

# Why 'irrational' choices can be rational

Theory shows logic in rearranging your preferences if the options may change.

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Leon Schadeberg/Rex Features

When faced with choices such as what to eat first, we might make decisions that look irrational at first sight.

You prefer apples to oranges, but cherries to apples. Yet if I offer you just cherries and oranges, you take the oranges.

That does not necessarily mean you're crazy, according to a new study published in *Biology Letters*<sup>1</sup>. The research shows that sometimes a decision like this, which sounds irrational, can actually be the best one.

Organisms, including humans, are often assumed to be hard-wired by evolution to try to make optimal decisions, to the best of their knowledge. Ranking choices consistently — for example, in selecting food sources — would seem to be one aspect of such rationality. If A is preferred over B, and B over C, then surely A should be selected when the options are just A and C? This seemingly logical ordering of preferences is called transitivity.

Furthermore, if A is preferred when both B and C are available, then A should 'rationally' remain the first choice when only A and B are at hand — a principle called the independence of irrelevant alternatives (IIA).

But sometimes animals do not display such logic. For example, honeybees (*Apis mellifera*) and gray jays (*Perisoreus canadensis*)<sup>2</sup> have been seen to violate IIA, and so have hummingbirds (*Selasphorus rufus*)<sup>3</sup>. "On witnessing such behaviour in the past, people have simply assumed that it is not optimal," says mathematical biologist Peter Trimmer of the University of Bristol, UK, a co-author of the latest study. "They assume that the individual or species is not adapted to solve the given task," or that the solution is too costly to compute, he says.

However, Trimmer and his colleagues use a theoretical model to show that, in fact, violations of transitivity can sometimes be the best choice for the given situation, and therefore rational.

The key is that the various choices might appear or disappear in the future. Then the decision becomes more complicated than a simple, fixed ranking of preferences. Is it better to expend time and energy eating a less nutritious food that's available now, or to

ignore it because a better alternative might become available in a moment? The researchers find that, for some particular choices of the nutritional values of food sources A, B and C, and of their probabilities of appearing or vanishing in the future, an optimal choice for pairs of foods can prefer B to A, C to B and A to C — which violates transitivity. Trimmer and colleagues also find some situations where IIA is violated in the optimal solution. These choices look irrational, but aren't.

### Delayed options

Behavioural ecologist Tanya Latty of the University of Sydney, Australia, who has observed violations of IIA in the food choices of a slime mould<sup>4</sup>, points out that some examples of seemingly irrational behaviour in foraging decisions are already understood to result from the animals rarely having all their options available at once.

“The choice is not so much ‘which item should I consume?’ as ‘should I spend time consuming this particular item, or should I keep looking?’” Latty explains. “Some of what we perceive as irrational behaviour would then simply be the result of presenting animals with the unusual case of a simultaneous choice, when they have evolved to make optimal sequential choices.”

She adds that it might be possible to test these ideas, for example by training animals to forage for items that have different probabilities of disappearing and reappearing. “It has certainly given me some ideas for future experiments,” says Latty.

“The paper is very nicely done,” says economist and behavioural scientist Herbert Gintis of the Santa Fe Institute in New Mexico, but he adds that “there is nothing anomalous or even surprising about these results”.

Gintis explains that the choices only seem to violate transitivity or IIA because there are in fact more than three of them. When IIA fails, he says, it's usually because the modeller failed to take into account the probabilities of appearance and disappearance in the range of possible choices.

Trimmer says that the results might apply to humans, for example in choosing investment strategies from savings schemes that may not be available in the future. “Of course, much of the time we make errors, which is a very simple explanation for any behaviour which appears irrational,” he says. “But an individual who displays intransitive choices is not necessarily behaving erroneously.”

In other words, while [economic behaviour is clearly not always rational](#)<sup>5</sup> (as some economists have assumed), we shouldn't be too hasty in assuming that what seems irrational necessarily is.

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### References

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