2. Criteria for evaluating arguments

So far, we have examined a basic skill of argument *analysis* – how to identify the conclusion and the premises of an argument. Having arrived at a preliminary analysis of the argument, the next step is to *evaluate* it – that is, form an opinion on how successful the argument is. In other words, we have to decide whether or not the argument really establishes that its conclusion is true.

There are two fundamental conditions an argument must satisfy in order for it to be successful:

The two criteria for a successful (cogent) argument:

1. All the premises must be **acceptable as true.**
2. The premises must be **sufficient** to establish the conclusion.

Other terms used to describe successful arguments are *cogent* and *sound*.

For an argument to be successful, it must satisfy both conditions 1 *and* 2. If either one, or both of these conditions fail, then the argument is not successful – it does not establish its conclusion.

What this means is that there are two *different* ways in which you can criticize an argument. Firstly, You can argue that one or more of the premises are false. Secondly, you can argue that the premises – even if they were true – might fail to provide sufficient support for the conclusion. Of course, a really bad argument might go wrong in both ways at once. Let us begin our study of argument evaluation by looking at each of the two conditions in turn.

Truth

If a premise in an argument is not true, then the argument cannot be a successful one. In a successful argument, *all* the premises must be true. Consider the following example:

The earth is flat. So, if you sail too far in one direction you will eventually fall off.

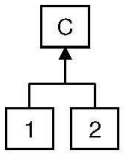
Does this argument prove its conclusion – that if you sail too far in one direction, you will eventually fall off the edge of the world? Of course not. The reason this argument fails is obvious; the premise on which it is based is false. The earth is not flat.

It is important to recognise that an argument with a false premise fails *even if the conclusion is true or plausible*. Here is an example:

Not all birds can fly. Puffins are birds and they can't fly.

Let's put this argument into standard form:

1. Puffins are birds.
2. Puffins can't fly.
Therefore:
C. Not all birds can fly.



The conclusion of this argument is certainly true. There are several species of flightless birds: penguins are everyone's favourite example. But although the conclusion of the argument is true, this argument fails to establish that conclusion. The reason is that premise 2 is false – Puffins *can*

actually fly (though not very elegantly). So this argument is not successful – it does not *prove* that its conclusion is true, even though that conclusion *is* actually true. The truth or plausibility of the conclusion by itself tells you nothing about the success of the argument of which it is a part. Notice that in this example, the other premise *is* true: puffins *are* a species of bird. But that is not enough – remember that for an argument to be successful, *all* of the premises must be true.

How do you make a judgement about the truth of the premises? There is no general answer of course, but here are some 'critical questions' you could ask:

- Does the premise come from an **expert source** or a **reliable authority**?
- Could you easily check whether the premise is true by looking it up in a reference book or other reliable source?
- Is the premise beyond reasonable doubt? Is it common knowledge?
- Does the premise contradict something else you know to be true?
- If the premise is a **generalisation**, can you think of any **counter-examples**?

We will discuss generalizations, counter-examples and the evaluation of sources for reliability later in this guide.

Support

For a set of premises to count as a good reason for accepting a conclusion they must all be true. But that is not all. They must also *support* the conclusion. To say that premises support a conclusion is not to say something about the truth of the premises, but about the *connection* between the premises and the conclusion. It is to say that *if* the premises were true, they would provide a sufficient reason for thinking that the conclusion is also true. In that case, we can say that the truth of the conclusion *follows from* the truth of the premises, or that the premises *entail* or *imply* that the conclusion is true.

> A set of premises **support** a conclusion when the following condition is satisfied:
>
> *If* the premises were all true, they would be **sufficient** to establish the conclusion as true.
>
> When a set of premises support a conclusion in this sense, we also say that the conclusion *follows from* the premises or that premise *imply* or *entail* the conclusion.

If this condition is satisfied then the premises support the conclusion in a *conditional* sense: we have a sufficient reason to think the conclusion is true *if* the premises are true. If the premises do not support the conclusion in this sense, then the argument cannot be a successful one, because in that case, even if the premises were true they would not provide a sufficient reason to accept the conclusion.

Note that as we are using the term, 'support' it is not something that comes in degrees. Premises are either sufficient to establish a conclusion or they are not. If the premises are *not* sufficient to establish the conclusion, they do not support it.

Two types of support: deductive and inductive

Another way to explain the idea of support is the following. For premises to support a conclusion, the *reasoning* (or *inference*) involved in moving from the premises to the conclusion should be *valid* reasoning. Valid reasoning is *reliable* reasoning in the following sense: if you start with truths and use only valid reasoning, you will arrive only at further truths and not falsehoods. Reliable reasoning is

'truth preserving'.

