The Card People Pick Second Most Often Carries Exactly Zero Information

— Taking the rule "if p then q" with a prior of 0.5, the two cards that can falsify it (p and not-q) carry 0.311278 bits each, while the other two (q and not-p) carry exactly 0.000000000 — the separator is whether a card can falsify the rule — [Paper 699]

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— *From thinking to syncing.* —

Abstract

In the Wason selection task the second card people turn is the consequent of the rule itself. Whatever is on its back, it cannot contradict the rule.What each chosen card carries is counted here in bits.No new theorem or law is claimed. First, and this is the core. Two of the four carry exactly zero——the q card and the not-p card carry 0.000000000 bits, and only the two that can falsify carry 0.311278 (Section 2). **Second, the zero is not an artefact of the prior——whatever prior is assumed, a card that cannot falsify still cannot, and its information stays at zero** (Section 2). **Third, people do worse than chance——picking two at random gives 0.166667, against a reported figure of about 0.100000, a ratio of 0.600000** (Section 3). **Fourth, doing worse than chance is itself the evidence of a bias——random choice would give 0.166667; falling below it requires a leaning towards one particular wrong pair** (Section 3). **Fifth, that pair leaves exactly half the information on the table——it carries 0.311278 bits against the 0.622556 of the correct pair, a fraction of 0.500000** (Section 3). **Sixth, the separator is whether a card can falsify the rule——not whether it is named in the rule; people substitute the second for the first** (Section 4). **Keywords**: Wason selection task, falsification, information in bits, confirmation bias, matching bias, observation of zero value.

> **Scope of this paper (scope note)**: **No new theorem or law is claimed——the Wason selection task, the low rate of correct answers and matching bias are all standard (Wason 1968, Evans and Over 2004).The experiment is not reproduced——the figure of 0.100000 is taken as a representative reported value; actual figures move widely with the task and the population.Content effects are not derived——that framing the rule as a social contract raises the rate is mentioned and not explained.No psychological mechanism is offered——why people match the words of the rule is not discussed.The assumptions are not claimed——the prior of 0.5, and the probability 0.5 that a p card shows q when the rule is false, are assumed; other values change 0.311278. The two zeros do not move.Relation to earlier papers**: **Paper 281 showed that a quantum state cannot be copied yet can be corrected, the syndrome carrying only the location of the error——there what to measure in order to obtain information was counted from the side of design. Here the same unit counts an observation of zero information being chosen. The same bits, working in opposite directions.**What is added is **computing the information of all four cards and showing two to be exactly zero**, **showing that zero not to depend on the assumptions**, **putting the ratio against chance at 0.600000**, **showing the commonly chosen pair to reach only 0.500000 of the correct pair**, and **placing the separator on whether a card can falsify**.

1. Notation and the Question

Setting: **let π be the prior probability that the rule "if p then q" holds, and θ the probability that a p card shows q when the rule is false. Measure the information of turning a card by the drop in entropy.**

$$I = H(\pi) - \mathbb{E}\left[H(\pi \mid \text{face seen})\right], \qquad \pi = 0.5, \qquad \theta = 0.5$$

For a card no face of which can contradict the rule, the posterior never moves and $I = 0$.

Question: **which cards carry information?**

2. Two of Them Are Exactly Zero

Computation 2.1: **the information of each of the four cards was derived.**

card	can it falsify	information
p (the antecedent)	yes	**0.311278** bits
q (the consequent)	no	**0.000000** bits
not-q	yes	**0.311278** bits
not-p	no	**0.000000** bits

Observation 2.2

this is the core: the zero is not an approximation.Behind the q card, either p or not-p is consistent with the rule, so no face moves the posterior——"looking tells you nothing" can be written as 0.000000000 bits.

Observation 2.3

the zero does not come from the assumptions.Whatever π and θ are set to, a card that cannot falsify still cannot——the value 0.311278 moves with the assumptions; the two zeros do not.

Observation 2.4

p and not-q carry the same.Both give 0.311278 bits, differing by 0.000000000——nothing on the side of information favours one over the other.

3. Worse Than Chance

Computation 3.1: **choosing two of four at random gives one correct pair out of six, a rate of 0.166667; choosing any subset with equal probability gives 0.062500.**

Observation 3.2

the reported rate lies below both.The representative 0.100000 is 0.600000 of the rate for choosing two at random——random choice would not produce this; falling below it requires a leaning towards one particular wrong pair.

Computation 3.3: **the commonly chosen pair (p and q) carries 0.311278 bits against the 0.622556 of the correct pair, exactly 0.500000 of it. What is left behind is the 0.311278 bits of the not-q card.**

Observation 3.4

there is a pattern in what is left behind.The cards chosen are those showing words that appear in the rule, and the cards left are those showing words that do not——the choice is made on appearing in the sentence, not on being able to falsify.

Observation 3.5

so “people prefer confirmation” is only half right.The p card serves both confirmation and falsification, so choosing it is no error. The error lies in choosing q and not choosing not-q——the bias is closer to matching the words of the sentence than to preferring confirmation.

4. The Separator

Observation 4.1

the separator is whether a card can falsify the rule.Not whether it is named in the rule——the two agree on the p card and disagree on q and not-q, and it is exactly where they disagree that people substitute one for the other.

Observation 4.2

beside Paper 281.Paper 281 showed that a quantum state cannot be copied yet can be corrected, the syndrome carrying only the location of the error——there what to measure in order to obtain information was counted from the side of design; here the same unit counts an observation of zero information being chosen. Design and choice, the same bits running opposite ways.

Observation 4.3

what is not said.Experiment, content effects and psychological mechanism are not treated, and both the rate and the assumptions are representative——what is shown is that the cards chosen and the cards carrying information do not coincide.

5. Roll Call and Closing

1. **the q card carries 0.000000000** (Computation 2.1): **the core.**
2. **not-p also 0.000000000** (Computation 2.1): **likewise.**
3. **p and not-q carry 0.311278** (Computation 2.1): **the two that can falsify.**
4. **the zero is assumption-free** (Observation 2.3): **0.311278 is not.**
5. **chance gives 0.166667** (Computation 3.1): **picking two.**
6. **reported about 0.100000** (Observation 3.2): **below chance.**
7. **a ratio of 0.600000** (Observation 3.2): **evidence of a bias.**
8. **the correct pair is 0.622556** (Computation 3.3): **the sum of two.**
9. **the chosen pair is 0.500000 of it** (Computation 3.3): **exactly half.**
10. **can it falsify** (Observation 4.1): **the separator; Paper 281.**

Closing: **The card people pick second most often carries exactly zero information.Of the four, q and not-p carry 0.000000000 bits, and only the two that can falsify, p and not-q, carry 0.311278——that zero is not an approximation and does not move with the prior.Picking two at random would be right 0.166667 of the time against a reported 0.100000, a ratio of 0.600000——doing worse than chance is itself evidence of a leaning towards one particular wrong pair.That pair carries 0.311278 bits, exactly 0.500000 of the 0.622556 carried by the correct pair——what is chosen are the cards showing words that appear in the rule, not the cards that can falsify it.The separator is whether a card can falsify the rule.Placed among the earlier papers——Paper 281 counted what to measure in order to obtain information; here the same unit counts an observation of zero information being chosen.To be honest——experiment, content effects and mechanism are not treated, and both the rate and the assumptions are representative.**

References

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