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Of chickens, eggs, and yolk:
The electrophysiology of breaking a rule

TeaP 2014

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Marco Steinhauser, & Wilfried Kunde

Background

- What is the electrophysiological signature of deliberate rule violations?
- …in situations in which the agent does not have to fear sanctions or punishment.

Background

- Rule representations are activated automatically and bias behaviour (cf. talk by Robert Wirth; Pfister et al., under review)

- Rule violations can only be achieved if the agent detaches from current affordances of a situation

- This process should affect ERP components that are linked to automatic S-R translation, in particular **P300** (e.g., Verleger et al., 2005)

P300

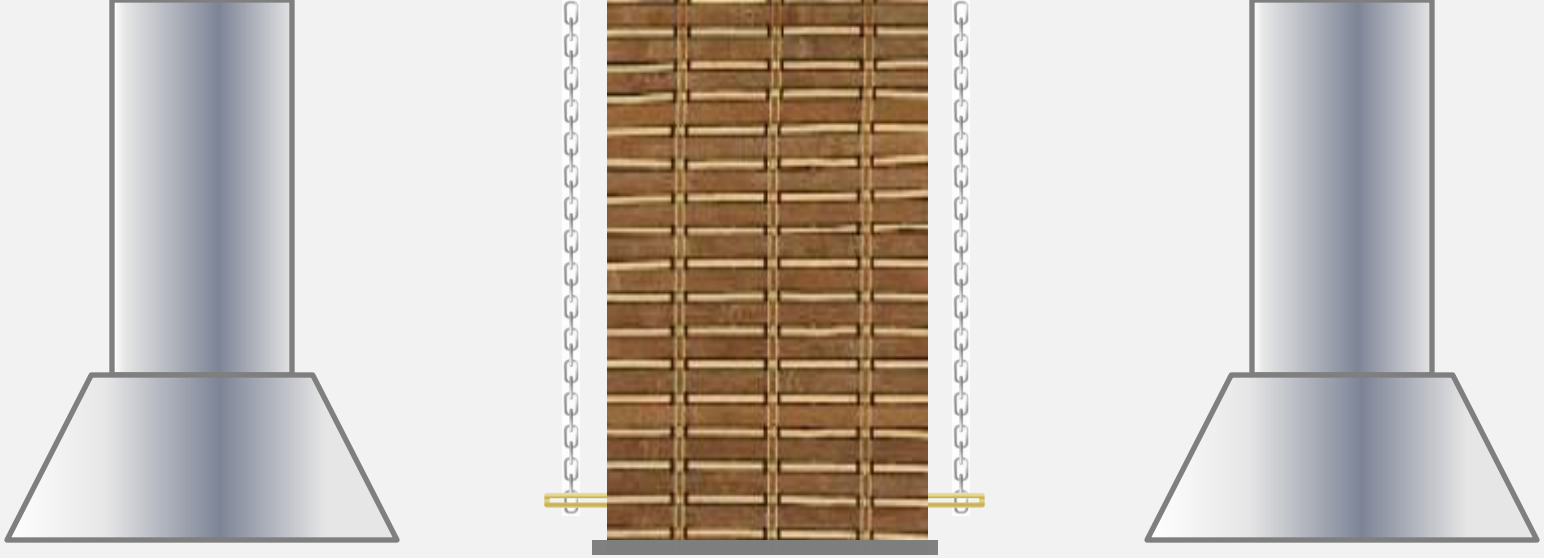
- Strong P300 responses occur whenever a stimulus can be translated into a learned, canonical response (Roche & O'Mara, 2003; Verleger et al., 2005)

- Conversely, P300 amplitudes are reduced in free choice tasks as compared to forced choice tasks (Keller et al., 2006; Waszak et al., 2005)

