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 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\textsubscript{2max} 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\textsubscript{2max} 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.

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\textsubscript{2max}, which is defined as the maximum oxygen consumption by an individual during strenuous exercise (1-3).

VO\textsubscript{2max} can be measured by direct or indirect measurements. But the direct measurement is expensive and requires equipment. Thus the more convenient way to measure VO\textsubscript{2max} is various field tests (4,5). These tests require minimal equipments and very easy to perform. Rockport 1 mile walk test is one of the field test to measure VO\textsubscript{2max} 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 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\textsubscript{2max} is unclear.

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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\(_2\) 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. Table I shows the average values of walk time, heart rate and VO\(_2\) max among all the three groups. As shown in table I. F value of walk time, heart rate and VO\(_2\) max were 61.53, 20.96 and 66.22 respectively.

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

Procedure. After taking the consent the procedure of Rockport 1 mile walk test were demonstrated to the subjects. Only one participant 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\(_2\) max was calculated by using this formula:

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

Participants firstly performed Rockport 1 mile 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). One way ANOVA were applied between walk time, heart rate and VO\(_2\) max among all the three groups, which is shown in table I. F value of walk time, heart rate and VO\(_2\) 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 differences between all the groups. The statistical analysis was done on SPSS v 16.00.

Figure 1. Average values of walk time, heart rate and VO\(_2\) max between all three groups
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Table I. One way ANOVA among three groups

<table>
<thead>
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<th>Effect</th>
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<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
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<td>10.612</td>
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<td>Heart Rate</td>
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<tr>
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<tr>
<td>Within Groups</td>
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<tr>
<td>VO2max</td>
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<td>149</td>
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Table II. Post Hoc with Scheffe test among three groups

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<th>(J) VAR00001</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig</th>
<th>95% Confidence Interval</th>
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</thead>
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<td>.000</td>
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<td>.6268 - 1.0376</td>
</tr>
<tr>
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<td>.75860</td>
<td>.08306</td>
<td>.000</td>
<td></td>
<td>.5532 - .9640</td>
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<td>.000</td>
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<td>2.83220</td>
<td>.08306</td>
<td>.000</td>
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<td>-1.0376 - .5532</td>
</tr>
</tbody>
</table>

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., VO2max. 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 VO2max was determined by Rockport 1 mile walk test.

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Statistically significant differences were found in VO₂max 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 VO₂max (mean difference=3.35, p<0.001) between group A (Normal group) and group B (Sports Drink Group). This finding suggests that consumption of pre-exercise sports drink 20 minutes prior to exercise helps in increasing the VO₂max 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 VO₂max 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 VO₂max can be increase by ingestion of glucose also.

Where 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 VO₂max during exercise and the finding supported by the findings of Snell et al (2010) and Bache 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 VO₂max 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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