

# Action-effect binding meets agency



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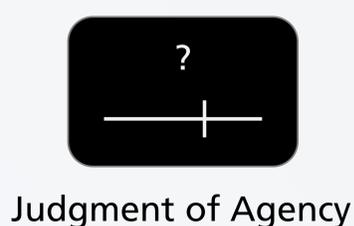
The feeling of agency is a pervasive phenomenon that accompanies intentional actions. Subjective feelings of agency are typically explained in terms of **predictive mechanisms** – e.g., internal forward models – and in terms of **postdictive mechanisms** – e.g., retrospective judgments –, with both mechanisms supplementing each other (Moore & Haggard, 2008).

## Background

We present new evidence for a third mechanism that contributes to feelings of agency: The integration of action and effect in an event file (Hommel, 2004), i.e., **action-effect binding**.

## Methods & Results

We assessed action-effect binding in a tried-and-tested **two-step paradigm** (Dutzi & Hommel, 2009). Freely chosen actions generated a random effect tone after a varying delay (0 ms vs. 1250 ms). Participants ( $N=32$ ) were then either presented with the previous effect or with an alternative sound, and were to freely choose a response again. Sound-consistent choices indicate action-effect binding for the first action, and we used this information to predict following judgments of agency.

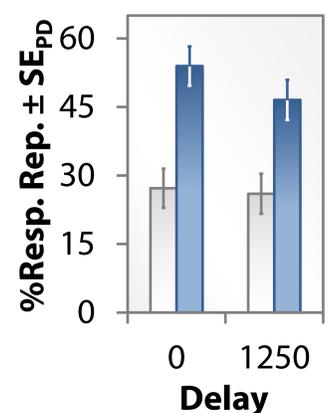


How strongly did you feel to have caused the first tone?  
(0-100%)

Response repetitions were more frequent when tones repeated rather than alternated, indicating action-effect binding.

### Effect-Stimulus Relation

- Tone Repetition
- Tone Alternation

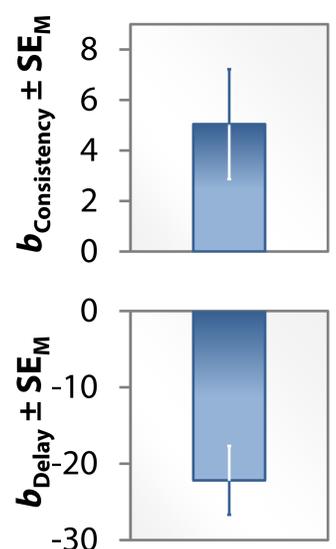


SE<sub>pd</sub> = Standard error of paired differences.

**Key finding:** Responses that were consistent with the effect-stimulus relation yielded significantly higher agency ratings across action-effect delays. This was true on a trial-to-trial basis as assessed by regression coefficient analysis for within-subjects designs:

$$b_{\text{Consistency}} = 5.04, p = .027$$

$$b_{\text{Delay}} = -22.19/\text{sec}, p < .001$$



## Conclusions

Our findings show that short-term integration of action and effect predicted agency ratings on a trial-to-trial level. This finding opens up a new perspective on feelings of agency and represents a first step towards reconciling theories on **sense of agency** with effect-based accounts of **human action control**.

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## References

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