High dose magnesium supplementation effects on 400m sprint performance and metabolism

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Introduction

Matwejews (1972) proposed the sports training "period" he divided it into preparation periods (Ⅰ, Ⅱ), specific training periods (Ⅰ, Ⅱ), and a competition period. This type of process allow athlete to reach their best physical condition in specific period Ⅱ and maintain it through the competition period. For this reason, coaches of sports adjust the training protocols before the competition period. It is still unclear weather other training methods can push the athlete to breakthrough through to new levels of peak performance using short periods of training. Therefore, the objective of this study was to investigate the effects of a short term high intensity interval training protocol for 400 m runners and high-doses of magnesium with 200 ml water before training on sprint performance and metabolism.

Methods

Two tests were investigated in this study. The first was a specific test (pre-post test consisting of 400m), the second was a training test (high intermittent training on the 1st and 3rd day). The training program consisted of a high intermittent mode on the 1st and 3rd day and a continuous run on the 2nd day. The intermittent workload was set at 90% of the individuals best performance time (3x3x20s), the continuous workload was set at 50 % (15min); each athlete took 400 mgs magnesium (+100mg Vitamin C) with water and warmed up for 30mins before each of the three days of training sessions.

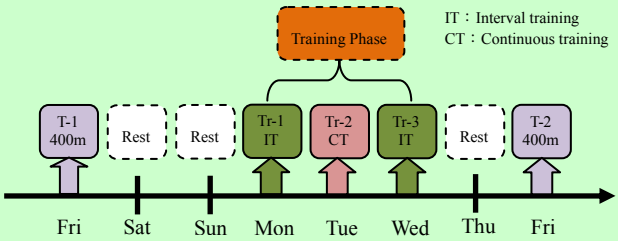

Figure. 1. Experimental flow chart

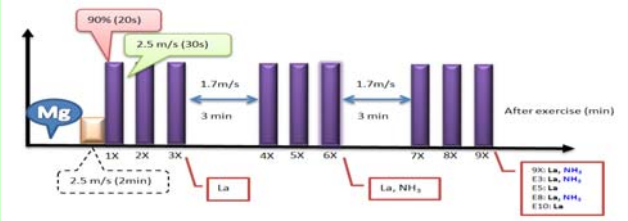

Figure. 2. Training test Tr-1 and Tr-3's training methods, content and biological parameters

Statistics

All data are presented as means ± SD. A paired *t* test was used to analyze lactic acid and ammonia levels between pre and post training 400m performances (T-1, T-2) as well as the intermittent training sets. Statistical analysis level significance was set at $p< 0.05$.

Results

Pre-test max speed in 400m, 90% max speed and 50% max speed were 7.41±0.19 m/s, 6.67±0.16m/s, 3.70±0.09m/s. During the training test (Tr-1 and Tr-3), blood lactate and NH_3 concentrations decreased after Tr-3 ($p>0.05$) (Figure 3,4). Table 3 during the 400m test, three subjects improved their range of speed performance by 0.01-1.80 s posttest; two subjects increased their range of speed performance by (0.21 and 0.54 s). Only one subject showed no increase in range of speed performance but still maintained pretest results. Between pretest and posttest a decrease in maximum lactate decreased by 1.06mmol/L ($p>0.05$). An increase in NH_3 was observed 23.63µl ($p>0.05$) (Figure 6).

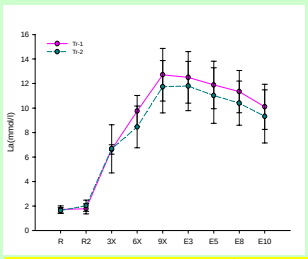

Figure 3: Lactate during the 1st (Tr-1) and 3rd day (Tr-3) of training including recovery time (E).

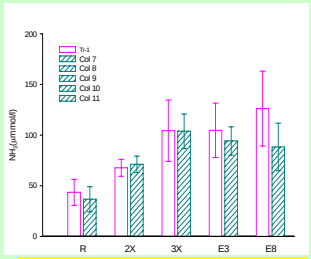

Figure 4: NH_3 during the1st (Tr-1) and 3rd day (Tr-3) of training including recovery time (E)

Table 3: Individual results of 400m pre-test (T-1) post-test (T-2)

No.	T-1	T-2	Diff
1	55.30	53.50	-1.80
2	54.00	54.00	0.00
3	54.20	54.19	-0.01
4	53.00	53.21	0.21
5	55.60	54.49	-1.11
6	52.00	52.54	0.54
M±SD	54.02±1.36	53.66±0.72	-

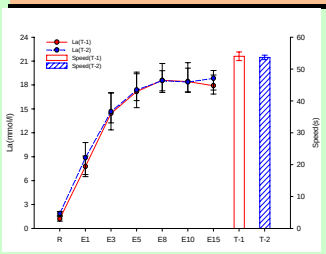

Figure 5: Comparison of lactate (mmol/l) during 400 m pre-test and post-test.

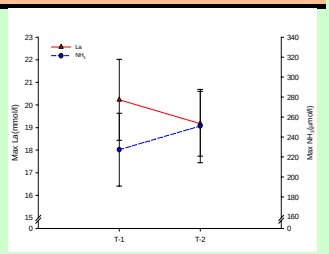

Figure 6: Comparison of maximum 400 m pre-test and post-test

Discussion

During the training test (Tr-1 and Tr-3), blood lactate concentration decreased after Tr-3, under high-intensity exercise with high dose magnesium, the decrease in blood lactate concentrations were discussed by Hutzelmann et al.(1993). The study indicated that when ingesting magnesium there was a significant reduction in the load in sports with the end effect being a decrease in lactic acid accumulation. Lukaski (1983) explained this theoretical mechanism by saying that magnesium stimulates the two-phosphoglycerate (2, 3 - diphosphoglycerate, 2, 3-DPG) enzymes, while increasing red blood cells to release oxygen to work the application of muscle tissue. Furthermore, NH_3 indicated a downward trend during (Tr-1 and Tr-3). Bertschat et.al.(1986) study when looking at marathoners who supplemented with magnesium showed a significant reduction in competition protein degradation. Hypothetically speaking, this may be due to the reduction of neonatal sugar resulting in a reduction in amino acid degradation to generate energy, but reduces its metabolites NH_3, in addition to magnesium and is also involved in cell ammonia (ammonia) to eliminate an important enzyme.In conclusion Golf et.al. (1998) pointed out that triathlon competitors after four weeks of added magnesium reduced their race times. In comparison to this study only three subjects improved their 400m times, this may be due to the supplement ingestion time being only 3 days.

References

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