Body and mind

Every human being is unique, both in body and in mind. But is the body or the mind responsible for making the decisions?

Is it the body that determines our talents and influences our choices in life?

For example:

- Are basketball players always tall?
- Do you need large hands to be a musician?
- Do you need to have a big head to be scientifically inclined?

Or is it the decisions our minds make that influence our physical development?

For example:

- If you start smoking at an early age, does it stunt your growth?
- Do people who drink milk have stronger bones?
- Do people who prefer soft drinks run a greater risk of being overweight?

Or can we say that the body and the mind influence each other?

Take wrist size for example.

Listed below are a few **hypotheses** about the size of a person's wrist that we can test, using Canadian random sample data from *Census at School*.

Please note: Since the Census at School questionnaire has changed over the years, some information was only collected in certain years/phases.

1. People who play hockey, baseball or basketball, or who practise martial arts have bigger wrists.
   (Data on wrist circumference and on favourite activities were collected during all phases.)

2. People who spend more than three hours a week playing computer games have bigger wrists.
   (Data on time use were collected in 2006/2007, 2005/2006, 2004/2005 and 2003/2004.)

3. People who drink milk have bigger wrists.
   (Data on favourite beverage were collected in 2004/2005 and 2003/2004 from Grades 4-8 students only.)

4. People who prefer soft drinks, sports drinks or chocolate milk have bigger wrists.
   (Data on favourite beverage were collected in 2004/2005 and 2003/2004 from Grades 4-8 students only.)

To test a hypothesis, first obtain a sample of 200 Canadian survey records. Visit www.censusatschool.ca, click on Data and results and under "International results and random data selector", click on "random data selector"**.** At the bottom of the next screen, click on "Choose data"**,** select "Canada" and then choose the appropriate collection phase and grade level for the hypothesis you will be testing.

From the dataset you obtained, select data for a group of students of the same age[1] and proceed as follows:

- Divide the group into two complementary subgroups:
  - those who correspond[1] to the description of the hypothesis in question (e.g., people who play hockey, baseball or basketball, or who practise martial arts)
  - those who do not correspond to the description

[1] .If you are working with Excel, the 'Sort' or 'Autofilter' functions can be used to identify groups and sub-groups of students.

- For each subgroup:
    - Retrieve the reported measurements of wrist circumference.
    - Look for any ‘far-out’ figures (those that just don’t make sense). Statistically speaking, these are referred to as **outliers**. You‘ll need to decide if the outliers should be rejected from your analysis.
    - From those measurements that you’ve decided to keep, identify the **maximum** and **minimum** values. The difference between these two values is called the **range**.
    - Calculate the **mean** of these measurements.

Fill out the following table for each hypothesis:

Hypothesis no. ___	Minimum	Maximum	Range	Mean
People who…				
People who don’t…				

- According to the table results, are there any hypotheses for which the results of the two subgroups show a **significant difference**?

  If so, what might explain that difference?

In answering this question, we must be extremely careful. Before interpreting a significant difference as a result of the effect of one **variable** (e.g., the question about sports practiced) on another (in this case, the circumference of the wrist), we must determine whether there might be a third variable, or **hidden variable**, that could explain the difference.

For example, suppose you observed that the mean wrist circumference is greater among people who play hockey, baseball or basketball, or who practise the martial arts. Does this mean that someone has to have big wrists to engage in these activities? Or does it mean that by practicing these sports, you are promoting wrist development? Is a third explanation possible?

Look at the breakdown of sports practiced by boys and girls in your sample. Accordingly, we must fill in a **contingency table**:

First, with **total numbers**:

	Girls	**Boys**	**Total**
Those who play hockey, baseball or basketball, or who practise the martial arts			
Those who don't play hockey, baseball or basketball, or practise the martial arts			
Total			

Then, with **frequencies**:

	Girls (%)	**Boys** (%)	**Total** (%)
Those who play hockey, baseball or basketball, or who practise the martial arts			
Those who don't play hockey, baseball or basketball, or practise the martial arts			
Total			100

What does this show us? If you observed a significant difference during the previous step, do you still interpret this difference the same way?

Try to identify the hidden variables for each hypothesis and present your results.

You can also test new hypotheses and attempt to associate another **anthropometric variable** (e.g., foot length) with other lifestyle variables (e.g., sport, eating habits). Establish an analysis plan, taking into account the possible hidden variables. Apply the plan to your sample.

Try to explain your results. Can you represent your data graphically in a way that justifies your conclusions? Remember that a picture is worth a thousand words … and a graph is worth a thousand numbers! Report your findings to the students in your class.

Contributed by France Caron, Université de Montréal, and Linda Gattuso, Université du Québec à Montréal