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# Simulated thought insertion: Influencing the sense of agency using deception and magic



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## ABSTRACT

In order to study the feeling of control over decisions, we told 60 participants that a neuroimaging machine could read and influence their thoughts. While inside a mock brain scanner, participants chose arbitrary numbers in two similar tasks. In the Mind-Reading Task, the scanner appeared to guess the participants' numbers; in the Mind-Influencing Task, it appeared to influence their choice of numbers. We predicted that participants would feel less voluntary control over their decisions when they believed that the scanner was influencing their choices. As predicted, participants felt less control and made slower decisions in the Mind-Influencing Task compared to the Mind-Reading Task. A second study replicated these findings. Participants' experience of the ostensible influence varied, with some reporting an unknown source directing them towards specific numbers. This *simulated thought insertion* paradigm can therefore influence feelings of voluntary control and may help model symptoms of mental disorders.

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## 1. Introduction

People typically believe that they fully control their thoughts and actions. This belief is often mistaken. People can *feel* control without *having* it, such as when subtle situational factors heavily influence decisions (Olson, Amlani, Raz, & Rensink, 2015; Thaler & Sunstein, 2008). Conversely, they can *have* control without *feeling* it, such as when under hypnosis or when using a Ouija board (Blakemore, Oakley, & Frith, 2003; Gauchou, Rensink, & Fels, 2012). We present a novel method to influence this feeling.

The *sense of agency* refers to the feeling of control over an action or thought. According to recent theories, this sense of agency has two overlapping components: feeling and judgement (Synofzik, Vosgerau, & Newen, 2008). The *feeling* refers to a low-level classification of whether an action is caused by oneself; the *judgement* refers to an analogous higher-level classification. Most theories of agency have focused on the feeling component. The *comparator model*, for example, claims that this feeling arises by comparing the outcome of an action with the initial intention: if they match, one feels a sense of agency (Frith, 2012). Accordingly, people feel more agency over their hand movements while drawing if the outcome of the drawing matches their intention (Synofzik, Thier, & Lindner, 2006).

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Some theorists argue that these comparator theories of agency better apply to actions than thoughts (Proust, 2009). If they applied to thoughts, one would have to compare the intention and outcome of a thought, which seems unlikely: one does not intend to have a thought before thinking it (Proust, 2009; Synofzik et al., 2008). Nevertheless, the sense of agency over thoughts varies across situations. When Penfield and Roberts (1976) stimulated the brains of their participants, for example, they reported that thoughts occurred without their control. Further, during pre-sleep states, drug experiences, believed spiritual possessions, and hypnosis, thoughts may seem to originate from an external source (Blakemore et al., 2003; Bourguignon, 1976; Masters & Houston, 1966; Mavromatis, 1987). A theory explaining the sense of agency over thoughts would thus have to account for these situations.

One related theory claims that feelings of agency are strongest when (a) a thought closely precedes the action, (b) is coherent with that action, and (c) is the only apparent cause (Wegner & Wheatley, 1999). The last condition – that the thought must be the only apparent cause of the action – is called the *principle of exclusivity*. This principle may also apply to thoughts: believing in an external source of thoughts may reduce agency. Schizophrenics, for instance, often experience *thought insertion* in which their thoughts seem to originate from a source outside of their own will (Mullins & Spence, 2014). As a result, some schizophrenics conclude there is an influencing machine that can implant their thoughts from a distance (Tausk, 1969).

These distortions in the sense of agency over thoughts can be approximated with hypnosis. Walsh, Oakley, Halligan, Mehta, and Deeley (2015) hypnotised suggestible participants and told them that an engineer would insert thoughts into their heads to complete sentences. When participants heard sentence stems, they reported that other words popped into their heads without their control. In the present feasibility study, we attempted to similarly reduce agency by constructing a plausible external source of thoughts, but without hypnotising participants or stimulating their brains.

Instead, to create this source of thoughts, we used deception, suggestion, and magic. *Mentalism* is a branch of magic that mimics unusual mental phenomena such as telepathy and thought insertion. In the context of a magic show, the audience generally knows these apparent abilities are tricks; in other contexts, they may seem more realistic. Indeed, many students cannot distinguish magic tricks from actual abilities and some believe that neuroimaging machines can read minds (Ali, Lifshitz, & Raz, 2014; Benassi, Singer, & Reynolds, 1980; Swiney & Sousa, 2013). Accordingly, we wanted to use magic to convince people that a neuroimaging machine could influence their thoughts, which would then reduce their sense of agency. Being able to experimentally alter this sense of agency would allow researchers to explore the role of higher-level cognition in feelings and judgements of agency (Gallagher, 2007; Synofzik et al., 2008; Vosgerau & Voss, 2013). It would also demonstrate how much deception and suggestion can affect one's mental experiences.

In this paper, we introduce the *simulated thought insertion* paradigm, which uses deception and magic to influence the sense of agency over thoughts. Study 1 tests whether this paradigm can distort feelings of agency; Study 2 replicates our findings and examines what these distortions feel like experientially. Combined, these studies offer a novel paradigm to study agency by making people believe – and feel – that we are controlling their minds.

## 2. Study 1: Influencing agency

We introduced participants to a brain imaging machine that could ostensibly influence thoughts. We had three hypotheses. First, when people believe a machine is influencing them, they will report less voluntary control over their mental decisions. Second, this apparent influence will affect the decision-making process, reflected by how quickly people make decisions and how often they change their mind. Third, people who tend to feel that external sources influence their lives (i.e., those with an external locus of control; Duttweiler, 1984) will be more suggestible and thus more likely to feel the influence of the machine (Burger, 1981). In short, we expected that manipulating beliefs would cause distortions in feelings and judgements of agency.

### 2.1. Methods

#### 2.1.1. Participants

Thirty-seven undergraduate students from McGill University completed the experiment for course credit; after exclusions, 27 participants remained. They were on average 20.5 years old ( $SD = 1.8$ ) and all were female. Most of them majored in psychology (78%) and were in the second year of their studies (50%). We chose our sample size based on a power analysis (see Section 2.1.4) while aiming to run as many participants as possible in Studies 1 and 2 over two months.

#### 2.1.2. Procedure

Participants completed two comparable tasks (Fig. 1) inside a mock neuroimaging scanner. In the Mind-Reading Task, participants chose arbitrary numbers and the machine appeared to guess them. In the Mind-Influencing Task, the machine chose random numbers and appeared to influence participants to choose them. After each task, we measured the participants' sense of agency over their decisions. Because we used a high level of deception, a detailed description of the protocol follows; however, readers can skip it without loss of clarity.

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