Effect of a tomato juice intake on resting heart rate, resting blood pressure and perception level of recovery in elite swimmers

Marques, F. B.[1] ; Godinho, C.[2] ; Bernardo, A.[2] ; Brito, J.[2]

[1] Clinical Nutrition Master's student on Instituto Superior de Ciências da Saúde (ISCSEM), Egas Moniz Cooperativa de Ensino Superior, C. R. L., Quinta da Granja, Monte da Caparica, 2829-511 Caparica, Portugal.

[2] Centro de Investigação Interdisciplinar Egas Moniz (CiiEM), Egas Moniz Cooperativa de Ensino Superior, C. R. L., Quinta da Granja, Monte da Caparica, 2829-511 Caparica, Portugal.

Background

Sports recovery is an important inter and intra individual multilevel process in time for the re-establishment of athlete performance [1]. Sport drinks arose in order to complement the nutritional needs of the athletes when their homoeostatic balance is affected [2]. Strenuous exercise affects this balance, leading to cell's oxidative stress, that, without an appropriate recovery, will conduct to fatigue, inflammation reactions and muscular damage. To prevent these scenarios several alternatives have been developed, as the increase of antioxidants in diet (as food or as supplements) [3].

Nowadays, tomato juice, which is rich in antioxidants, is studied as an enabler of the recovery process at sports level. Formerly, post-exercise consumption of tomato juice was shown to be effective in decreasing the oxidative stress and lipid peroxidation markers values, which verifies its antioxidant potential and optimizer power of sports performance [4].

This work aims to investigate the effect of the intake of a tomato juice on the resting heart rate, resting blood pressure and perception level of recovery in elite swimmers over 2 months.

Methods

Chemical analyses of Tomato Juice

Tomato juice was analyzed in laboratory, in terms of antioxidant capacity and total phenol content, in lipophilic and hidrophilic fraction. For antioxidant capacity it was used 2,2-diphenyl-1-picrylhydrazyl method (DPPH) and Ferric Reducing Antioxidant Power method (FRAP) to measure the eliminatory capacity of free radicals, and for phenol content it was used a complex reaction with *Folin Ciocalteau* reagent.

Interventional Study

This pilot-study was conducted after the recruitment of elite swimmers and the convenience sample was divided into two groups: control group (CG) and experimental group (EG). EG ingested 150 mL of the tomato juice on a daily basis after training, besides their normal eating routine, while CG only served as comparison group, maintaining their eating routine.

Both physiologic and psychometric parameters were evaluated: the first ones through cardiovascular measurements (resting heart rate – RHR - and resting blood pressure - RBP), while the others by the use of stress-recovery questionnaire for athletes (RESTQP-Sport), in T0, T1 (1 month later) and T2 (2 months later). The measures of RHR and RBP was applied in the morning, before training, as the RESTQP-Sport (used to verify the perception level of recovery) was applied after exercise routine. A food inquiry was also applied on a weekly basis in order to control the occurrence of biases on the study.

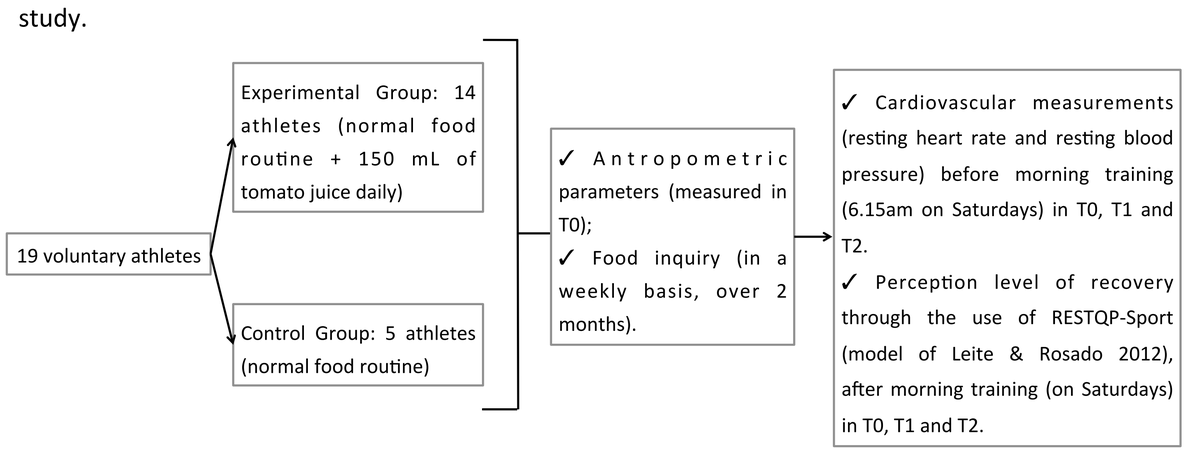

Figure 1. Organogram of experimental design.

Anonymized data was analyzed after study approval by the Ethics Commissions of Cooperativa de Ensino Superior Egas Moniz and the informed consent of the subjects was obtained.

Results

Chemical analyses

The results show the high antioxidant capacity and high total phenol content of the tomato juice, as reported in other investigations with tomato juice analyses.

