

HEART RATE AFTER EXERCISE

National Curriculum Science KS2 PoS Sc1: 1a; Sc2: 2d

QCA Science Unit 5A: Keeping healthy

Scottish 5–14 Guidelines The processes of life – Level C

HOW TO GATHER THE DATA

The Programme of Study for Sc1 (Scientific enquiry) in the English National Curriculum encourages the use of secondary sources of data. Research papers such as the one cited here (Stratton, G and Leonard, J 2002) are very useful for this purpose. You can use this example to encourage debate among the children about the benefits of exercise. If coloured lines were painted on the playground, would more of them exercise at breaktime? You may want to discuss what they think the researchers found out (in fact, the children's energy expenditure increased by 35%).

The children can predict what factors will change the pulse rate, and what types of exercise will raise it the most. The most difficult part of the investigation for the children is measuring their own pulse rates accurately. Hand-held pulse monitors are available from scientific suppliers for £17 each. If the children

are taking their pulse by hand, remind them not to use the thumb because it has a pulse of its own. You can also ask the children:

- why the research scientists took measurements from several boys and girls, not just one (for greater reliability of results)
- why they measured the heart rate in the last minute of each activity (to make sure it had adjusted to the activity)
- why they used special equipment to measure the heart rates (for greater accuracy).

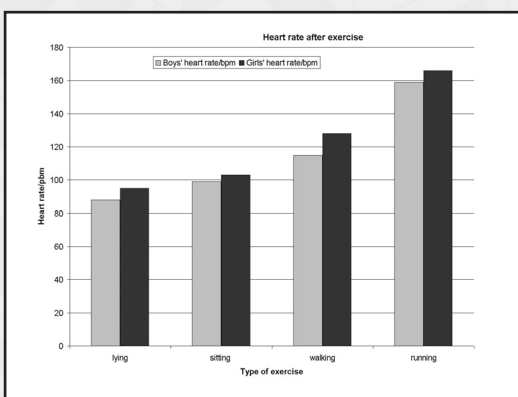
The mean heart rate was measured using a short-range radio telemeter (Sport Tester from Polar-Electro Kemperle, Finland) strapped to each child's wrist, sending radio signals to a receiver that computerised the data.

THE SCIENCE BEHIND THE DATA

The heart is a pump made of powerful muscle. Each contraction of the heart's left ventricle sends a burst of oxygenated blood around the body, and we feel this as a pulse where an artery is close to the surface. The body's muscle cells use glucose and oxygen from the blood to release energy by respiration. When we exercise, the muscles need more energy (from the breakdown of glucose) and more oxygen, so the heart pumps faster to send more blood to the muscles. The body feels hot, because the muscles have been working harder than normal and more energy has been released. The breathing rate increases to supply more oxygen to the blood. During maximum effort, an adult heart pumps 34 litres of blood per minute.

Answers

1. 88 bpm
2. None (the boys were lying down).
3. Yes: not much energy is needed to lie still, so the heart rate should be low.
4. The girls' heart rate was higher than the boys' by 13 bpm.
5. 166 bpm
6. The girls had been running for 4 minutes, using up a lot of energy, so their hearts would have needed to beat very quickly.
7. 44 bpm
8. (You may need to discuss with groups how they can display two sets of data on one graph for comparison.)



9. The children's heart rate was probably close to its maximum after 4 minutes of exercise, so it would not increase by much if the children exercised for a longer time.

10. The more active the exercise, the faster the heart rate (up to a maximum).