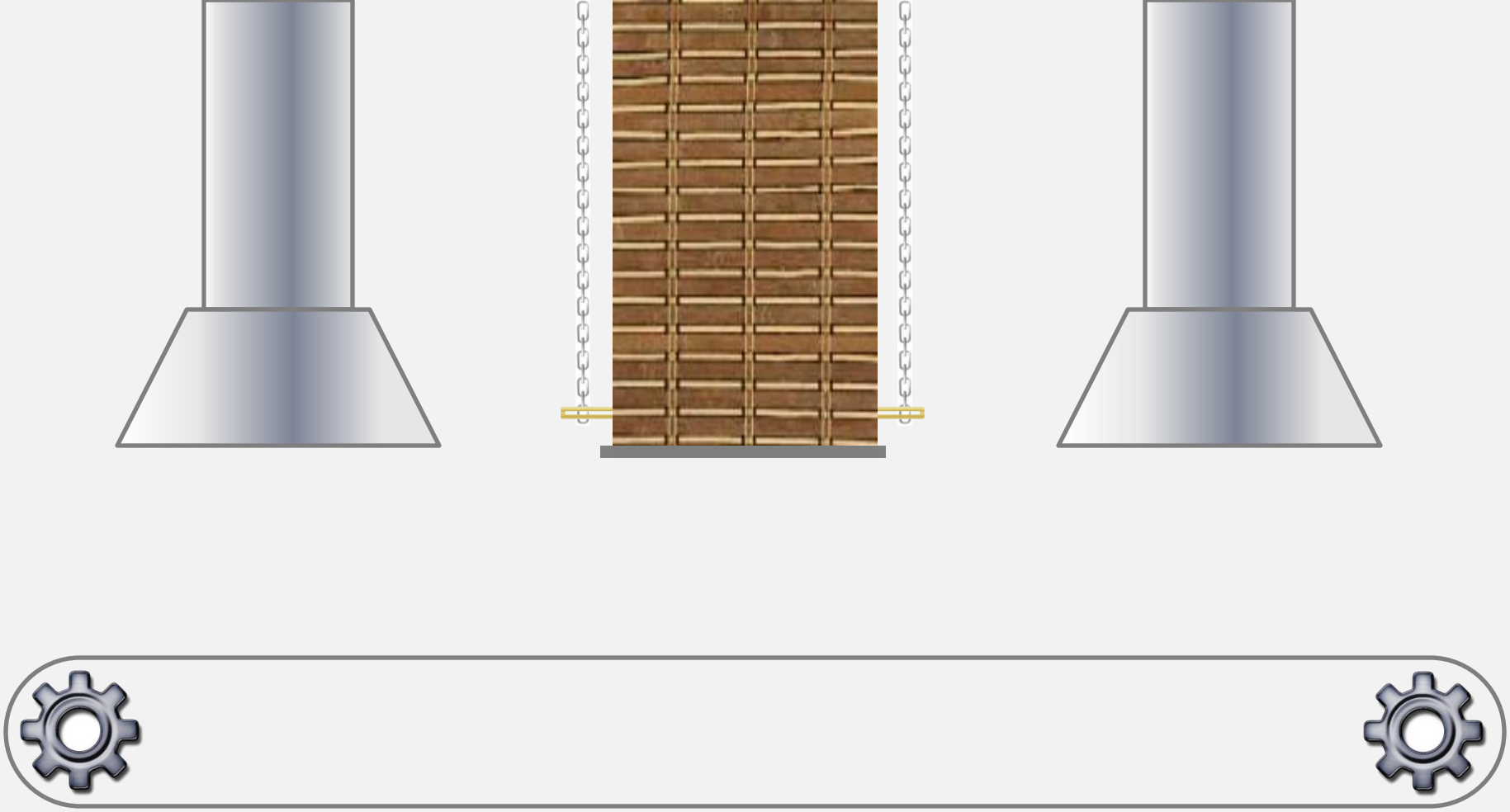
Hypotheses

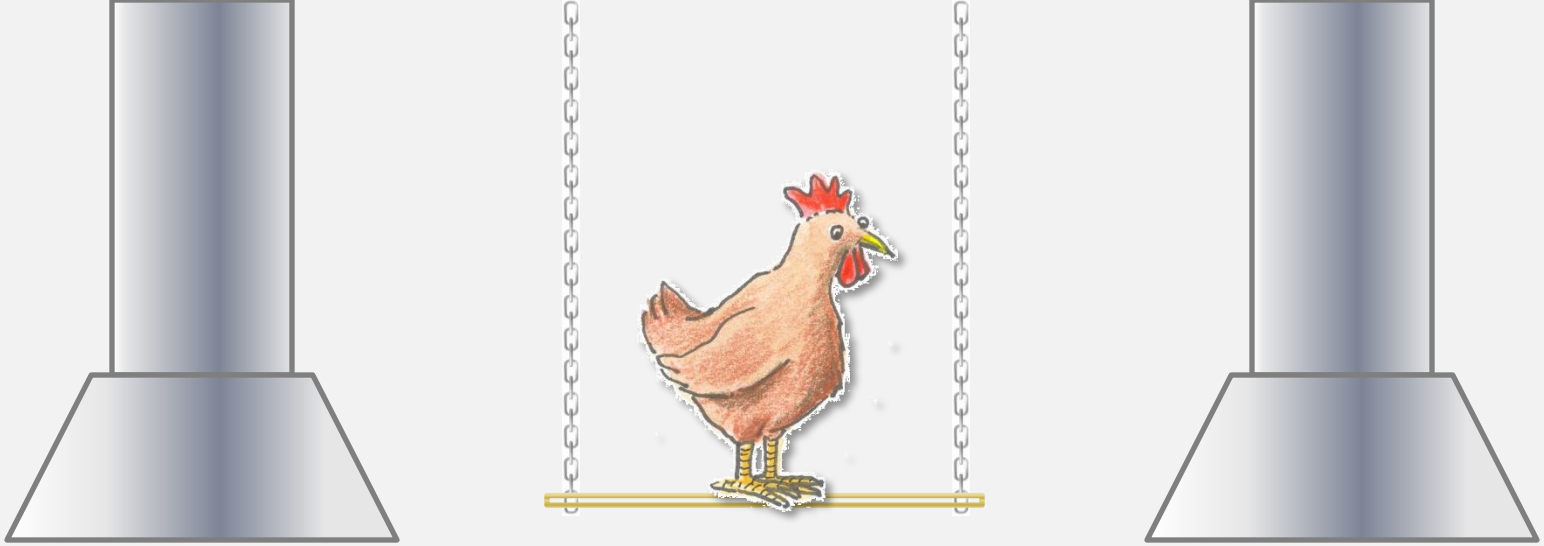
Stimulus- vs. response-locked analysis:

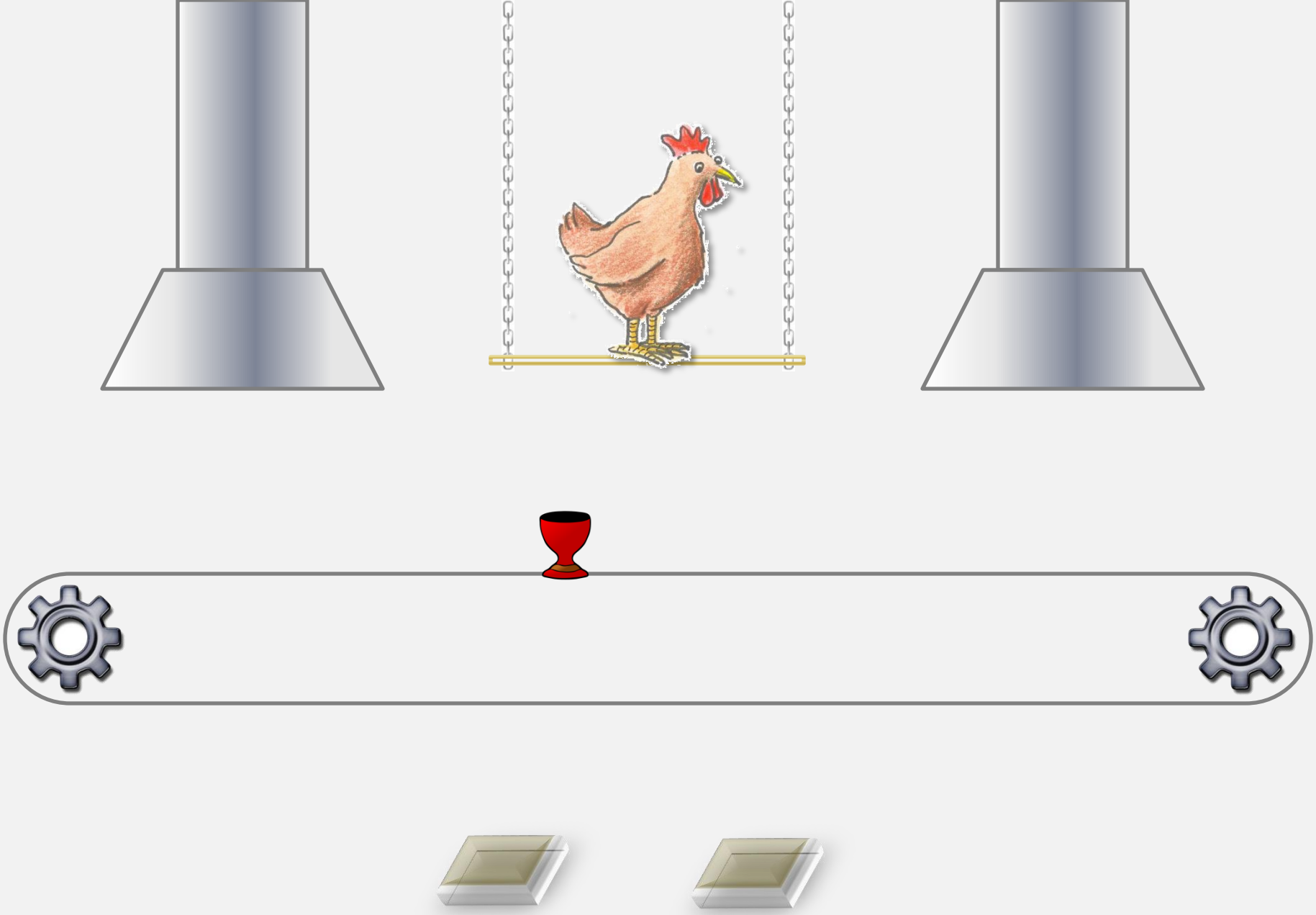
- Stimulus-locked ERPs: Reduced P300 amplitudes for rule violations as compared to correct responses
- Response-locked ERPs: No particular differences

