

REPLY TO COLE:

Magic and deception—do magicians mislead science?

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We share Cole's view that magicians frequently mislead the public about how they use psychological principles to manipulate what we perceive and the decisions we make (1). Indeed, research from our laboratory shows that contextualizing magic tricks as psychological demonstrations perpetuates false beliefs about pseudoscientific principles even when they are explicitly labeled as magic tricks (2). However, contrary to Cole's view, we believe that there is great value in studying conjuring principles scientifically (3).

Magicians have acquired valuable applied knowledge about ways in which they can manipulate our conscious experiences, and this knowledge can provide insights into human cognition. As scientists, our true challenge lies in 1) identifying magic principles that are of scientific interest and 2) distinguishing fabricated principles from plausible mechanisms. The first challenge is met by creating taxonomies that help bridge the gap between the magicians' conjuring methods and established psychological mechanisms. For instance, psychologically based taxonomies of misdirection (4) and forcing (5) allow us to draw links between conjuring principles and formal theories of cognition. These taxonomies provide a first step toward distinguishing between myths and plausible psychological mechanisms.

A true understanding of these conjuring principles relies on empirical investigations. In addition to the priming force (6), we have studied other "decision forces," which either exploit cognitive biases or implicitly restrict a person's choice. For instance, in the

placement force, which relies on position effects and reachability biases, most participants (on average, 60%) choose the most reachable card among a horizontal spread (7, 8). Likewise, the visual riffle force (9) relies on manipulating the visual saliency of the target card—which is shown slightly longer than the others during a riffle—and leads to most participants (98%) choosing the forced card. Other forcing techniques rely on exploiting stereotypical behaviors, and physically restricting the number of cards that are available for selection (10). The scientific study of these principles provides insights into the ease by which our decisions can be influenced.

We agree with Cole that magicians rarely reveal the true nature of their misdirection and frequently misinform the public about the way in which misdirection is deployed. However, in practice magicians deploy a plethora of misdirection principles, and it is hard to imagine a magic trick that does not rely on some form of misdirection. Our taxonomy of misdirection has helped highlight a wide range of these principles, and there have been countless empirical investigations examining the psychological mechanisms that underpin them (11).

We agree that there is a natural tension between the magician's use of deception and secrecy and the need for transparency in science. Merging this ancient art form with experimental science does indeed make for a somewhat awkward combination. However, we believe that advances in bridging this gap provides valuable insights into the human mind.

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