



Can observing a Necker cube make you more insightful?



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ABSTRACT

It is a compelling idea that an image as simple as a Necker cube, or a duck-rabbit illusion, can reveal something about a person's creativity. Surprisingly, there are now multiple examples showing that people who are better at discovering 'hidden' images in a picture, are also better at solving some creative problems. Although this idea goes back at least a century, little is known about *how* these two tasks—that seem so different on the surface—are related to each other. At least some forms of creativity (and indeed scientific discoveries) may require that we change our perspectives in order to discover a novel solution to a problem. It's possible that such problems involve a similar cognitive process, and perhaps the same cognitive capacities, as switching perspectives in an ambiguous image. We begin by replicating previous work, and also show metacognitive similarities between the sudden appearance of hidden images in consciousness, and the sudden appearance of solutions to verbal insight problems. We then show that simply observing a Necker cube can improve subsequent creative problem-solving and lead to more self-reported insights. We speculate that these results may in part be explained by Conflict Monitoring Theory.

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1. Introduction

In a 1973 short film, *Take the World from Another Point of View*, Richard Feynman was asked by esteemed astronomer, Sir Fred Hoyle: "Have you had a moment when, in a complicated problem, where quite suddenly the thing comes into your head and you are almost sure that you have got to be right?" Feynman agreed enthusiastically, and replied, "For example, I worked out the theory of helium once and suddenly saw everything. I had been struggling and struggling for two years and suddenly saw everything." Commenting further on the moment of revelation, Feynman says, "And then afterwards, you wonder why was I so stupid that I didn't see this?" As we will soon see, this exchange between Feynman and Hoyle captures several now well documented features of the insight experience.

On one end of a problem-solving spectrum, there are problems that we solve, or things we learn, where progress is gradual, moving step by step to a solution. Problems solved in this analytic way are characterized by linearity and predictable solutions; from beginning to end, progress is smooth. On the other end of the spectrum we have solutions to problems that are sudden, unexpected, and accompanied by an 'Aha!' moment. These occasions—and Feynman discovering the theory of helium is one example—we may call insights, eureka moments, or revelations. And once an experience like this occurs, the solution seems obviously correct, and like Feynman, we are left to wonder how we were "so stupid" just a moment before. Curiously, the problem of understanding how and why insights occur, and predicting their appearances, has made considerable progress through our understanding of a far simpler stimulus, a bistable image.

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If you identified both perspectives in Fig. 1, chances are that you experienced a small ‘Aha!’ moment when the image suddenly appeared quite differently than just a moment before. Here we will begin by describing at least three reasons that we believe bistable images, like the Necker cube, have become so intimately linked to the insight experience in previous research (e.g., Maier, 1930; Schooler, McCleod, Brooks, & Melcher, 1993; Schooler & Melcher, 1995; Schooler, Fallshore, & Fiore, 1996; Sternberg & Davidson, 1995; Wiseman, Watt, Gilhooly, & Georgiou, 2011; Doherty & Mair, 2012; Ohlsson, 1984, 2011).

Reason 1: **Phenomenology.** The ‘Aha!’ experience of solving a bistable image and experiencing an insight is the simplest and perhaps most intuitive reason that the relationship has become so popular. We can see first-hand that the way a “hidden” image appears in consciousness has similar phenomenological characteristics to a sudden insight (Schooler et al., 1996; Metcalfe & Wiebe, 1987). Reason 2: **Representational Change.** Bistable images and some (but perhaps not all) insight experiences are preceded by a change in representation, or interpretation of problem elements or assumptions (Ohlsson, 1984, 2011; Schooler et al., 1996). When some part of the problem is re-interpreted, or a new perspective is found, then the solution may be immediately obvious, and therefore the insightful solution appears suddenly and unexpectedly. We do not usually have conscious access to our interpretations or awareness of when they change, so all that is experienced is a sudden recognition of a solution that was previously unknown (Ohlsson, 1984, 2011). Reason 3: **Performance Correlations.** Evidence has also accumulated suggesting that the relationship between bistable images and insight may be more than a simple analogy. That is, the ability to change perspectives in ambiguous images appears to be associated with our ability to solve creative problems (Doherty & Mair, 2012; Jarosz, Colflesh, & Wiley, 2012; O’Brien et al., 2014; Schooler & Melcher, 1995; Wiseman et al., 2011).

Taken together, bistable images and insights feel the same, they may be solved through the same cognitive process of changing perspectives, and successfully reinterpreting an ambiguous image predicts success in creative problems that often lead to insights. It is this third reason—i.e., the empirical relationship between ambiguous images and creative problems—that is particularly not well understood, and as far as we know, there is currently no evidence of a mechanism, cognitive, neuroscientific, or otherwise. To this end, in Experiment 1, we begin by replicating and extending on previous work by testing the association between perceptual switching in ambiguous images and solving insight problems using both accuracy and metacognitive measures. In Experiment 2, we test whether observing the alternations in a Necker cube can trigger cognitive processes that improve subsequent insight problem-solving

1.1. Summary of previous research

In the first and most popular experiment of its kind, Schooler and Melcher (1995) demonstrated that recognizing out-of-focus images was correlated with performance on traditional insight problems. Recognizing blurry images was a better predictor of success with insight problems than analytic problem-solving, remote associate tests, vocabulary, need for cognition, and more. In more recent work, Wiseman et al. (2011) found that self-reported creativity and performance on an alternative uses task correlated with self-reported ease of reversal for one ambiguous figure (the duck-rabbit illusion). Doherty and Mair (2012) found a similar pattern of results, where reversals in three ambiguous figures correlated with performance on a pattern meanings test. Two separate studies also found that insight problems and reversals in ambiguous images were positively influenced by alcohol intoxication, whereas non-insight problems were not (Jarosz et al., 2012; O’Brien et al., 2014). Taken together, the existing research points to a relationship between re-interpreting perceptual stimuli (e.g., blurry or ambiguous images) and re-interpreting conceptual stimuli (e.g., solving insight problems: Doherty & Mair, 2012; Schooler

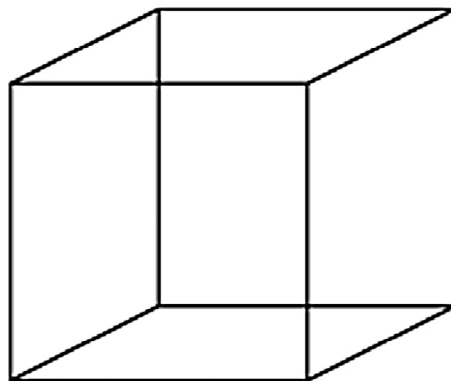


Fig. 1. A Necker cube that can, with sustained attention, alternate between two mutually exclusive interpretations: A cube facing down and left, or a cube facing up and right (Necker, 1832).

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