Professional Basic English
Lecture 10

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Expressing caution

- Literature: *Academic Essay Writing for Postgraduates, Unit 5. English Language Teaching Centre, University of Edinburgh, 2014*
- There are many possible causes for mistakes and misinterpretations in scientific studies
  - Mistakes in the results reported in the literature
  - Mistakes in test design or implementation
  - Correlation does not imply causation
- It is necessary to indicate the uncertainties in scientific writing
  - The strength of a claim must match the strength of the evidence

Why is it important to be cautious…

Faster-than-light neutrino anomaly

From Wikipedia, the free encyclopedia

In 2011, the OPERA experiment mistakenly observed neutrinos appearing to travel faster than light. Even before the mistake was discovered, the result was considered anomalous because speeds higher than that of light in a vacuum are generally thought to violate special relativity, a cornerstone of the modern understanding of physics for over a century.[1][2]

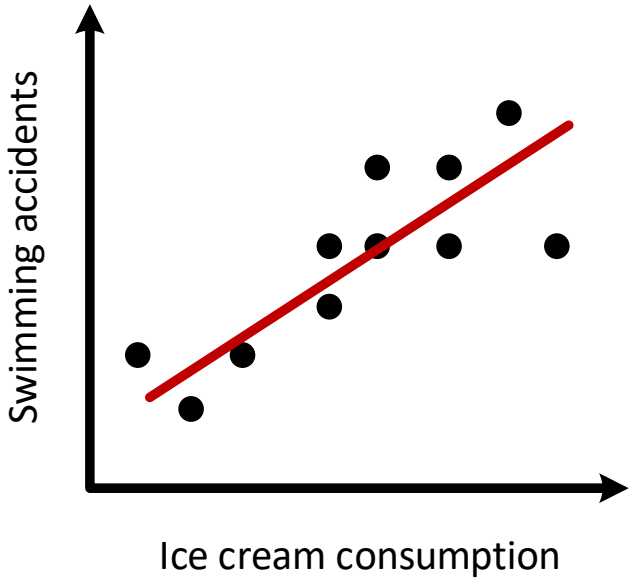
OPERA scientists announced the results of the experiment in September 2011 with the stated intent of promoting further inquiry and debate. Later the team reported two flaws in their equipment set-up that had caused errors far outside their original confidence interval: a fiber optic cable attached improperly, which caused the apparently faster-than-light measurements, and a clock oscillator ticking too fast.[3] The errors were first confirmed by OPERA after a ScienceInsider report;[4] accounting for these two sources of error eliminated the faster-than-light results.[5]Reich (2012c)

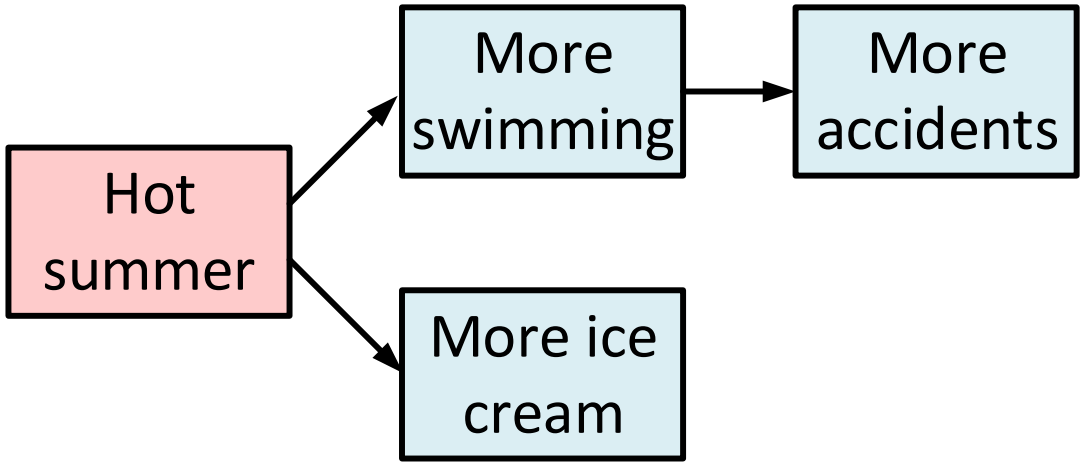
Sources of uncertainty

- Uncertainty of the results by the others
  - Outdated information, mistakes in experiments or interpreting the results, (rarely) intentional misleading (scientific fraud)
  - The more researchers have obtained the same results independently, the more certain the results are (scientific consensus)
- Uncertainty of the results obtained by yourself
  - Mistakes in the test design, wrong analysis methods, logical fallacies
  - Wishful thinking: trying to explain results to match with the hypothesis
  - Correlation does not imply causation

Correlation does not imply causation

- Swimming accidents and ice cream consumption are highly correlated: eating ice cream causes swimming accidents?
- More credible explanation: hot summer increases ice cream consumption and swimming, temperature is the real cause





Classroom task 1: alternative explanations

- Is the conclusion plausible? What alternative explanations there could be in the following scenarios?