In the next chapter we will look at an especially important kind of support, which is *perfectly* reliable. It is called **deductive support** (or deductive validity). Given true premises, a deductively valid inference *always* produces true conclusions. In other words a deductively valid inference *never* produces false conclusions from true premises. It's like a car that never fails to start, provided there's petrol in the tank.

In real life nothing is ever *perfectly* reliable and the same is true with arguments. Many kinds of inference in common use are not deductively valid, but are still sufficiently reliable. They *rarely* produce false conclusions from true premises, though they can occasionally lead us astray. They are like a very reliable car that hardly ever fails to start, given that there's petrol in the tank. We call this kind of support *inductive*, to distinguish it from the perfectly reliable *deductive* support.

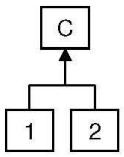
Examples

Here is a simple argument in which the premises *do* support the conclusion:

> Penguins can definitely fly. After all, penguins are birds and all birds can fly.

In standard form, this argument would look like this:

1. All birds can fly.
2. Penguins are birds.
Therefore:
C. Penguins can fly.



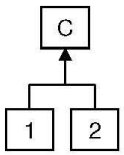
Clearly this argument has a false premise, so it would fail to satisfy the first condition for a successful argument. Although premise 2 is true, premise 1 is not. However, the argument *does* satisfy the second condition: *If* both premises were true, then it would follow that penguins can fly. In this example then, the premises *support* the conclusion in the conditional sense we have given to that term. Even though one premise is false, *if* they were both true, the conclusion would also be true. In fact, this is an example of a deductively valid argument – the truth of the premises guarantees the truth of the conclusion.

This example illustrates a very important point: the premises of an argument can support the conclusion *even if they are not all true*. Truth is not required for premises to support a conclusion. What is required is that *if* the premises were true, they would provide a sufficient reason for accepting the conclusion. As the above example shows, this condition can be satisfied by false premises. That is why 'truth of the premises' is a separate, independent condition an argument must satisfy to be successful.

The argument about puffins we looked at above is also like this; the premises support the conclusion, but one of the premises is false. In these arguments, there is the right kind of *connection* between premises and conclusion but the argument still fails because not all of the premises are true. The car is perfectly reliable, but there's not enough petrol in the tank.

A successful argument for the (correct) claim that not all birds can fly would be the following:

1. Penguins are birds.
2. Penguins can't fly.
Therefore:
C. Not all birds can fly.



This argument satisfies *both* of our two conditions for a successful argument. The premises are both true. Penguins are classified as birds by biologists. And although they are excellent swimmers, their wings are so stunted they cannot fly. (They make excellent flippers though).

The argument also satisfies the *second* condition. The premises *support* the conclusion. The truth of the premise does indeed give us a sufficient reason to think the conclusion is true. Given that the premises *are* true, it follows that the conclusion is true too and so the argument succeeds in establishing its conclusion. Once again, this is deductive support – the inference involved is deductively valid. In fact, you can probably already see that the inference used here is exactly the same kind as the one about puffins. The only difference is that this time the premises talk about penguins rather than puffins.

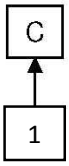
Inductive support

Here is an example where the premise provide *inductive* support for the conclusion:

> The wine glass must have smashed to pieces: Trevor just dropped it from the third floor balcony of my apartment.

Here is the argument in standard form:

1. Trevor just dropped the wine glass from the third floor balcony of my apartment.
Therefore:
C. The wine glass has smashed to pieces.



Could the premise of this argument be true and the conclusion false? Could someone drop a wine glass from a third floor balcony and it *not* smash into pieces? Well, it's *possible*, but not very likely. A passing bird *might* have caught the glass as it fell. More plausibly, the glass *might* have landed in something soft enough to prevent it breaking. But neither of these possibilities is as likely as the glass breaking when it hits the ground. So in this case, we should say that the premise does support the conclusion. If the premise was true, that would in normal circumstances be a sufficient reason to accept the conclusion as true too.

Arguments like this are not deductively valid – it is still possible for the premises to be true and the conclusion false. But they do provide support for their conclusions nonetheless. An argument like this is sometimes called an *inductively valid* argument. We will say that in arguments likes these, the premises provide *inductive support* for the conclusion.

If premises provide inductive support for a conclusion and the premises are true, we have sufficient reason to accept the conclusion – for the time being. But since in this case the truth of the premises does not *guarantee* the truth of the conclusion we should be aware that new information can weaken the support the premises give to that conclusion. For example, if we discovered that the wine glass Trevor dropped was made not of ordinary glass but of a special extra-strong shatter proof glass designed for use on submarines, we would now have to say that his having dropped it from the balcony is no longer sufficient to warrant the conclusion. The new information we have

undermines the support that premise gives to the conclusion.

