

The Conjunction Fallacy

Kevin Dorst
kmdorst@mit.edu

24.223: Rationality

I. Extensional vs. intuitive thinking

'Extensional' thinking: how likely something is depends on how 'big' the set of possibilities is where it happens.

Mud diagrams

Any such approach validates the **conjunction rule**: $P(A \& B) \leq P(A)$.

Q: Does people's thinking respect this rule?

First pass: maybe not. It seems like more-specific events can be easier to think of; and if we use how 'available' examples are to estimate probabilities, we can get apparent violations.

- How many people are killed by fish each year?
- How many words on this page fit the form `__ _ _ _ n _`?

This isn't yet strong evidence for violation of the conjunction rule. Different ways of asking questions can give people different evidence.

Example: `___mt`

II. Basic Result

Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Linda is a teacher in elementary school.

Linda works in a bookstore and takes Yoga classes.

Linda is active in the feminist movement. [F]

Linda is a psychiatric social worker.

Linda is a member of the League of Women Voters. Linda is a bank teller. [T]

Linda is an insurance salesperson.

Linda is a bank teller and is active in the feminist movement. [T&F]

Direct-subtle: rank each by probability.

→ 88% violated conjunction rule.

'Indirect': receive only one of T, F, or T&F. Compare ranks. No differences.

Direct-transparent: Which of the following do you think is more likely?

Linda is a bank teller.

Linda is a bank teller and is active in the feminist movement.

85% chose the second.

III. Alternative/rationalizing explanations?

Gricean reasoning. ('Why did he say that?')

'He ate some of the cookies'

'He has good handwriting'

'He ate a burger.'

Interpret T as T&¬F?

- When *ranking* probabilities, 82% commit CF.
- Presented with two arguments (extensional vs similarity), 65% rated the latter as more convincing.
- 'If you could win \$10 by betting on an event, which of the following would you choose to bet on?'
 - 56% CF rates in undergrads. (36% in stat-sophisticated grads)
- Did it with T* = 'Linda is a bank teller whether or not she is active in the feminist movement'.
 - 57% did CF, and only 16% said $P(T\&F) < P(T^*)$.

Dulany & Hilton 1991:

Linda is a bank teller and regardless of the actual likelihoods, there are simply two logical possibilities: she must either be or not be active in the feminist movement

Messer and Griggs 1993:

Linda is a bank teller regardless of whether or not she is also active in the feminist movement

Macdonald and Gilhooly 1990:

Linda is a bank teller who may or may not be active in the feminist movement.

BUT they asked it about the future. When Agnoli and Krantz (1989) ask same question about the present, they get 69% CF rates.

Interpret 'how likely' as which is *made more likely* by vignette?

Confirmation: often $P(A\&B|E) > P(A\&B)$, without $P(A|E) > P(A)$.

- CF can happen even when no evidence is provided. Flood vs. earthquake + flood case.
- CF happens when both conjuncts confirmed: runner (double-CF).
- Confirmation theory makes clearly-wrong predictions.

IV. Diagnosis

Representativeness heuristic.

Evidence:

- The picture in your head of Linda is more representative of / similar to T&F than to T.
- Extremely high correlations between representativeness-judgments and probability ones.

'Exhaustification'

Eh.

Eh.

Note: not actually incentivized.

Eh. 'How likely do you think it is that I'm a runner whether or not my brother is?'... 'Huh?'

→ 38% CF rates

→ 56% CF rates

→ 20% CF rates.

T&F an example

But this is indirect test + diff evidence. Better: Bo Derek wins award and Governor Blanchard passes bill

Which is more likely?:

- 1) Linda is a bank teller
- 2) Linda is a feminist bank teller with a hangnail on her left pinky finger who was born on July 30 and likes apples.

Similarity, but not nec. symmetric

That's also evidence for misinterpretation of question.

What exactly *is* representativeness? No precise theory given.

- Not just confirmation, as we've seen.
- Form a maximally-specific guess, and then see how close hypothesis is to it?

No—they say HHHTHT is more representative than HTHTHT.

Also wrongly predicts over-specificity: 'Feminist bank teller who likes chocolate, hot coffee, and dogs'

Is 'representativeness' just a black box for whatever governs people's judgments about what they 'think is likely'?

What's explanation for why CF rates fall dramatically with *frequency formats*? They say:

It appears that extensional considerations are readily brought to mind by seemingly inconsequential cues? The force of the conjunction rule is more readily appreciated when the conjunctions are denned by the intersection of concrete classes than by a combination of properties.

Seems unlikely. When explicitly presented with the extensional class-inclusion argument, most people rejected it!

IV. 'Fallacy'?

A judgment is appropriately labeled a fallacy when most of the people who make it are dis- posed, after suitable explanation, to accept the following propositions: (a) They made a non-trivial error, which they would probably have repeated in similar problems, (b) the error was conceptual, not merely verbal or technical, and (c) they should have known the correct answer or a procedure to find it... Subjects who have erred because of a misunderstanding are likely to reject the propositions listed above and to claim (as students often do after an examination) that they knew the correct answer all along, and that their error, if any, was verbal or technical rather than conceptual. (304)

This is dangerously close to saying 'it's a fallacy if you can convince most people that they've made a mistake'.

Compare: 'A number is *florp* if it's a prime number greater than 2.'

Is 3 florp?
Is 4 florp?