	Total Phenols (mg/L GAE) ± SEM	
	Hidrophilic fraction	Lipophilic fraction
Tomato Juice (Commercial)	145,0 ± 8,0	420,2 ± 8,7

Table 1. Total phenol content, mg/L gallic acid equivalent (GAE), in hydrophilic and lipophilic fraction of a sample of commercial tomato juice.
*SEM=Standard Error of the Mean

	FRAP (µg TE/L) ± SEM	
	Hidrophilic fraction	Lipophilic fraction
Tomato Juice (Commercial)	1400,7 ± 70,6	3090,2 ± 171,9

Table 2. Antioxidant activity of the hydro and lipophilic fractions of commercial tomato juice characterized by the FRAP test and expressed in µg TE/L trolox equivalent (TE).
*SEM=Standard Error of the Mean

	DPPH (µg TE/L) ± SEM	
	Hidrophilic fraction	Lipophilic fraction
Tomato Juice (Commercial)	2326,4 ± 173,5	3819,4 ± 377,9

Table 3. Antioxidant activity of the hydro and lipophilic fractions of commercial tomato juice characterized by the DPPH test and expressed in µg TE/L trolox equivalent (TE).
*SEM=Standard Error of the Mean

Interventional Study

	Control Group	**Experimental Group**	
	Mean Value (SD)	Mean Value (SD)	**P**
Height (cm)	169,40 (±10,14)	173,79 (±7,85)	0,333
Weight (kg)	63,90 (±8,81)	63,35 (±6,94)	0,889
Lean Mass (LM) (%)	73,84 (±4,85)	79,14 (±7,74)	0,174
Fat Mass (FM) (%)	22,21 (±5,08)	16,68 (±8,14)	0,177
% Water	54,02 (±2,54)	59,54 (±5,06)	0,034
Body Mass Index (BMI) (kg/m)	22,20 (±1,02)	20,92 (±1,57)	0,112

Table 4: Mean Value of anthropometric parameters in Control Group and Experimental Group. T-student test to evaluate the difference between groups (p-value).
*SD=Standard Deviation

At intervention level, with a sample of 19 athletes (CG, n=5 and EG, n=14) of *Sporting Clube de Portugal*, the results suggest a significant difference on the resting heart rate (p=0.015) and diastolic resting blood pressure (p=0.021) over the time. The difference occurred was a decrease in values between T0 and T2 (factor 1).

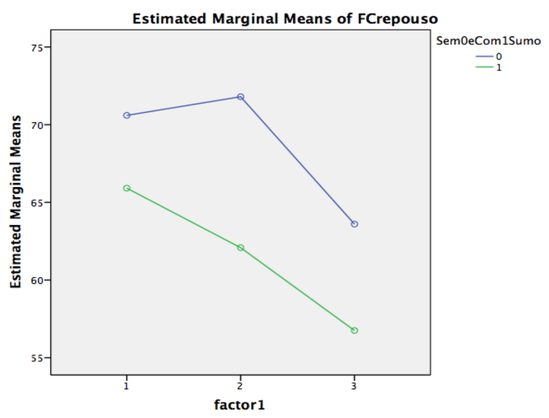

Figure 2. Distribution of estimated marginal means of resting heart rate, between groups (Control Group=0 and Experimental Group=1), over the time (**Sem0eCom1Sumo*=Without0andWith1Juice). Data was analyzed by mixed repeated measures ANOVA.

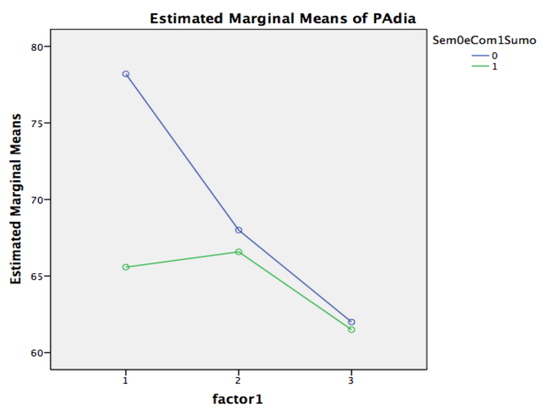

Figure 3. Distribution of estimated marginal means of resting diastolic blood pressure, between groups (Control Group=0 and Experimental Group=1), over the time (**Sem0eCom1Sumo*=Without0andWith1Juice). Data was analyzed by mixed repeated measures ANOVA.

Basically, on the RER, the mean of the values decrease from 65,9 bpm's to 56,8 bpm's in CG, while in EG decrease from 70,6 bpm's to 63,6 bpm's. In turn, on the resting diastolic blood pressure, a decrease was observed from 78,2 mmHg to 62,0 mmHg in CG, and 65,9 mmHg to 61,5 mmHg in EG.

Neither other effects in the remaining evaluated parameters (e.g., cardiovascular measurements between groups and psychometric measurements with RESTQP-Sport between groups and over the time) nor any variable interaction were verified.

Discussion/Conclusions

✓ It can be concluded that the sample size and the lack on random distribution between groups (CG and EG) compromises the observed statistical power of the results, which does not allow its extrapolation for the target population, or even data generalization.

Therefore, further studies are required, in order to confirm the beneficial effects of a tomato juice intake in sports recovery of elite swimmers (and accordingly, on sports performance).

Acknowledgements/References

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