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Mind control trick: Magicians' forcing and free will.

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Abstract

A new research program has recently emerged that investigates magicians' mind control tricks, also called forces. This research highlights the psychological processes that underpin decision-making, illustrates the ease by which our decisions can be covertly influenced, and helps answer questions about our sense of freewill and agency over choices.

Keywords: Magic tricks; Sense of agency; Illusion of control; Forcing techniques; Free will

We like to think that we are in charge of our decisions, but psychological research shows that many of our behaviours are unconsciously influenced by external stimuli, and that we are often oblivious to the cognitive mechanisms that underpin the choices we make. Magicians have exploited this illusory sense of agency for a long time, and they have developed a wide range of techniques to influence and control their spectators' choices of such things as cards, words, or numbers. These techniques are called forces.

The last decade has seen a sharp rise in scientific research on the science of magic, and researchers have investigated diverse cognitive processes such as perception, attention, problem solving or belief formation [1]. More recently, the focus has shifted towards understanding how magicians' control our choices. Magicians have developed a wide range of psychological tricks to covertly influence people's choices [2]. These forces are often extremely effective, and illustrate various weaknesses in our sense of control over decisions and their outcomes. Forcing techniques are frequently discussed in the magic literature, but magicians do not offer a universally accepted definition. We define a force as a technique that covertly influences a person's choice without their awareness (here, we use "choice" as an umbrella term comprising of the spectator's decision as well as the outcome of that decision).

Illusory agency and freedom in forcing

As we have argued elsewhere [2], a successful force has two key components. Firstly, the force has to significantly affect the spectator's decision or the outcome of their choice. Secondly, the spectator has to feel free in their choice and in control of the outcome they get. When sucessful, the force results in an illusory feeling of freedom of choice and/or agency over the outcome (e.g. the card they chose). As we will see later, some forces exploit psychological biases and restrictions to influence the spectator's decision, while others do not. In the first case, the spectator's freedom of choice is undermined as it is constrained by external factors imposed by

the magician. In the latter, the spectator makes a completely free decision which has no impact on the outcome. In both cases, spectators typically fail to realize that their decision was manipulated or that it had no impact on the outcome [3]. Video examples of the techniques can be found at *https://www.magicresearchlab.com/forcing-taxonomy-material*.

Forcing techniques provide powerful tools to investigate illusory sense of agency and freedom over choices. Empirical research using magicians' forces indeed shows that participants report high feelings of freedom and control over their choice, even though they ended up with the predetermined target card or object [4–10]. Moreover, when asked to explain the reason for their choice, most participants confabulated reasons which were unrelated to the influences exerted by the magician [7,9].

Decision Forces

Decision forces are techniques in which the magician directly manipulates the person's decisions. These techniques allow the magicians to enhance the probabilities that the target card or item is selected, but they typically do not guarantee its choice. For instance, the visual riffle force (see Box 1) has a success rate that ranges between 30 and 98% depending on whether the performance was live or computer-based [7,8]. Empirical research on the position force shows that around 60% of participants end up with the target card when we would expect 25% by chance [4,6]. In these techniques, the magician uses psychological tricks and biases to influence the spectator's decisions. People tend to choose a "path of least resistance": the chosen item is often the one that involves the least amount of effort – what is associated with heuristic/system 1 type of behaviour. Most of the decision forces that have been investigated to date rely on exploiting psychological biases (see Box 1): priming, stereotypical behaviours and visual saliency.

Outcome Forces

In outcome forces, the spectator has, and makes a genuinely free decision, but unknown to them this decision has no impact on the outcome of the trick. Most forcing techniques fall into this category, as they guarantee that the spectator will end up with the forced item [11]. Here, a key principle relies on the spectator not understanding that their choice cannot affect the outcome of the procedure. These techniques provide a particularly useful tool to investigate illusory sense of agency over the outcome of our actions. Many outcome forces rely on the fact that the chosen item is covertly switched by the magician for the target/predetermined one. This kind of technique has been used in choice blindness paradigms, in which people fail to notice the mismatch between their choice and the outcome of this choice [12]. Other outcome forces rely on the spectator's memory or reasoning errors, leading them to misremember or misunderstand the event sequence. To date, two outcome forces have been scientifically studied: the Criss-cross force and the Equivoque force (see Box 2).

Wider implications

Studying forcing techniques can help us understand the cognitive mechanisms that underpin decision making, the external factors (e.g. visual saliency, position effects, priming) that guide our choices, and what makes us believe that we are in control of our actions. These techniques provide an opportunity to help understand what makes one action feel 'freer' than another, as few studies have investigated this subjective experience. Most of the past research on free will and agency has focused on simple physical actions (e.g., when to press a button). The study of forcing allows us to examine these questions in more natural contexts, and in

situations in which there are lots of choice alternatives. Many of these principles have been thoroughly tested in the real world (i.e., magic performances), but they can be easily implemented in more controlled laboratory experiments that allow us to examine the cognitive factors that result in illusory feelings of freedom and agency over our behaviour and thoughts.