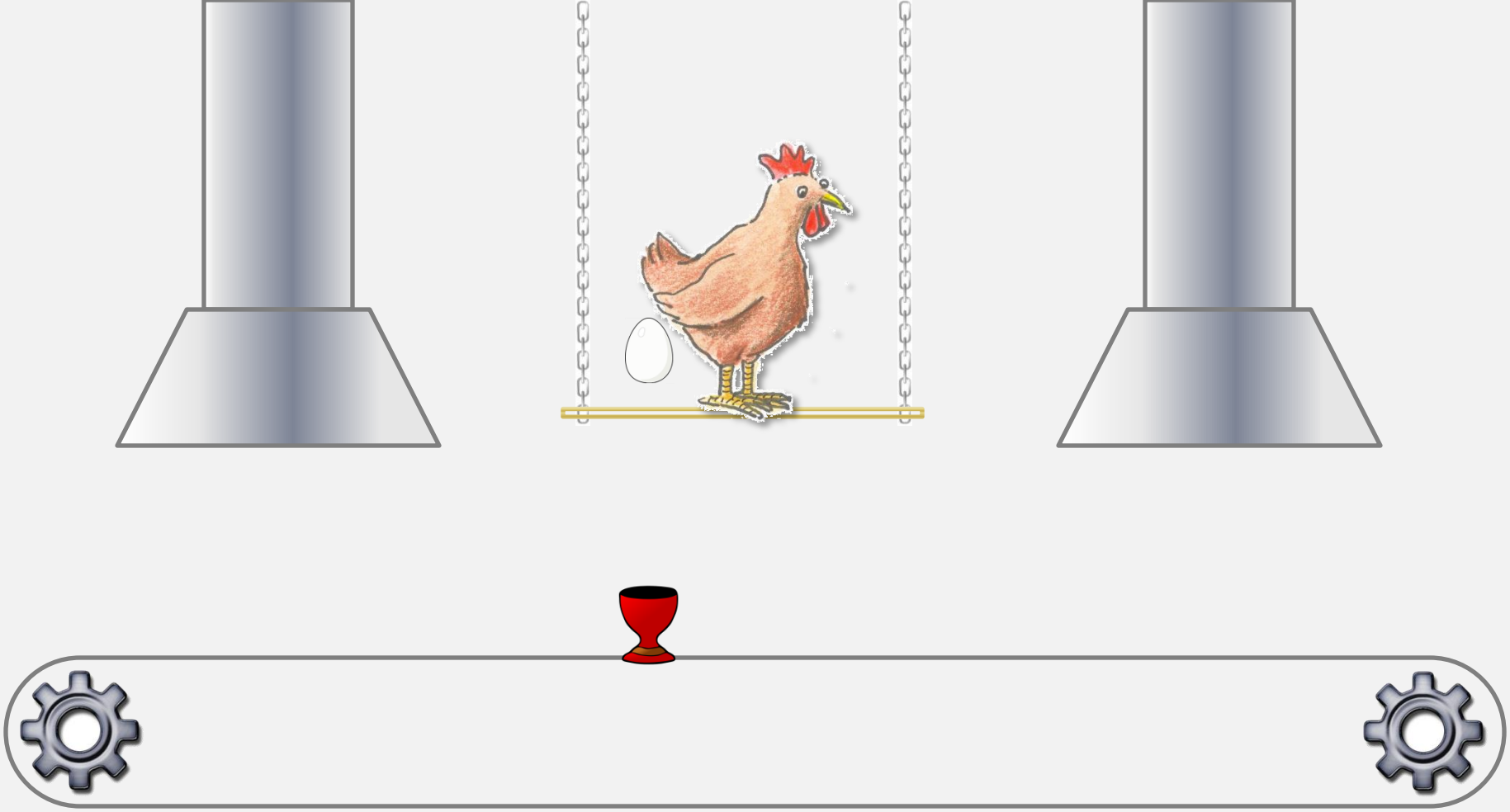


