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# Magic Meets Neuroscience in 'Cup and Balls' Experiment

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By ABC News Feb 12, 2013 7:00am

Reported by Nick Wasson, M.D.:

How does the mind work? We may be closer to answering this centuries-old question, with the help of a little magic.

In an attempt to better understand how human attention and visual systems work, researchers at the Barrow Neurological Institute teamed up with Teller, of Penn and Teller, in the first-ever study of the magician duo's "cup and balls" routine, in which balls appear and disappear under the cover of cups.

Their goal: to find out what distracts a person during an illusion.

"If we knew how the brain reveals magic, we would reveal the neural basis of consciousness," said Barrow neuroscientist Susana Martinez-Conde, lead author of the study published today in [the journal PeerJ](#).

Barrow's team tracked the eye movements of seven study subjects as they watched a tape of Teller performing his classic illusion. They were each given a remote, and instructed to press "1" every time the ball was removed from the cup and "2" when the ball was replaced.

They then watched Teller repeat this trick 48 different ways. Sometimes the cups would be clear instead of solid. Other times the ball would be dropped or stuck to the cup, or not in the cup at all. In some, the magician's face was completely covered.

Teller, whose trade depends on knowing how to distract the audience, had some theories of his own on what would make break a person's attention during the trick. His hypothesis? That a falling ball distracts more than any other ball motion.

They found some interesting results. First, the belief held widely by magicians that facial cues would direct attention was wrong. Covering the face of a magician had no effect on where participants thought the ball was, according to the study. In fact, eye movements didn't accurately track what people were actually paying attention to at all.

The secret of the trick, instead, is that the eyes are decoyed away, and this was done most effectively when the ball is placed on the table, the study found, not dropped into a hand as Teller had originally thought.

In the end, both magicians and cognitive scientists can learn something from this study.

"We have a better understanding of the types of motions in the world that engage your attention," said Martinez-Conde.

And as Stephen Macknik, also a co-author of the study and author of the book "Sleights of Mind," put it, "Magicians have a lot to gain in collaboration with scientists in terms of perfecting their art."

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