Magicians' forces also relate to the broader issue of agency, for which there is a distinction between predictive and postdictive mechanisms [13]. Some theories put the emphasis on processes which *precede* the execution of one's action (i.e. the experience of agency arises from internal prediction about the sensory consequences of one's actions). Others stress out the importance of processes succeeding one's action (e.g. the experience of agency is a product of our *post-hoc* inference after the action has occurred). Decision forces are successful because the spectator does not have direct access to the cognitive processes preceding their decision (e.g. priming mechanisms, or thoughts activated by the visual saliency of a card). In this case, the spectators often confabulate reasons for their choice which have nothing to do with the forcing technique. Outcome forces take advantage of the fact that spectators cannot predict the outcome of their choice (e.g. choosing a card when it is face down or touching a card without knowing whether it will be kept or discarded). Because of this, they fail to understand that they had no agency on the outcome result. As it has been noted, an interplay between prediction and postdiction seems to exist in the experience of agency, and the context of forcing in magic purposefully downplays the role of predictive processes on the spectator's sense of agency.

Importantly, decision forces simply enhance the probability that a spectator will choose one alternative over the other, and it is possible that some people are more strongly affected by these techniques than others. The magic literature often emphasizes that the performer should select "responsive spectator" and that external factors might impact the success rate of such

technique. These parameters seem worth exploring in the future (e.g. needs for cognition, locus of control, hypnotic suggestibility).

Many of the psychological principles that underpin these forces can be applied to domains outside the magic performance. Nudging people's behaviours has become an increasingly popular way of modifying behaviour. Most forcing principles have been tested in the real world, and thus offer powerful tools to influencing people's choices. This might provide new ways of encouraging better decisions in regards to health and well-being (e.g. visual saliency, placement of items). Forcing techniques could also be implemented in the entertainment industry, by creating a false sense of choice and autonomy, which helps create more engaging and interactive experiences. Similar principles could be implemented in other interactive media such as TV shows or theatre. Finally, the covert control and modification of people's thoughts does raise serious ethical issues. Magicians are not alone in using such techniques and we believe that magicians' forcing techniques provide a valuable tool to raise awareness about the ease by which our choices can be manipulated. Such awareness may help protect people against unwanted influences (e.g. political propaganda) and encourage policy makers to take the issue seriously.

Box 1. Decision Forces

Visual Riffle force

In the visual riffle force [7,8] visual saliency and/or restrictions are used to influence the spectator to mentally choose a playing card. The magician flips through a deck of cards and asks the spectator to visually select one of them. However, unbeknownst to the spectator, the target card is shown slightly longer than the others and becomes more visually salient. Two

scientific papers have investigated this force and shown that in a live context, between 54 and 98% of participants choose the target card, while feeling completely free for their choice.

Position force

The position force relies on a physical/motor stereotypical behaviour [4,6]: most people tend to act in the same way when presented with a specific situation. In this technique, the conjurer places four cards in a horizontal row on a table and asks the spectator to touch or take one. As most people are right-handed and tend to choose items that are more reachable, the majority will choose the third card form their left. Two scientific papers have investigated this force: on average 60% of people choose the target card. Moreover, participants are oblivious to this bias, as they significantly underestimated the percentage of people who would also select this card. Interestingly, the percentage of people who impulsively chose the most reachable card dropped from 60 to 35% when participants were explicitly reminded that they were making a decision[6].

