

## Effect of pre-exercise sports drink on cardio-respiratory fitness

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**Abstract.** The objective of the present study was to determine the effect of pre-exercise consumption of sports drink in enhancing cardio-respiratory fitness. A total of 50 male individuals participated in the present study with the mean age of 21.97 years (SD=  $\pm 1.42$ ) and their mean weight (in lbs) were 138.86 (SD=  $\pm 19.48$ ). All 50 subjects were placed in three groups as same subject design. In group A they all performed Rockport 1 mile walk test without taking any supplement and then their  $VO_2$ max was measured. In group B the  $VO_2$ max of all subjects were measured after one week of first session by Rockport 1 mile walk test after consuming sports drink (Gatorade) 20 minutes prior to the test. In group C again the  $VO_2$ max was measured after one week of second session by Rockport 1 mile walk test after consuming placebo drink (coloured glucose solution) 20 minutes prior to the test. Statistically significant differences were found in  $VO_2$ max between group A (F=61.53), group B (F=20.96) and group C (F=66.22). The finding of the present study reveals that pre-exercise ingestion of carbohydrate supplement is helpful in increasing  $VO_2$ max during exercise. The effect of sports drink and simple glucose is relatively similar.

**Keywords:** *VO<sub>2</sub>max, cardio-respiratory fitness, walk test, sports drink.*

### Introduction

Cardio-respiratory fitness is considered as an important component of physical fitness. It enhances the ability to perform moderate to high intensity exercises for prolonged periods, whereas, low cardio-respiratory fitness can lead to various conditions, like, coronary artery disease, high blood pressure, stroke, obesity and type 2 diabetes.

The standard measure of cardio-respiratory fitness is  $VO_2$ max, which is defined as the maximum oxygen consumption by an individual during strenuous exercise (1-3).

$VO_2$ max can be measured by direct or indirect measurements. But the direct measurement is expensive and requires equipments. Thus the more convenient way to measure  $VO_2$ max is various field tests (4,5). These tests requires minimal equipments and very easy to perform. Rockport 1 mile walk test is one of the field test to measure  $VO_2$ max and predicts cardio-respiratory fitness for individuals of all ages (6, 7).

Consumption of sports drink by athletes is common now a day. There are numerous sports drinks are available in market, in which Gatorade is one and very popular among athletes. It contains water, sugar, dextrose, acidity regulator, mineral salts (sodium) and flavor emulsion. There are so much advantages of sports drink, it helps in replenishing the carbohydrate, and it also helps in

maintaining the electrolyte balance as well as in fluid balance. It reduces the risk of heat stroke. If an athlete consumes carbohydrate-rich foods or sport drinks within 60 minutes of the beginning of an endurance exercise performance, the glucose from the ingested food or drink enters the circulation within minutes of ingestion (8). The effect of pre-exercise sports drink (Gatorade) on the recovery heart rate, blood lactate and glucose level in short term intense exercise has been done in Indian condition (9) but its effect on  $VO_2$ max is unclear.

Therefore, the purpose of the present research work is to determine the effect of consumption of pre-exercise sports drink on cardio-respiratory endurance in Indian condition.

### Materials and Methods

A total of 50 young, healthy and moderately active male subjects were randomly selected for this study with the aged between 18-25 years. Same subjects were placed in three groups; group A: Normal Group, group B: Sports Drink (Gatorade) Group, and group C: Placebo group (Coloured glucose solution).

The  $VO_2$ max was measured by Rockport 1 mile walk test, heart rate was measured by Polar heart rate monitor, weight was measured by weighing machine and time was measured by stop watch.

*Procedure.* After taking the consent the procedure of Rockport 1 mile walk test were demonstrated to the subjects. Only one participate performed this test at one time. Now on 'Go' signal the participant began walking as fast as possible for 1 mile around the ground.

Walking time was measured by stop watch and heart was measured by Polar heart rate monitor immediately after crossing the 1 mile mark.

