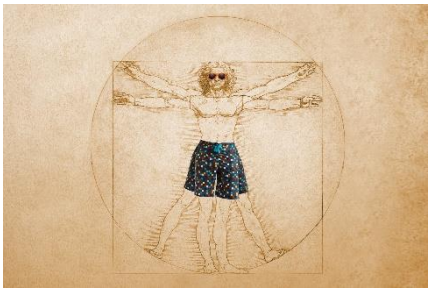
NPL

Measurement At Home

Report on ‘Vitruvian people’



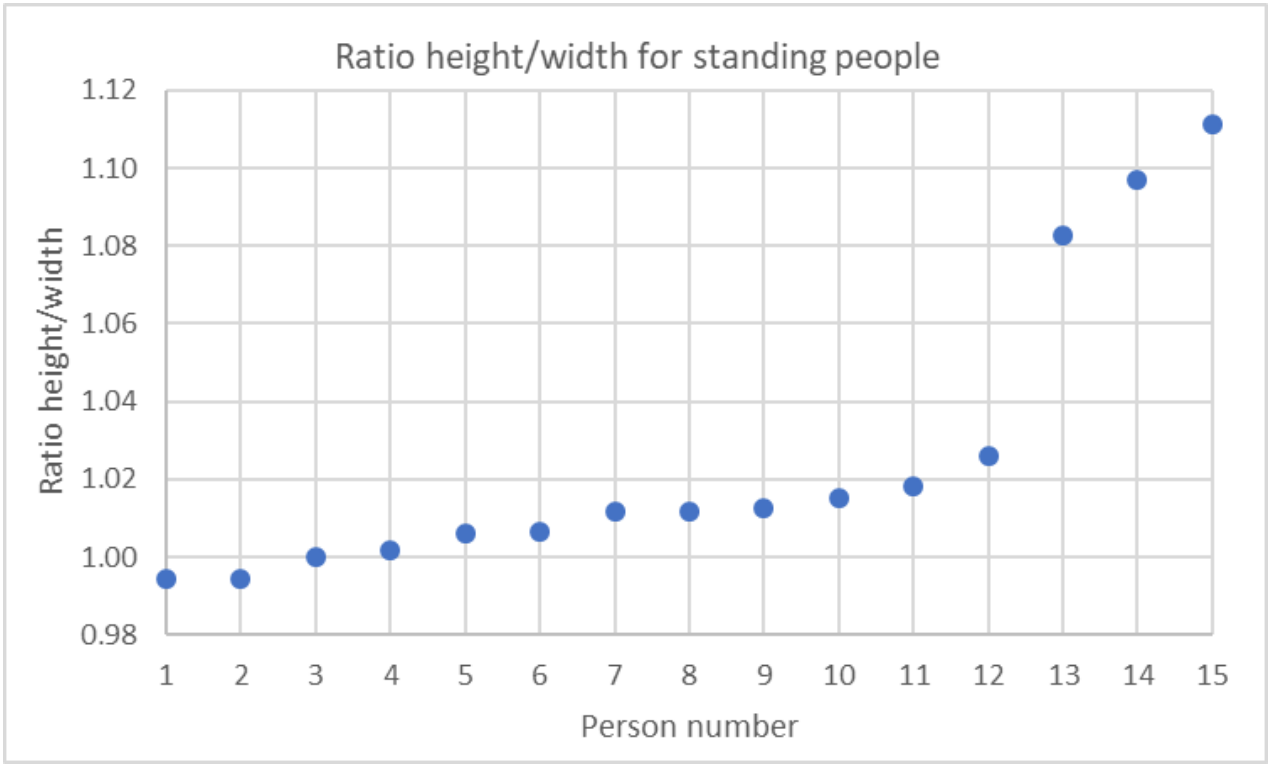
1. Overview

This report uses 19 results received within a few days of issuing the challenge. **Thank you:** Andrew, Bob, Dylan, Elizabeth, Fenris, Gordon, Grace, James, Jill, Kat, Layla, Merrin, Oliver, Philippa, Rhiannon, Robert and another Robert.