Inductive support is less conclusive than deductive support since it does not entirely rule out the possibility that the conclusion is false. Nevertheless, it is still a perfectly good (and very useful) way of supporting conclusions. Scientific thinking in particular, thrives on this kind of support. Scientific theories and hypotheses are hardly ever supported *deductively* by the evidence for them. Instead, the evidence provides them with strong inductive support. For example, the evidence we have for Einstein's theory of Special Relativity is very strong indeed. But none of it entirely rules out the possibility that the theory might be false. This is part of what makes science exciting: the possibility that currently accepted may one day be overturned, when some future Einstein comes along with a better theory.

Evaluating support

How can you judge whether the premises in an argument support the conclusion? In the case of deductive support, there are common patterns of valid argument that are easy to identify; we discuss these in the next chapter. We will also look at some common types of inductive argument; arguments that generalize from a sample and arguments for causal claims. We will discuss arguments for policies, decisions and ethical principles. For each kind of argument, we will look at some typical ways they can fail to support their conclusions and explain what it is required for them to succeed in supporting their conclusions.

Whatever the argument though, the essential question to ask is this: assuming that the premises are true, are they *sufficient* to establish the conclusion as true? Assuming that the premises are true, are there possibilities, considerations, situations, cases or examples which would count *against* the conclusion? If there are possibilities, considerations, situations, cases or examples which would count against the conclusion and which the premises do not rule out, then the premises do *not* support the conclusion. But if the premises rule out any reasonable ground for thinking the conclusion false, then they *do* support the conclusion.

Biases in assessing support

It is very important to realise that an argument in which the premises do not support the conclusion fails *even if the conclusion is true or plausible.* Consider this example:

> Anything that has an engine need oil. Cars need oil. Therefore, cars have engines.

The conclusion of this argument is true: cars do have engines. But the argument fails because the premises do not support the conclusion. To see this, pretend that you did not know whether cars have engines or not. Suppose you were an alien recently arrived on planet Earth and didn't know anything about 'cars' or 'engines'. Suppose somebody tells you that the premises of this argument are true and you believe them. So now you believe that anything that has an 'engine' (whatever that is) needs 'oil' (whatever that is). You also believe that 'cars' (whatever they may be) need 'oil'. Should you now believe that cars have engines?

The answer is clearly *no*. You know that things with engines need oil. But for all you know, there could be lots of things without engines that need oil too (as indeed there are: bicycles also need oil). For all you know, 'cars' might also be an example. Just being told that cars need oil doesn't rule that out. So you actually have no reason to think (on the basis of the information you've been given) that cars have engines. For all you know, they *could be* one of the things that need oil even though they don't have engines. So accepting the premises as true would not enough to make the conclusion acceptable too. Hence, in this example, the premises do not support the conclusion, even though that conclusion *is in fact perfectly true*.

To reiterate: whether or not premises support a conclusion is independent of whether or not the conclusion is true or plausible. However, many psychological studies show that people are typically not very good at making objective judgements about whether premises support a conclusion. People tend to overweigh the evidence for a conclusion they already believe or know to be true – a tendency that has become known as *myside bias*.

These studies show that (on average) it is harder for people to correctly judge when premises fail to support a conclusion if the conclusion is one they already believe. In the same way, it is harder for people to correctly judge that premises *do* support a conclusion if the conclusion is one they reject. This is something you should try to take account of when deciding whether premises support a conclusion. When assessing support, always pretend that you suspend belief in the conclusion, especially when it is a conclusion you actually believe to be true. Then ask, if I accepted all the premises, should I be more or less inclined to believe the conclusion?

Summary

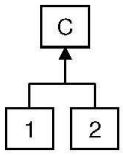
There are **two** fundamental criteria for evaluating arguments:

1. Truth: The premises must be true.
2. Support: If the premises are all true, they would be provide sufficient support for the conclusion.

For an argument to be a good one it must satisfy *both* conditions. The premises must all be true and the conclusion must follow from the premises. If one or more of the premises is false, or if the conclusion does not follow (or both) then the argument is not a good one – it fails to establish its conclusion.

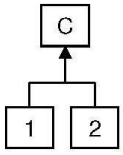
The two conditions for a successful argument are completely independent. It is perfectly possible for an argument to satisfy one of them and not the other. The examples we have already looked at illustrate this point. In this argument:

1. Puffins are birds.
2. Puffins cannot fly.
Therefore:
C. Not all birds can fly.



the second condition, but not the first is satisfied. The conclusion follows from the premises, but one of the premises is false (puffins *can* fly). By contrast, in this argument:

1. Anything that has an engine need oil.
2. Cars need oil.
Therefore:
C. Cars have engines.



the first condition, but not the second is satisfied. The premises are both true, but as we saw, the conclusion does not follow.

An argument in which the conclusion follows from the premises is sometimes called a *valid* argument. If in addition, the premises are all true, the argument is said to be *sound*.

