

Speedy Star Jumps: demonstrators guide

Aim

An activity that allows the collection of lots of data to test whether sports drinks make a difference to performance during a short time of high intensity exercise. This ties into the RSC 2012 Global Experiment.

Equipment

- Stopwatch
- 100ml sports drink
- 100ml non-sports drink option – water

To make the sports drink:

- 2 litre measuring jug
- Large stirrer
- 50-70g sugar
- 1 litre of warm water
- A pinch of salt
- ~~200ml~~ of sugar free squash- use **100ml** at science festival as we have double concentrate

Activity

To make the “sports drink”:

- Mix the sugar, salt and sugar free squash with the warm water.
- Stir well until the sugar and salt have dissolved.
- Drink your 100ml of sports drink or water and get ready...
- Go! When the timers starts do as many star jumps as you can in 20 seconds.

The Science

All living cells need energy to function in order for the chemical reactions occurring in the cells to take place. In humans this energy is obtained by breaking down organic molecules such as carbohydrates, fats and proteins. When these are broken down at a molecular level, bonds breaking and forming between the atoms in the molecules release or require energy. The biochemical reactions, which take place in cells when a fuel substance such as carbohydrate (e.g. glucose or fructose) is broken down, will normally release more energy than they use. Thus energy is available for other reactions to take place and to provide the energy needed for muscle contraction. Sports performance in particular is dependent on providing the energy required to contract our muscles to move our bodies.

Sports drinks or isotonic drinks contain similar concentrations of salt and sugar as in the body. They are designed to replenish the electrolytes lost during physical activity. Sports drinks don't hydrate the body any better than water, but you are more likely to drink larger volumes, which lead to better hydration.

But do sports drinks make a difference to sports performance? This is what this activity will test!

Athletes need to remain hydrated during exercise and that extra bit of 'energy' could boost performance, but there is debate and people are still investigating it:

- The Global Experiment: there is **no difference** between water and sports drinks.
- Recent research evidence suggests that consuming carbohydrates during high intensity exercise lasting less than an hour **can be beneficial** to overall performance.

Difference between types of drinks:

Water hydrates better than any other liquid, both before, during and after exercise. Cold water is absorbed faster by your body than water at room temperature or body temperature. However, people don't usually drink enough water.

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Energy drinks contain sugar, caffeine and a variety of other ingredients such as taurine, guarana and ginseng. Manufacturers claim that they are designed to 'boost' performance and increase stamina but many health experts disagree and say that any 'boost' in performance is due only to sugar and caffeine content.

Soft drinks contain mainly water, sugar and flavouring. They are meant to taste good, encouraging more to be drunk, resulting in better hydration. They can be high in calories.

Possible Follow-ups

- **Are sports drinks and energy drinks the same thing?** Sports drinks contain similar concentrations of salt and sugar as in the body. Energy drinks also contain caffeine and other stimulants like taurine, guarana and ginseng, which boost performance by blocking adenosine receptors in the brain. If adenosine receptors are blocked, adenosine cannot bind to the receptors to slow down cellular activity.
- **Will a sports drink make me fitter?** Sports drinks replace the water, sugar and salts that you lose when sweating during exercise. The sugar in them might give you some extra energy for a short time, but when this wears off it won't make you any fitter – only exercise will do that!!
- **Are pulse rates affected by sports drinks?**
- The RSC ran a *Chemistry in the Olympics Global Experiment* in 2012. This tested the effect of the same sports drink you are drinking on the results of competitors running 100m. Over 2,000 people from five different continents took part in this last year.

- The winner of the 2012 Olympic men's 100m sprint, Usain Bolt, ran 100m in 9.63 seconds.
- The winner of the 2012 Olympic women's 100m sprint, Shelly-Ann Fraser, ran 100m in 10.75 seconds.
- If you scan the QR code on the poster or handout, it takes you to the Chemistry in Sport website, which has lots of resources about sports and the Olympics.