

# Global Experiment Instructions

---

## Join in with the Global Experiment before the London 2012 Games start!

This document contains a more detailed description of the Chemistry in the Olympics Global Experiment. It is designed to look at the effects of sports drinks on physical performance. The experiment involves running 100 metres with or without a sports drink. The experiment can be completed at school (groups of students) or individually at home.

At school, a class of students should be split into two groups (of roughly equal running ability); all individuals from one group will be asked to complete a 100 metre run after consuming a sports drink and the other group after consuming a non-sports drink (water). The number of participants conducting the experiment with a sports drink and without a sport drink should be approximately the same. The relatively large sample size of the class will make it a more controlled test overall.

## Starter Activity in The classroom:

- Ask the class what they drink before, after and during exercise. Why do they drink it? What effect do they think it has on the body? For further guidance and information see our handout titled: [Sports drinks](#).
- Show the class a range of different drinks including water, a soft drink, a sports drink and an energy drink. Ask them which they think an athlete would drink before, after and during exercise.

## The Experiment

Please read the **health and safety guidance** before you start. You will need to carry out your own **risk assessment**.

### Materials and Equipment Listings:

1. Stopwatch
2. 100 metres track, measured
3. 200 ml sports drink
4. 200 ml non-sports drink option – Water
5. 2 litre measuring Jug

### **Sport Drink Recipe:**

1. 50-70 g sugar
  2. One litre of warm water
  3. Pinch of salt
  4. 200 ml of sugar free squash
- Mix, cool and drink

### Variables

Independent:

- Type of drink
- Age (years)

Dependent:

- Average time in seconds (Average time of student group or individual)

Conditions:

- At school:
  - Group 1 consume 200 ml of sports drink 5 minutes before the run.
  - Group 2 consume 200 ml of non-sports drink 5 minutes before the run.
- At home – Individual to consume 200 ml of sports/non-sports drink 5 minutes before the run.
- Each group/individual run 100 m.
- Average time of each group measured using a stopwatch.

# Health and Safety Guidance

---

Anyone using this activity will need to complete a **risk assessment** and must follow the instructions from their employer about referring to sources of model risk assessment for example those produced by *CLEAPSS* or *SSERC*.

## Experiment with Physical Exertion

Physical Education (PE) specialists should be consulted by science teachers planning exercise practicals for the first time. Teachers should ensure they follow medical advice obtained for any diabetic participants because there is a lot of extra sugar in the “sports drink”. Care must be taken regarding consuming drink before exercise.

For further guidance please follow the Section below from Section 11 of the *CLEAPSS* Handbook:

### 11.8.2 Physical exertion

Take care in selecting pupils for activities which involve physical activity such as running 100 metres.

An informal, preliminary enquiry to the colleague who has the same class for PE will reveal any pupils with physical disabilities; obvious cases will already be apparent.

The extent to which pupils excused physical exercise on medical advice can participate in these activities will depend on the activity and the health problem; if there is any doubt, they should not. Pupils should not be forced to take part and care should be taken to avoid the influence of peer-group pressures.

If it is difficult to obtain information about the health of pupils, choose someone to take part in an activity who is an active member of a school sports team; this individual is likely to be fit and healthy. Do not allow participation to develop into *competition*.

The teacher’s risk assessment should include consideration of any other food or drink that students may have consumed prior to the activity.

### Additional safety guidance:

Adapted from *CLEAPSS* Student safety Sheet 7(2), published 2012.

See <http://www.cleapss.org.uk/free-publications>

**Further hazards:**

- Over-exertion may be a hazard, especially for those with some medical conditions.
- Competitive situations can lead to careless behaviors and accidents.
- Unsuitable footwear and uneven surfaces.

**Further control measures:**

- Ensure only willing volunteers are used and re-assure them if results are exceptional or surprising.
- Do not exercise more than in PE lessons and beware of asthma, diabetes or circulatory problems.

The following advice has been taken from the RSCs publication *Kitchen Chemistry* ISBN 0-85404-389-6.

**Experiments with Food**

When experiments with food are carried out, it is worth arranging for the class to be transferred to the Home Economics/Food Technology Department for the session, especially if the food is to be tasted. This minimises risks and also reinforces the special nature of laboratories in students' minds. If a laboratory has to be used for tasting activities it should be made very clear to students that tasting activities are exceptional and that normally, eating and drinking in the laboratory are not permitted.

Particular attention must be paid to hygiene for tasting investigations. For example, all bench surfaces should be cleaned and preferably disinfected so that students do not inadvertently pick up spilled chemicals on their hands. The use of plastic sheets as for microbiology experiments may be considered. All equipment must be scrupulously clean and where a student tastes food with, for example, a teaspoon, this must be adequately sterilised before reuse by another student. The use of disposable plates, cups and spoons is preferable. If normal laboratory glassware is to be used, it is a good idea to have separate stocks that are reserved solely for tasting investigations. Even in investigations where food is not intended to be tasted, there may be a temptation for students to try to taste it. They should be warned against this.