The overall finding was that the ‘Vitruvian ratio’ – height related to fingertip to fingertip distance - is close to 1:1, though only for adults. We confirmed that lying down measurably increases people’s height and discovered that age and gender affect the ratio. We also discovered something surprising about people’s arms and fingers when they lie down.

2. Was Vitruvius right?

In the chart below, dots show Vitruvian ratio for each person (identified by a number).



The results suggest Vitruvius’ assertion that width equals height is approximately right, though the investigation’s resolution is good enough to show that for most people, height exceeds width by 1-2 %. Some interesting trends came to light ***after*** we had issued the challenge which explains why people 13-15 were so non-Vitruvian - more about that in section 5.

3. Why did NPL insist each measurement was done 4 times?

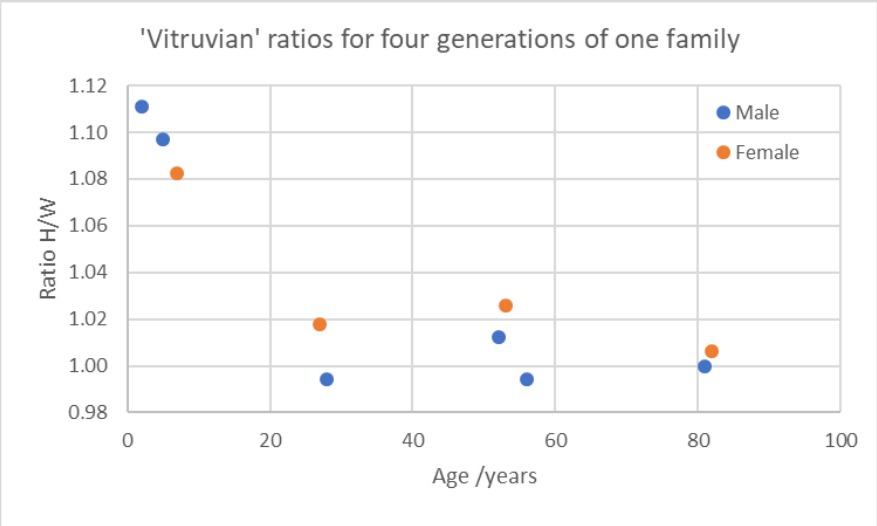
This wasn't just us trying to get test subjects to exercise more, rather, it was intended to obtain more accurate results. Dressmakers say: 'measure twice cut once', reminding us that you can't trust in a single measurement. By repeating, you increase likelihood of spotting blunders like misreading a tape measure, and by taking an average of several readings you can reduce the effects of some random contributions to uncertainty such as how you place the measuring tape. In this investigation typical ranges for the 4 results were +/- 1 cm.

4. Does lying down increase height?

Yes. We are grateful to **Elisabeth, Oliver** and **Grace** who did this extra test. It was worthwhile their doing the many measurements to provide enough confidence in the results to discriminate the small differences. After lying down for about 15 minutes heights increased from 132, 118.5 and 170.75 cm by 0.75, 1.75 and 2.25 cm respectively. We expected spine cartilage to stretch on lying down – increasing height, though we did not expect cartilage in arms and fingers to stretch too. In fact, the increase in 'width' was so similar to that in height, the Vitruvian ratio was unchanged.

5. 'Non-Vitruvian' People

One family sent results for 4 generations gathered at a Sunday 'Zoom' get together. They remarked upon how age and gender affected the result. The plot here of their results (in generation age clusters) shows females tend have taller height than fingertip-fingertip width. Also, as the children grow up, they progress closer to a ratio of 1:1, possibly reaching that point in late teens.



Our bodies do not grow proportionally. Baby's heads constitute more than a quarter of their height compared with about an eighth for an adult. Evidently, Vitruvian ratios change as we grow. We did rather 'kick ourselves' over this – if we had asked for test subjects' age and gender, we could have investigated more aspects.

Making additional discoveries during investigations and raising new lines of enquiry often happens in science research, and whilst it can be frustrating, ultimately adds to the excitement.

#MeasurementAtHome

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