coenzyme on maximum strength, flexibility and power in 15–17 years old female Kumite Karateka. *European Journal of Experimental Biology*, 4(3), 176–181.
- Gharahdaghi, N., Shabkhiz, F., Azarboo, E., & Keyhanian, A. (2013). The effects of daily coenzyme Q10 supplementation on VO<sub>2</sub>max, vVO<sub>2</sub>max and intermittent exercise performance in soccer players. *Life Science Journal*, 10(8s), 22–28.
- Gökbel, H., Gül, I., Belviranl, M., & Okudan, N. (2010). The effects of coenzyme Q10 supplementation on performance during repeated bouts of supramaximal exercise in sedentary men. *The Journal of Strength & Conditioning Research*, 24(1), 97–102.
- Knapik, J. J., Steelman, R. A., Hoedebecke, S. S., Austin, K. G., Farina, E. K., & Lieberman, H. R. (2016). Prevalence of dietary supplement use by athletes: Systematic Review And Meta-Analysis. *Sports Medicine (Auckland, N.Z.)*, 46, 103–123.
- Linnane, A. W., Kopsidas, G., Zhang, C., Yarovaya, N., Kovalenko, S., Papakostopoulos, P.,... Richardson, M. (2002). Cellular redox activity of coenzyme Q 10: Effect of CoQ 10 supplementation on human skeletal muscle. *Free Radical Research*, 36(4), 445–453.
- Mackenzie, B. (2005). *101 performance evaluation tests*. London, United Kingdom: Electric Word.
- Mizuno, K., Tanaka, M., Nozaki, S., Mizuma, H., Ataka, S., Tahara, T.,... Kuratsune, H. (2008). Antifatigue effects of coenzyme Q10 during physical fatigue. *Nutrition*, 24(4), 293–299.
- Seifbarghi T, Y. S., Halabchi F, Mazaheri R, & Djafarian K. (2015). Type and frequency of dietary supplement use by Iranian soccer players. *Journal of Nutrition Science and Diet*, 1(2), 93–97.
- Yasukawa, S., Fujieda, Y., Sakai, K., Sugiura, K., Morifuji, M., Sanbongi, C.,... Suijo, K. (2006). The synergic effects of coenzyme Q10 and creatine through oral intake on repetitive short duration high-intensity exercise. *Tairyoku kagaku: Japanese Journal of Physical Fitness and Sports Medicine*, 55, 247–250.
- Ylikoski, T., Piirainen, J., Hanninen, O., & Penttinen, J. (1997). The effect of coenzyme Q10 on the exercise performance of cross-country skiers. *Molecular Aspects of Medicine*, 18, 283–290.