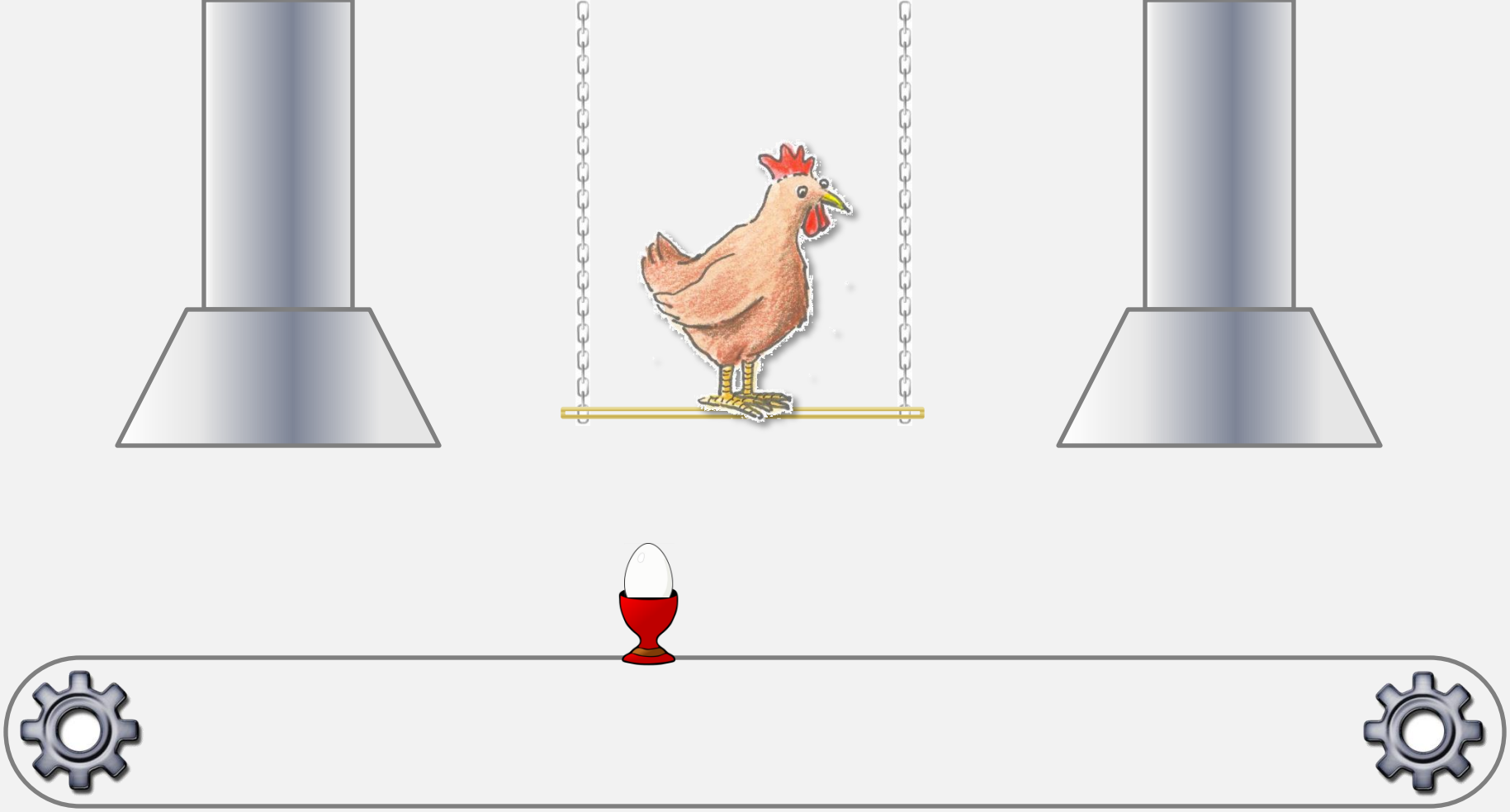
Design & Procedure

