Title	Surprising findings: Comparing patterns of surprise, explanation, and probability
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Publication date	2015-03-14
Conference details	International Convention of Psychological Science, Amsterdam, Netherlands, 12-14 March 2015
Link to online version	http://icps.psychologicalscience.org/
Item record/more information	http://hdl.handle.net/10197/8323

Surprising findings: Comparing patterns of surprise, explanation, and probability

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Background

Why are some events more surprising than others? We suggest that some surprises are more surprising because they are harder to explain.

Two factors impacting surprise are explored here:
- different classes of surprising outcome (Outcome-Type)
- increasing/decreasing the difficulty of explaining with added cues (Keywords)

Three experiments using the same materials but different measures: 1) produced explanations, 2) surprise ratings, and 3) subjective probability ratings.

Current Theories

One group of theorists[1,2,3] focus on the properties of surprising outcomes:
- low-probability events
- disconfirmed expectations
- schema-discrepant events

Another group of theorists[4,5,6] focus on making sense of surprising events:
- (often retrospective) sense-making
- Integration with previous events

Outcome-Type

Not all surprising outcomes are equal - we know more about some events than other, more surprising events.

Imagine realising that you have lost your wallet (known surprising outcome), or that you have lost your belt (less-known surprising outcome).

I've lost my wallet!
I might have left it at home... maybe it has fallen out of my pocket... was I robbed? Maybe I...

I've lost my belt!
?

Keyword

Some scenarios cue knowledge that helps to explain the target event, making it *less* surprising.

Conversely, parts of a scenario could direct retrieval and explanation processes to a "less-productive" region of activated knowledge, making explanation more difficult, and the event *more* surprising.

We added keywords that were either supportive (cue) or unsupportive (miscue) for explaining why the event occurred.

Table 1. Examples of materials used (labels and italics were not shown in presented materials).

		Known	Less-Known
Setting		Gary is on holidays in a small village in West France. He is sitting in a café near his hotel.	
Keyword	Cue	*copycat*	*circus*
Keyword	Miscue	*circus*	*copycat*
Outcome		He looks up and sees his next-door neighbour walk by.	He looks up and sees a rhino charging through the cafe.
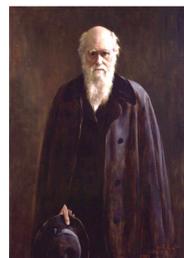
"As surprise is excited by something unexpected or unknown, we naturally desire, when startled, to perceive the cause as quickly as possible" [7]

Experimental Procedure

- Instructions
  - Read scenario setting and keyword (8 in total, a mix of known and less-known outcomes, each with a consistent/inconsistent keyword)
  - Complete task (produce Explanations/Surprise rating/Probability rating)
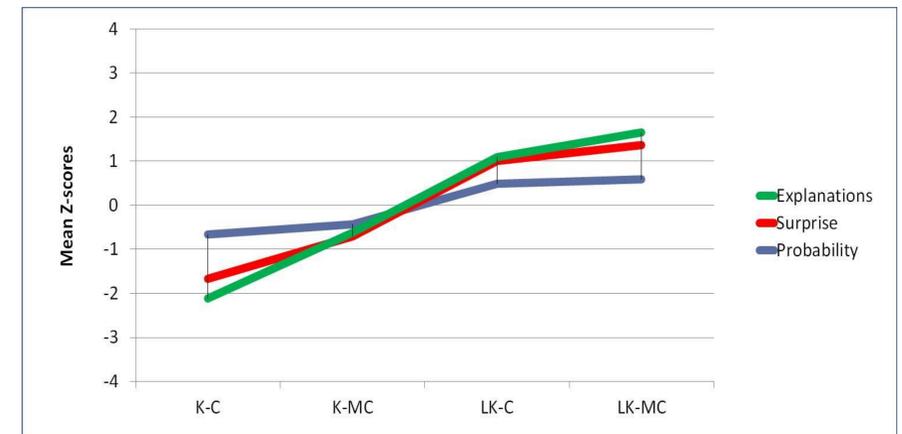- Repeat

Figure 1. Mean standardized scores for each level of Outcome-Type and Keyword (known (K) vs. less-known (LK), cue (C) vs. miscue (MC)) for surprise ratings , inverse explanation productivity, and inverse probability ratings (*n*'s = 32, *N* = 96). Note, that the pattern of results across experiments show that explanation productivity, not probability ratings, parallel surprise ratings.

Results

Outcome-Type: participants produced more explanations to known outcomes (*M* = 1.73, *SD* = .599), rated them less surprising (*M* = 3.84, *SD* = .97) and more probable (*M* = 37.40, *SD* = 22.02), than less-known outcomes; explanations (*M* = 1.48, *SD* = .49), surprise (*M* = 6.05, *SD* = .93), probability (*M* = 9.72, *SD* = .11.81).

Keyword: participants produced more explanations with cues (*M* = 1.73, *SD* = .715), and lower surprise ratings (*M* = 4.52, *SD* = .96), than miscue keywords; fewer explanations (*M* = 1.48, *SD* = .45), and higher surprise ratings (*M* = 5.37, *SD* = .83). For the surprise ratings, there was a larger effect of Keyword on known than less-known outcome-types (*p*'s < 0.05).

For probability judgments, no main effect of Keyword or interaction between Keyword and Outcome-Type was found (*p*'s > .05).

Discussion & Conclusions

Outcomes that are more known are easier to explain, and are judged to be less surprising.

Providing keywords to ease the explanation process increases produced explanations and reduces surprise, but not probability judgments.

Surprising events are those which are *difficult to explain*; Ease of explanation building may be the key factor in experienced surprise.

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