Warning: A *bad* argument can have a *true* conclusion

It is very important to realise that just because an argument is not successful, that does *not* show that the conclusion is false. All it means is that the given argument does not *prove* that the conclusion true. The conclusion may still be true for all that. Then again, it may not be. A failed argument does not establish the conclusion one way or the other. Do not be tempted to jump to the conclusion that a claim or hypothesis must be false because the argument given for it is unsuccessful.

Further Reading

For more on the two criteria for evaluating arguments, see:

Alec Fisher: *Critical Thinking: an introduction* (2nd edition), Chapter 8.
Anne Thomson, *Critical Reasoning: a practical introduction*, Chapter 2, pp. 39-48.

For more about myside bias (and the related 'confirmation bias') see:

Jonathan Baron, *Thinking and Deciding*. Cambridge; New York: Cambridge University Press, 1994. Chapters 14-15.
T. Gilovich, *How We Know What Isn't So: The Fallibility of Human Reason in Everyday Life. New York*: The Free Press, 1993. Chapters 4-6.
D. Kahneman, *Thinking, fast and slow*. Chapter 3 ('The Lazy Controller'), pp. 39-49 and Chapter 7 ('A machine for jumping to conclusions') pp. 79-88.

Exercise 2.1 Assessing the truth of claims

Have a look at each of the following common beliefs. Some of them are true and some are false. Which ones do you think are true and which false? How could you find out? For those you think are true, try to think of some evidence that would support or undermine the claim. Some of these claims are discussed on the 'urban legends' website: www.snopes.com

1 People who go swimming less than one hour after eating will get a cramp and drown.

2 Chewing gum takes seven years to pass through the human digestive system

3 The Nobel Foundation does not confer a prize for achievement in mathematics because the man who established it, Alfred Nobel, was upset that his wife was carrying on an affair with an eminent mathematician

4 Tapping the side of a can of fizzy drink will prevent its contents from foaming over when you open it.

5 Cooking food in a microwave seriously depletes its nutritional value.

6 The Great Wall of China is the only man-made object visible from the moon.

7 A penny placed on the tracks can derail a train.

8 A tooth left in a glass of Coca-Cola will dissolve overnight.

9 Plastic chopping boards are more hygienic than wooden ones.

Exercise 2.2 Assessing support for conclusions

For each of the following arguments, write out the argument in standard form and say whether you think the premises provide sufficient support the conclusion. Explain your answer.

1 Most antidepressant drugs cause weight gain. While dieting can help reduce the amount of

weight gained while taking such antidepressants, some weight gain is unlikely to be preventable. It follows that at least some patients taking antidepressant drugs gain weight as a result of taking them.

2 Since children who read voraciously are more likely to have defective vision than children who do not read very much, it follows that children who do not like to read usually have perfect vision.

3 There are a growing number of organisations which have been set up to deal with bullying. So bullying must be on the increase.

4 All mammals are herbivores and dogs are mammals. Therefore, dogs are herbivores.

5 Some flowers have thorns and roses are flowers. Therefore roses have thorns.

6 Politician: The funding for the new nationwide health-awareness campaign should come from an increase in taxes on cigarettes. It is well established that cigarette smoking causes many serious health problems, and it is only reasonable that people whose unhealthy habits cause so many health problems should bear the costs of that campaign.

7 Physical education should teach people to pursue healthy, active lifestyles as they grow older. But the focus on competitive sports in most schools causes most of the less competitive students to turn away from sports. Having learned to think of themselves as unathletic, they do not exercise enough to stay healthy. That is why physical education should include non-competitive activities.

8 Long-standing success of a theory in physics is no guarantee that the theory will continue to be dominant indefinitely. Newtonian physics dominated science for over two centuries. It found consistently successful application, becoming one of the most highly substantiated and accepted theories in the history of science. Nevertheless, Einstein's theories came to show the fundamental limits of Newtonian physics and to surpass the Newtonian view in the early 1900s, giving rise once again to a physics that has so far enjoyed wide success.

9 The druid stones discovered in Ireland are very, very old. But this particular druid stone was discovered in Scotland, so it must be of more recent vintage.

10 In rheumatoid arthritis, the body's immune system malfunctions by attacking healthy cells in the joints causing the release of a hormone that in turn causes pain and swelling. This hormone is normally activated only in reaction to injury or infection. A new arthritis medication contains a protein that inhibits the functioning of the hormone that causes pain and swelling in the joints. Therefore, any patient treated with the new medication for rheumatoid arthritis could sustain a joint injury without becoming aware of it.

11 Using rational argument in advertisements does not persuade people to buy the products being advertised. Therefore, advertisers who replace rational argument with non-rational appeals to emotion in advertisements will persuade people to buy the products being advertised.