Mental Priming force

The mental priming force relies on subtle priming mechanisms (Figure I). Here, the magician, uses both verbal and nonverbal primes, to prime the spectator to name the target object. The Mental Priming force, created by British mentalist Derren Brown, relies on using subtle hand gestures and key words to prime people to think of the three of Diamonds [9]. In this force, the magician declares that they will try to mentally transmit the identity of a playing card, and then asks them to follow some instructions while imagining different things. For instance, the magician gestures a Diamond shape while asking participants to imagine a screen in their mind, or quickly draws little 3s in the air while asking them to imagine the numbers on the card. This force has been shown to be effective for 18% of participants, when we would expect less than 2% by chance [9].
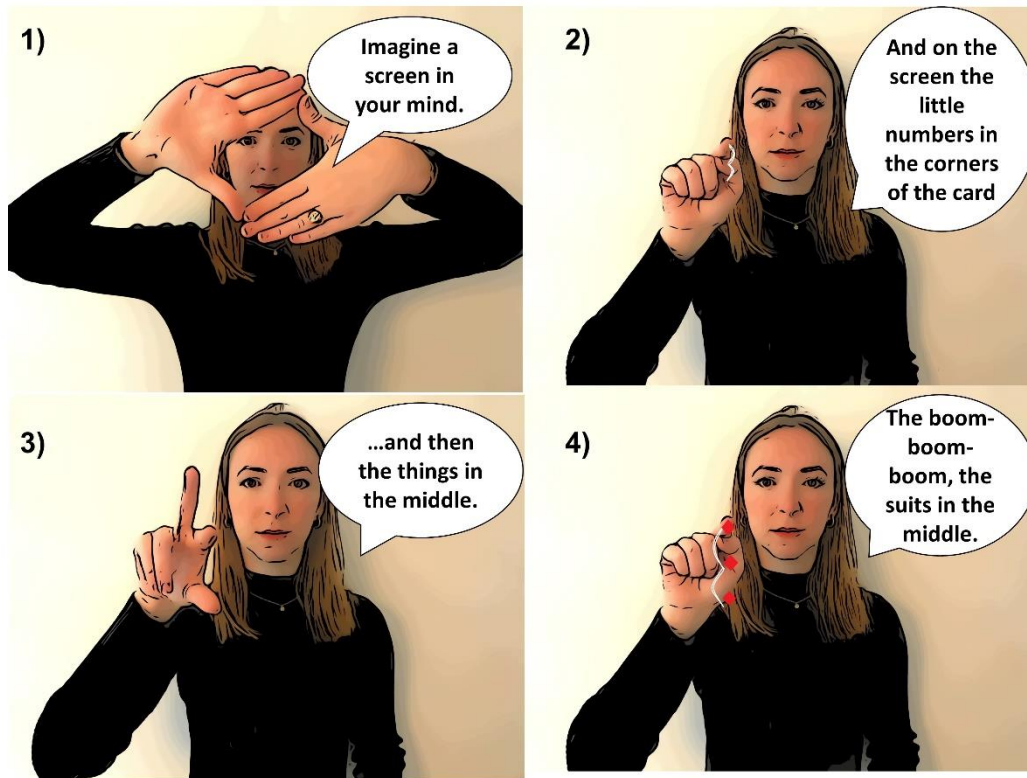
Figure I (Box 1). The Mental Priming force. The magician primes the spectator to think about the three of diamonds. 1) Hands picture a diamond shape, 2) finger draws the number three, 3) three fingers are pointed and 4) three different places are pointed.

Box 2. Outcome Forces

The Criss-Cross force

The Criss-cross force consists in asking a spectator to cut a deck of cards and place the top pile next to the bottom one, after which the magician takes the bottom pile and places it on the top one in a crossed figure (see Figure I). The magician then asks the spectator a question to draw their attention away from the deck and create a time delay. The conjurer then raises the top pile of the cross and asks the audience member to take the top card of the bottom pile (the top card of the original deck). This technique has been shown to be extremely effective and, the vast

majority of participants fail to understand that their action of cutting the deck had no impact on their outcome card, and believe that they were in control of it [5].

The Equivoque

The Equivoque, also called the Magician's force, is considered to be one of the most powerful forcing technique a magician can use. This technique relies on ambiguity blindness – the failure to recognize ambiguous situations – to create an illusion of choice [2]. For this, the magician deals two objects on a table, such as a key and a wallet. They then ask the spectator to touch one of them. If the conjurer wants the person to end up with the key and the spectator touches it, the magician keeps it and discards the wallet. But if the spectator touches the wallet rather than the key, the magician simply discards this choice and keeps the key anyway. Regardless of the spectator's choice, the sequences result in the same outcome. The Equivoque is highly effective in providing an illusory sense of control over the outcome of participants' actions [10]. Participants fail to understand that their action – touching one object – could be interpreted in different ways and are oblivious to the semantic inconsistencies in the procedure.
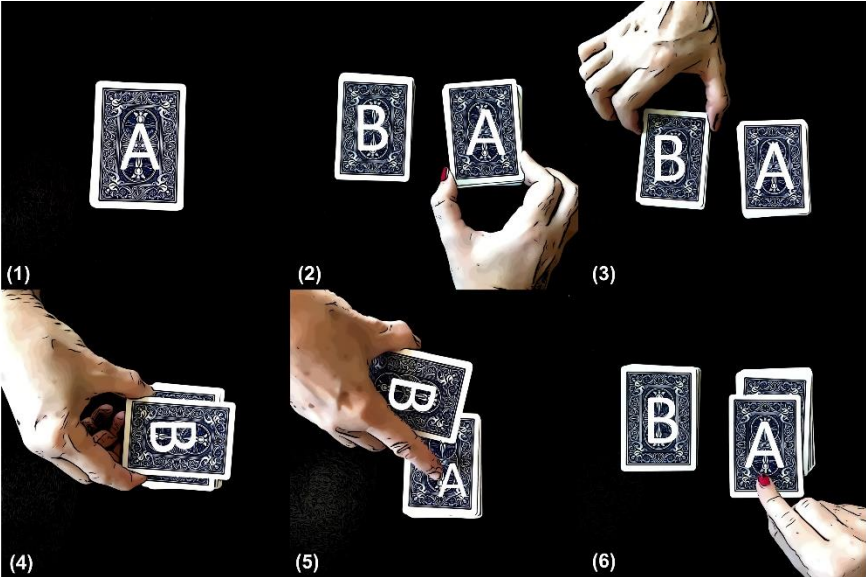

Figure I (Box 2). The Criss-Cross Force. The spectator ends up with the forced card (card A) which he/she believes to be the other card, selected by the cut (card B).

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