Then the VO<sub>2</sub>max was calculated by using this formula:

$$\text{VO}_2\text{max (ml/kg/min)} = 132.853 - (0.0769 \times \text{body weight in lbs}) - (0.3877 \times \text{age in years}) + 6.3150 \times \text{gender [female =0, male = 1]} - (3.2649 \times \text{1 mile walk test time [in minutes and hundredths]}) - 0.1565 \times \text{1 minute heart rate at end of 1 mile [beats per minute]}.$$

Participants firstly performed Rockport 1mile test without taking any drink.

After one week they again performed Rockport 1 mile walk test, but this time they consumed Gatorade sports drink 20 minutes prior to commence the test. Again after one week they performed Rockport 1 mile walk test after 20 minutes consumption of placebo drink (coloured glucose solution).

*Statistical analysis.* Mean, SD, standard error and percentile were used to prepare summary statistics. ANOVA (F) and Post Hoc with Scheffe test were used to determine the differences between all the groups. The statistical analysis was done on SPSS v 16.00.

## Results

A total of 50 male individuals participated in the present study with the mean age of 21.97 years (SD ±1.42) and their mean weight (in lbs) were 138.86 (SD ± 19.48).

All 50 subjects were placed in three groups as same subject design.

In group A they all performed Rockport 1 mile walk test without taking any supplement and then their VO<sub>2</sub>max was measured.

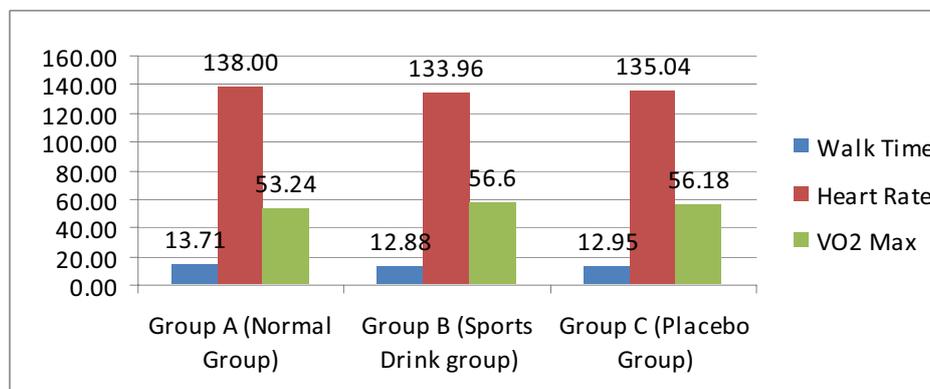
In group B the VO<sub>2</sub>max of all subjects were measured after one week of first session by Rockport 1 mile walk test after consuming sports drink (Gatorade) 20 minutes prior to the test.

In group C again the VO<sub>2</sub>max was measured after one week of second session by Rockport 1 mile walk test after consuming placebo drink (coloured glucose solution) 20 minutes prior to the test.

Walk time (min), heart rate (beats/minute) and VO<sub>2</sub>max (ml/kg/min) in group A were 13.71 (SD±0.30), 138 (SD±3.16) and 53.24 (SD±2.03) respectively. Same in group B were 12.88 (SD±0.50), 133.96 (SD±3.34) and 56.60 (SD±1.45) respectively, whereas in group C it was 12.95 (SD±0.42), 135.04 (SD±3.19) and 56.18 (SD±1.16) respectively, as shown in figure 1.

One way ANOVA were applied between walk time, heart rate and VO<sub>2</sub>max among all the three groups, which is shown in table I. F value of walk time, heart rate and VO<sub>2</sub>max were 61.53, 20.96 and 66.22 respectively.

As shown in table I. Post Hoc multiple Scheffe range test were applied to determine the inter group differences which is shown in table II.



