Effect of Creatine Supplementation on Performance of Swimmers in Open Water

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ABSTRACT

Scorcine C, Nascimento M, Colantonio E, Madureira F. Effect of Creatine Supplementation on Performance of Swimmers in Open Water. JEPonline 2013;16(5):51-56. The purpose of this study was to analyze the effect of creatine supplementation (CS) in open water swimmers. The sample consisted of 30 experienced swimmers who were divided into two distinct groups. Only one group was assigned to CS. The experiment period lasted 9 wks. Four tests (500 m swim, 50 m swim, 50 m using only the legs for propulsion, and 50 m using only the arms for propulsion) were conducted in two stages before and after the supplementation period. The Wilcoxon test was used to compare before and after the supplementation and the Mann-Whitney U test was used to compare between the two groups. There was a significant improvement for the CS group in the 50 m test using only the legs for propulsion (50.43 pre-test) and (48.29 post-test). For all other swim test results, there were no significant differences between the tests.

Key Words: Performance, Open Water Swimmers, Creatine Supplementation
INTRODUCTION

In 2008, the International Olympic Committee made the official 10 km open water competition for men and women. Since then, the number of participants has increased worldwide. Brazil and Australia lead the ranking of amateur athletes as well as the number of such events (17). Given the increased interest in open water competition, several intriguing issues have been the subject of research involving physiology (3-4), biochemistry (18), anthropometry (13), and motor behavior (11). Also, there is the research issue of what role creatine monohydrate may play in regenerating the muscles' energy source during open water competition.

While creatine supplementation (CS) has been reported to increase body weight and improve performance during high intensity, short duration exercise, it has not been determined whether CS strategies improve performance in open water competition. Interestingly, since CS provides a rapid but short-lived regeneration of adenosine triphosphate (ATP) through the alactic anaerobic power system, it should help with the sprints used by athletes at the end of the open water competition. This is important in that the winner is often decided during the last meters of the race. Still, given other competition characteristics, such as using sprints as a strategy to confuse opponents and to increase the distance from the other swimmers that prevents them from drafting (5-11), the extra muscle creatine may help to boost the swimmers’ exercise performance.

This question is interesting from the research point of view, especially with regards to competitive swimming. Clearly, the use of creatine results in positive athletic performances. Creatine significantly increases lean muscle mass and, therefore, minimizes the loss of power and strength (1). It increases muscle power and improves athletic performances (2,8,12,16). In other studies, the benefits of CS were observed through biochemical analysis that demonstrated a decrease in the production of cortisol, lactate, and plasma ammonia during maximal efforts (8-14). In swimming, the work of Dabid Roshan et al. (6) supports previous findings that demonstrate a positive influence of creatine on muscle fatigue in swimmers who increase their performance in anaerobic activities. There is also a decrease in the levels of blood lactate (6).

Conversely, there are reports (7-10) that reported no positive effects on athletic performance or the biochemical variables of athletes that associate with increased performance with CS. These findings encourage increased work by other researchers with different protocols in effort to observe the physiological and biochemical variables that are linked to athletics. Thus, due to the characteristics of the strategies used by these athletes and documented effects of creatine supplementation on competitive swimmers, the purpose of this study is investigate this issue in open water swimmers.

METHODS

Subjects
The sample included 30 open water swimmers of the Metropolitan University of Santos Team. All athletes were males with at least 3 yrs of systematic training. The mean age of the subjects was 29.20 ± 7.76 yrs with a body mass of 75.20 ± 10.07 kg at a height of 1.76 ± 0.09 cm. All subjects were informed about the risks of the research before giving their written consent, and all procedures were in accordance with Brazilian ethical and legal issues in research involving human subjects.
Procedures
The subjects were randomly divided into two groups of 15 each; the creatine supplementation (CS) Group and the Control Group. The subjects in the CS (Experimental) Group ingested creatine provided by a pharmacy. They were instructed to take 5 g creatine per day 1 hr before the start of training.

Tests
The subjects performed four freestyle sprints: (a) 1 x 500 m; (b) 1 x 50 m; (c) 1 x 50 m used only the legs for propulsion while holding onto a swimming board; and (d) 1 x 50 m used only the arms with a float between the legs while using a rubber band to secure the float to the legs. The rest period between the bouts was 10 min in duration. All tests were performed before and after the experiment, which lasted 9 wks with 5 training sessions·wk⁻¹.