Words expressing degree of (un)certainty

- Used to adjust the strength of the claim in e.g. cited research
- Hedged claims (claims limited by conditions) are *'tentative'*, *'limited'*, *'moderate'*, or *'modest'*
- Claims that are stronger than justified by evidence are *'overstated'*, *'exaggerated'*, or *'immoderate'*
- Claims not supported by evidence are *'unfounded'* or *'unwarranted'*

Words for expressing caution

- **Modal verbs:** *can / may / might / could (have ..ed)*
- **Full verbs:** *appear to / seem to (have ..ed) / suggest, point to, imply*
- **Adverbs:** *apparently / perhaps / possibly / potentially*
  relatively / comparatively
  arguably
- **Nouns:** *possibility, potential, (on the) evidence (available)*
- **Adjectives:** *possible / potential / plausible / probable / likely /*
  not impossible / reasonable to assume

Avoid generalizations

Do not use	Do use
“All computer scientists are good in math”	“Computer scientists are usually good in math”
“Everyone knows that nothing travels faster than light”	“There is general agreement that nothing travels faster than light”
“The results prove that Python is the best programming language for AI”	“The results suggest that Python is the most suitable programming language for AI”

- Avoid words like “all” or “everyone”, unless it is certainly true

Classroom task 2

- Read the extract from a study investigating how British students who speak Spanish as a second language (L2) are influenced as they learn Portuguese as a third language (L3). Find the definite expressions and the cautious expressions.

Source: *Writing Postgraduate Assignments*, English Language Teaching Centre, 2010

Caution in interpreting others' research

- It is important to check the results from different sources (if available)

  Smith et al. [1] have found evidence that X causes Y. However, the findings by O'Connel et al. [2] suggest that in fact, Z may cause both X and Y…

- If there is no scientific consensus or the topic is not yet mature, use cautious expressions

  There is some evidence that X causes Y. Nevertheless, more research is needed to exclude other possible explanations.

- Be clear about what are your own interpretations and what is claimed in the references

  We assume that different results could be obtained by using different methodology from Smith's [1].

Caution in interpreting your own findings

- It is important that you choose the appropriate level of certainty when interpreting what you have found in your own research
- Highest level of certainty if you have repeated experiment done earlier by someone else, and your findings are similar
  - *Our results are similar to [1], and therefore provide further evidence of X …*
- If the results are as expected, you can be reasonably sure about them
  - *X and Y are highly correlated, supporting the hypothesis that X causes Y …*
- If you have unexpected results, you need to be very cautious
  - *Unexpectedly, only weak correlation between X and Y was observed. More research is needed to verify the results and formulate alternative hypothesis.*

Caution in interpreting data

- Take your time to look at the data, don't rush to conclusions
  - Check main headings and pick up some numbers to check if they make sense
  - Go back to the labels to be sure you know what you are looking for
  - Scan the table horizontally and vertically, check especially for **high and low points**, **trends** and **blips**
- Summarize yourself the main conclusions you think can be drawn

Smartphone ownership % (2015)

	Smartphone ownership (2015)			GDP (PPP)	Average
Country	Total	Age 18-34	Age 35+	per capita	Age (years)
South Korea	88%	100%	83%	38 k$	41.8
USA	72%	92%	65%	59 k$	38.1
Germany	60%	92%	50%	51 k$	47.1
China	58%	85%	43%	17 k$	37.4
Russia	45%	76%	29%	26 k$	39.6
Brazil	41%	61%	26%	15 k$	32.6
Japan	39%	77%	31%	44 k$	47.3
Nigeria	28%	39%	13%	6 k$	18.4
India	17%	27%	9%	7 k$	28.1
Tanzania	11%	14%	6%	3 k$	17.7
Uganda	4%	6%	2%	2 k$	15.8

Discussion of limitations

- It is essential to discuss limitations of your research in your reports
  - Related to cautiousness in scientific research
  - Shows intellectual honesty and transparency
- Different possible limitations exist
  - Limited datasets or small scale experiments
  - Robustness depends on model parameters
  - Algorithm works well only in specific conditions, or performs poorly in specific conditions (e.g. image recognition in low light)

Summary

- In scientific writing, it is important to express caution
  - Indicates the degree of uncertainty in the results
  - Shows intellectual honesty
  - Especially important when the results are unexpected
- Caution is also needed when interpreting the results by others
  - Check from many different sources, if possible
  - Distinguish clearly your own conclusions and the conclusions by the others in the references