More detailed advice and model risk assessments on experiments with food can be found on the *CLEAPSS* website: [www.cleapss.org.uk](http://www.cleapss.org.uk).

# Entering your results:

---

The average running time of each group or individual can then be uploaded onto the website [www.rsc.org/sport](http://www.rsc.org/sport). If a student is completing the run at home with or without the sports drink they can upload their time individually. Once you have worked out the average and your results are ready to share, click on **Submit your experiment data**.

You will need to enter a name (school/individual), a teacher's name (which is optional) and an email address. You will also need to enter the location details by selecting your country in the drop down bar and street name in the search bar.

Once the data is uploaded the next **click** will lead you to a summary page. There is then an option to recommend the experiment to another school/friend and to upload your own YouTube video.

To upload your YouTube video you will need to sign into YouTube, upload your video from your computer files and then enter the URL into the submission box on the Global Experiment submitting results page. We will then add this to the RSC's Chemistry in Sport channel.

Your experiment data will be updated in the database in 2 hours and will appear on the **Interactive Map** on the Global Experiment page against the location pinned. You will then be able to access your school/individual data as a bar chart from the pin location of the school. On the *Chemistry in the Olympics* Global Experiment page a pin will appear on the interactive map at your location with a bar chart displaying the individual school's results alone. Then all the data collected from all the schools so far will be displayed on a bar chart found on the Global Experiment page.

## Global Experiment Data

Schools	No. of Participants	Age Group	With Sports Drink (Average Time in Sec.)	Without Sports Drink (Average Time in Sec.)
School A	10	5-7	20	25
School B	15	5-7	29	27
School C	20	5-7	24	29

Note- The time mentioned under the 'With Sports Drink' and 'Without Sports Drink' column is the average time in seconds for the participant count mentioned under the 'No. of Participants' column.

For more Information:

### Class Average

Calculate your average time in seconds for your class using the method below. The data will appear on your location pin on the interactive map. The example method below uses the readings from the table above.

Example:

The average time for 'With Sports Drink' which will be plotted on the graph will be

$$\begin{aligned}\text{Average time} &= (20+29+24) / 3 \\ &= 24\end{aligned}$$

The average time for 'Without Sports Drink' which will be plotted on the graph will be

$$\begin{aligned}\text{Average time} &= (25+27+29) / 3 \\ &= 27\end{aligned}$$

### **Weighted Average for all the data from all schools**

The weighted average method is used to plot all the data submitted to the Global Experiment from all the schools and individuals who participate. The following method is used to calculate the average times plotted on the Global Experiment page.

The weighted average method will take into account the number of participants from all the data submitted for each time entry against 'With Sports Drink' and 'Without Sports Drink'.

The weighted average time for With Sports Drink will be plotted on the graph with the

$$\begin{aligned}\text{Average Time} &= ((20 \times 10) + (29 \times 15) + (24 \times 20)) / (10 + 15 + 20) \\ &= 24.78 \text{ seconds}\end{aligned}$$

The weighted average time for Without Sports Drink will be plotted on the graph with the

$$\begin{aligned}\text{Average Time} &= ((25 \times 10) + (27 \times 15) + (29 \times 20)) / (10 + 15 + 20) \\ &= 27.44 \text{ seconds}\end{aligned}$$

# Discussion in Class:

---

Encourage the students to analyse and discuss the Global Experiment data. You could use the following questions to get started or return to the starter activity to see if anyone's views have changed. For further guidance and information see our resource: [Sports drinks](#).

- 1. Will there be an effect on the average running time for 100 metres run between the group drinking a sports drink and the group drinking a non-sports drink?**
- 2. Will there be an effect on the average running time for 10 kilometres run between the group drinking a sports drink and the group drinking a non-sports drink?**
- 3. How long do you think you should drink a sports drink before exercise to see an effect?**

The sports drink educational resources linked with the Global Experiment will provide background information about sports drinks and tutorial hand-outs for relevant questions for students to think about the role of chemistry in sports drinks.

Example: *Why do sports drinks contain electrolytes?*

There is unlikely to be any effect from sports drinks on a 100 metre run, therefore we wanted to introduce a critical evaluation part of the experiment for the students to discuss in the classroom.

## Extension Activities:

- 1. Are pulse rates affected by sports drinks?**

Follow [NHS guidelines](#) to check your pulse rate:

- 2. Is there a difference between the pH of the sweat of the group who consume sports drinks and those who consume a non-sports drink?**

## Contact:

If you have any questions please do not hesitate to contact the Learn Chemistry team:

[learn-chemistry@rsc.org](mailto:learn-chemistry@rsc.org)