Statistical Analyses
The Shapiro-Wilk test was used to verify the normality of the data. After non-confirmation, it was decided not to use the Wilcoxon test for comparing two distinct moments and the Mann-Whitney U test for comparison between the two groups.

RESULTS
Tables 1 and 2 show the results in seconds for the average time for the subjects to swim the required distances.

Table 1. Time Results in Seconds for the Tests: 500 and 50 m Swimming.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>500 m Swim Pre-Test</th>
<th>500 m Swim Post-Test</th>
<th>50 m Swim Pre-Test</th>
<th>50 m Swim Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>430.50 ± 61.83</td>
<td>419.00 ± 71.41</td>
<td>29.71 ± 3.13</td>
<td>29.46 ± 3.11</td>
</tr>
<tr>
<td>Control Group</td>
<td>448.75 ± 52.28</td>
<td>438.50 ± 38.29</td>
<td>33.12 ± 3.68</td>
<td>32.57 ± 3.58</td>
</tr>
</tbody>
</table>

Table 2. Time Results in Seconds for the Tests: 50 m Only Legs and 50 m Only Arms.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>50 m Legs Pre-Test</th>
<th>50 m Legs Post-Test</th>
<th>50 m Arms Pre-Test</th>
<th>50 m Arms Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>50.43 ± 14.18</td>
<td>48.29 ± 12.91*</td>
<td>36.64 ± 3.94</td>
<td>36.23 ± 5.00</td>
</tr>
<tr>
<td>Control Group</td>
<td>51.79 ± 7.91</td>
<td>52.68 ± 8.06</td>
<td>39.91 ± 4.43</td>
<td>38.71 ± 3.55</td>
</tr>
</tbody>
</table>

*Indicates significant difference in pre-test and post-test experiment. The level of significance was accepted at P≤0.05.
DISCUSSION

The Experimental (CS) Group achieved a statistically significant decrease in the 50 m Legs Swim Test (i.e., using only the legs as a means of propulsion). The CS Group did not achieve an improvement in the 500 m Swim test, the 50 m Swim Test, and the 50 m Arms Test. Thus, the findings from the present study only partially support Selsby and colleagues (16) who analyzed 15 swimmers during maximal sprints of 50 m and 100 m with significant improvements in time.

Anomasiri et al. (2) used CS in 19 swimmers compared to a control group without CS. The aim of their study was to analyze the last 50 m of a 400 m swimming competition. The authors observed significant differences for the CS Group. The swimmers who received CS decreased their sprinting time in the last 50 m of a 400 m competition, which did not happen in the Control Group. The Control Group showed a non-significant change in the 50 m Leg Post-Test.

Although it is tempting to argue that the overall findings in this study should not be used to avoid the use of CS among athletes of open swimming competition, the findings in the 500 m Swim Test and the 50 m Swim Test were not significantly different. In each case, the swimmers used both the arms and the legs to cover the required distance (9-15). Therefore, had the CS worked, then, the time results in seconds for both tests would have decreased. That was not the case.

Keeping in mind that it is understood that CS reduces muscular fatigue by transporting extra energy into the cells, the ingestion of creatine by the experimental subjects over a 9 wk period should have resulted in faster muscle contractions with a decrease in swim time for a given distance. In other words, given that the best results in healthy subjects occur when CS is combined with a specific exercise training program, it is clear that the effect of creatine on the performance of swimmers in open water was minimal to none. Also, aside from the subjects’ fiber type (i.e., fast-twitch fibers vs. slow-twitch fibers), another major consideration is the likelihood that not all athletes, regardless of whether the sport is predominately anaerobic or aerobic, respond similarly to CS. Perhaps, one confounding variable might be either the unusually low or high levels in the muscle. This may be a natural effect of what the athletes eat (e.g., non-meat eaters vs. meat and fish eaters).

CONCLUSION

After 9 wks of CS, the results demonstrate a statistically significant difference to the experimental test at 50 m using only the legs as a mean of propulsion. In all other tests, the results did not show significant differences. Therefore, the findings support that CS is efficient in only one test with power characteristics while showing no improvement in the endurance tests. Due to the lack of research on this particular topic as well as the limitations of our study, further investigations and better controlled trials are necessary for more conclusive assertions.

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