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# Metacognition of agency across the lifespan

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ABSTRACT

Metacognitions of agency were investigated using a computer task in which X's and O's streamed from the top of a computer screen, and the participants moved the mouse to get the cursor to touch the X's and avoid the O's. After each 15 s trial, participants made judgments of agency and judgments of performance. Objective control was either undistorted, or distorted by (1) Turbulence (i.e., random noise), (2) a Lag between the mouse and cursor movements (of 250 or 500 ms), or (3) 'Magic,' (i.e., an increased radius around the X's for which credit was given). In Experiment 1, college students' judgments of agency showed that they were sensitive to all three manipulations. They also indicated that they felt more in control in the Lag conditions, where there was a rule on which they could potentially capitalize, than in the matched Turbulence conditions. In Experiment 2, older adults were also sensitive to all three manipulations, but less so than the college students. They were not sensitive to the difference between the Lag and Turbulence manipulations. Finally, in Experiment 3, 8–10 year-old children were sensitive to their loss of control equally in the Lag and Turbulence conditions. However, when performance was artificially improved, in the Magic condition, children took full credit and showed no evidence that they realized that the results were due to an external variable. Together, these findings suggest that people's metacognition of agency changes in important ways across the lifespan.



## 1. Introduction

Until recently, the idea that people might not know that they were the agents behind their own actions was almost inconceivable. The "I" who was doing the thinking, in Descartes' (1637/1969) meditations, became his incontrovertible basis of all other knowledge. His metacognition about his own agency was the one and only thing Descartes could not doubt or deny. His thoughts could be wrong; his perceptions distorted; his knowledge inaccurate. But Descartes was unable to conceive of the possibility that it was not he who was doing the thinking and doubting. As Jeannerod and Pacherie (2004) put it: "A number of contemporary thinkers acknowledge that when I judge "I think X", I may be mistaken about X and thus that the mind is not wholly transparent of itself. But they maintain, with Descartes, that when I judge: "I think X", I cannot be mistaken about who the subject of the thought is. " (p. 114). So, too, by this view, when actions are taken, we know, unmistakably and in a uniquely privileged way, that we are doing them ourselves.

This brand of privileged access, which Ryle (1949) called the 'official doctrine', has special status in the law. Eyewitnesses accounts—the report from a witness that they saw the perpetrator—hold enormous weight, both in court, in juror's decisions, and even in the face of conflicting evidence (see, Fox & Walters, 1986). However, even eyewitness reports pale by comparison to an individual's confession. There is simply no more incriminating thing that a person can do than assert that they did it. Their attribution of self-agency with respect to the act of the crime is paramount. And, although everyone acknowledges that confessions might be coerced and hence not be valid (c.f., Kassin

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& Sukel, l997), if the confession is made freely and there is every reason to suppose the confessor believes it, then we the jury take this to be the most sure evidence that exists that the person indeed committed the crime.

And yet, there are cases of uncoerced false self-confession, and that people may believe they did something they did not do (Kassin & Gudjonsson, 2004). Indeed, in laboratory situations, Kassin and Kiechel (1996) and Redlick and Goodman (2003) report that adults will confess falsely to having hit a forbidden computer key that crashed a computer, under circumstances that are far from what would be considered legally coercive. Furthermore, Redlick and Goodman (2003) found that younger children, 10–12 year olds, were more likely to confess than were older children and college students. And, when Candel, Merckelbach, Loyen, and Reyskens (2005) said to 8–10 year-old children, "You hit the SHIFT-key, didn't you?" 36% of the children—none of who had actually hit the key—said yes. There are a number of possible explanations. Perhaps the participants, and especially the younger children, were just being compliant or suggestible. But it is also possible that people have considerable uncertainty about their own actions. Perhaps the younger children were genuinely less able to discern their own agency than were the adults, and they really did not know that they had not done it. Children are also impaired, when compared to young adults, in their memory for source, as, indeed, are older adults (Schacter, Kagan, & Leichtman, 1995; Spencer & Raz, l995). These differences in source memory might be ascribable to a memory differences. But it is also possible that there are differences in online judgments of agency that vary over the lifespan. It is this possibility that we explore in this article.