**Figure 1.** Average values of walk time, heart rate and VO<sub>2</sub>max between all three groups

**Table I.** One way ANOVA among three groups

		Sum of Squares	df	Mean Square	F	Sig.
Walk Time	Between Groups	21.224	2	10.612	61.530	.000
	Within Groups	25.353	147	.172		
	Total	46.577	149			
Heart Rate	Between Groups	437.493	2	218.747	20.964	.000
	Within Groups	1533.840	147	10.434		
	Total	1971.333	149			
VO <sub>2</sub> max	Between Groups	334.515	2	167.257	66.224	.000
	Within Groups	371.268	147	2.526		
	Total	705.783	149			

**Table II.** Post Hoc with Scheffe test among three groups

Dependent Variable	(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Walk Time	1	2	.83220*	.08306	.000	.6268	1.0376
		3	.75860*	.08306	.000	.5532	.9640
	2	1	-.83220*	.08306	.000	-1.0376	-.6268
		3	-.07360	.08306	.676	-.2790	.1318
	3	1	-.75860*	.08306	.000	-.9640	-.5532
		2	.07360	.08306	.676	-.1318	.2790
Heart Rate	1	2	4.04000*	.64604	.000	2.4424	5.6376
		3	2.96000*	.64604	.000	1.3624	4.5576
	2	1	-4.04000*	.64604	.000	-5.6376	-2.4424
		3	-1.08000	.64604	.251	-2.6776	.5176
	3	1	-2.96000*	.64604	.000	-4.5576	-1.3624
		2	1.08000	.64604	.251	-.5176	2.6776
VO <sub>2</sub> max	1	2	-3.35420*	.31784	.000	-4.1402	-2.5682
		3	-2.94100*	.31784	.000	-3.7270	-2.1550
	2	1	3.35420*	.31784	.000	2.5682	4.1402
		3	.41320	.31784	.432	-.3728	1.1992
	3	1	2.94100*	.31784	.000	2.1550	3.7270
		2	-.41320	.31784	.432	-1.1992	.3728

\*. The mean difference is significant at the 0.05 level.

### Discussion

The purpose of the present study was to find the impact of consumption of pre-exercise sports drink on cardio-respiratory endurance i.e., VO<sub>2</sub>max. 50 participants were involved in all three testing session and considered as

three groups as group A (Normal group), group B (Sports drink group) and group C (Placebo group).

The VO<sub>2</sub>max was determined by Rockport 1 mile walk test.

Statistically significant differences were found in  $VO_2\max$  between group A ( $F=61.53$ ), group B ( $F=20.96$ ) and group C ( $F=66.22$ ). The post hoc Scheffe test reveals statistically significant difference in  $VO_2\max$  (mean difference=3.35,  $p<0.001$ ) between group A (Normal group) and group B (Sports Drink Group). This finding suggest that consumption of pre-exercise sports drink 20 minutes prior to exercise helps in increasing the  $VO_2\max$  of an individual, this finding is supported by Snell et al (2010) and Jeukendrup (2004) (10, 11) who stated that simple transportable monosaccharide and sodium are important for maximal exercise performance and effective recovery associated with endurance exercise-induced rehydration, and carbohydrate feeding during exercise can improve endurance capacity and exercise performance during prolonged exercise.

Similarly, statistically significant difference were found between group A (Normal Group) and group C (Placebo Group) (mean difference=2.94,  $p<0.001$ ), which reveals that consumption of pre-exercise simple glucose can also enhance the  $VO_2\max$  during exercise. This finding is consistent with the result of Snell et al (2010) (10). Therefore, the finding indicates that despite of any particular drink the  $VO_2\max$  can be increase by ingestion of glucose also.

Whereas statistically insignificant difference were seen between group B and group C (mean difference=0.41,  $p=0.432$ ), which suggests that pre-exercise consumption of either sports drink or simple glucose has same effect on  $VO_2\max$  during exercise and supported by the findings of Snell et al (2010) and Bachle et al (2001) (10, 12) which states that pre-exercise sports drink and simple glucose are equally effective in enhancing cardio-respiratory fitness during exercise.

### Conclusion

The finding of the present study reveals that pre-exercise ingestion of carbohydrate supplement is helpful in increasing  $VO_2\max$  during exercise. The effect of sports drink and simple glucose is relatively similar. Furthermore, it is recommended to the athletes to ingest carbohydrate, either by sports drink

or by glucose solution, prior to competition. The future research work should emphasize on to determine the exact timing and amount of consumption of carbohydrate prior to exercise.

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