That the official doctrine, itself, is not unimpeachable—at least in 'special' cases—is already known. There are many examples of abnormal attributions of agency in people with schizophrenia, or with neurological conditions such as alien hand syndrome (see, for example, Frith, Blakemore, & Wolpert, 2000; Jeannerod, 1999; Pacherie, Green, & Bayne, 2006). Drugs can alter people's metacognitions of their own agency (Kirkpatrick, Metcalfe, Greene, & Hart, 2008). And by creating clever, intentionally misleading situations, Wegner, Sparrow and Winnerman (2004, and see Wegner & Wheatley, 1999), have shown that even ordinary, healthy college students claim to have felt that they were moving someone else's hands, or that they were controlling a mouse when, in fact, they were not. Such demonstrations contradict the idea that our knowledge of our own agency is an immediate, incontrovertible given, as the official doctrine supposes.

Instead, it appears likely that our metacognition of agency is inferential, as are other metacognitive judgments (see Dunlosky & Metcalfe, 2009; Dunlosky & Nelson, 1992; Koriat & Ma'ayan, 2005). But saying that this knowledge is not a direct given, is not to say that these judgments are arbitrary. Far from it, making accurate judgments of agency is highly adaptive, and the person who fails at this task is at severe risk, as the seriousness of the above-mentioned pathologies affirm. Understanding what heuristics people use to make these essential metacognitive judgments, and whether their use varies over a lifespan, is essential if we are to understand how people gain and maintain a sense of agency, and, in what that sense consists. The issue that we address here, then, is whether there are systematic changes in people's judgments of their own agency over the lifespan, under conditions in which objective control is manipulated. Do healthy normal children, young adults and older adults process the information to agency differently – producing distinct age-specific judgment of agency profiles? Or are the patterns of people's judgments of agency constant over the lifespan?

In earlier work (Metcalfe & Greene, 2007), we have shown that college students are remarkably good at detecting when they are, objectively, in control, and when they are not. We had participants perform a computer-based task in which X's and O's streamed from the top of the computer screen, and the participant was able to move, via the computer mouse, a box on a horizontal bar on the screen. They were instructed to try to touch all of the falling X's with the box (which beeped when contacted) and avoid touching any of the O's (which booped). (See Fig. 1 for a static illustration of this task, which is also be the task used in the present experiments.)

After engaging in this task for a short period of time (20 s) they were asked to make judgments of their perfor-

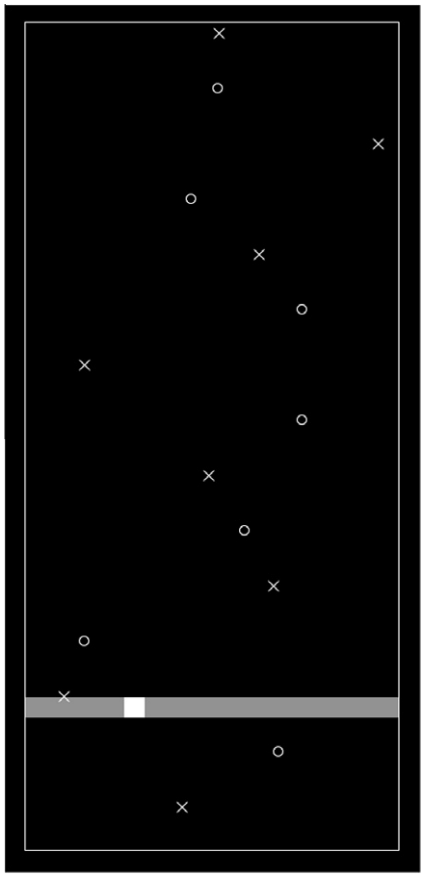

**Fig. 1.** A screen shot of the task. The participant moves the square on the grey bar at the bottom of the screen to 'catch' downward scrolling X's and avoid catching O's.