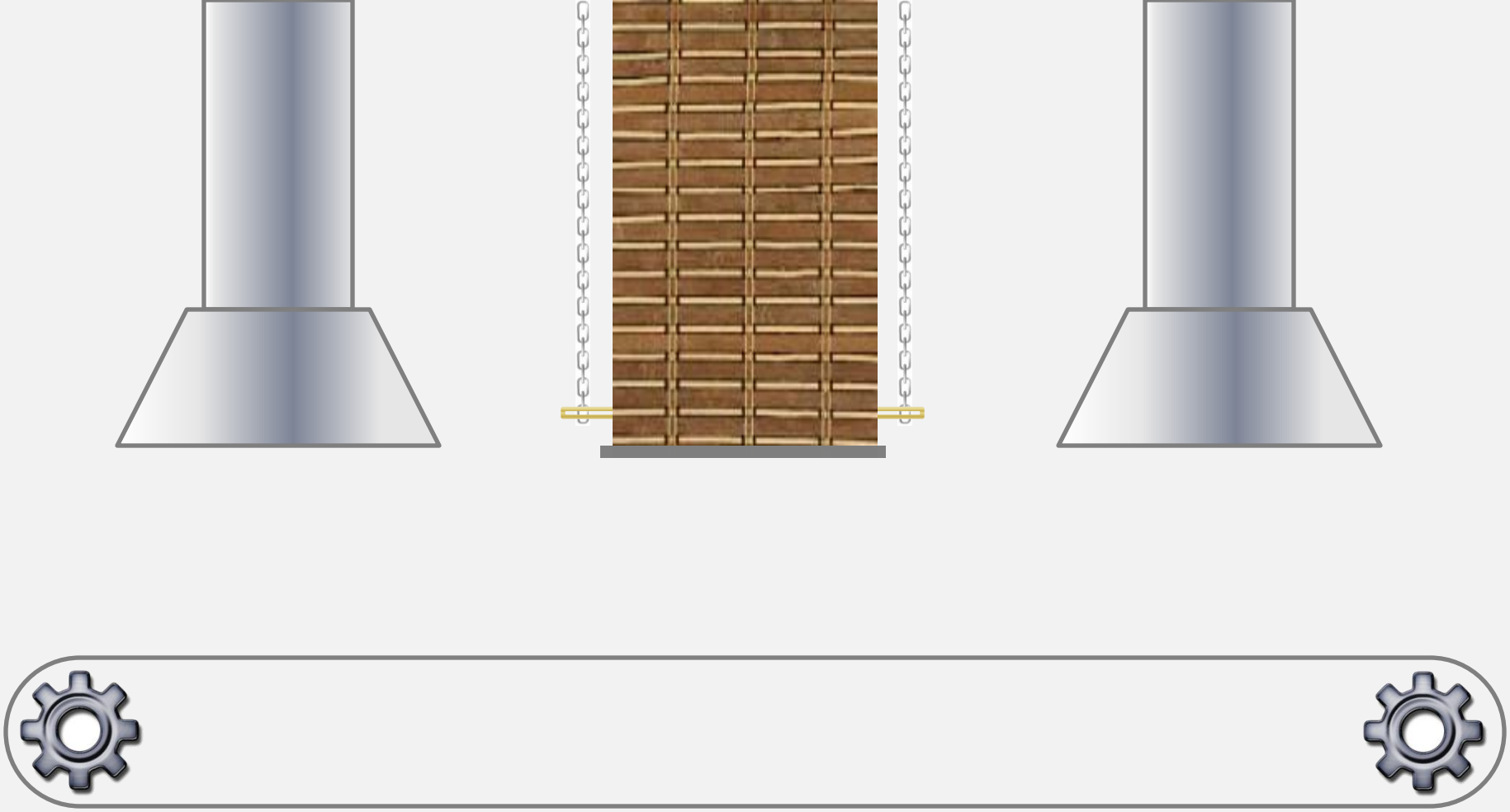


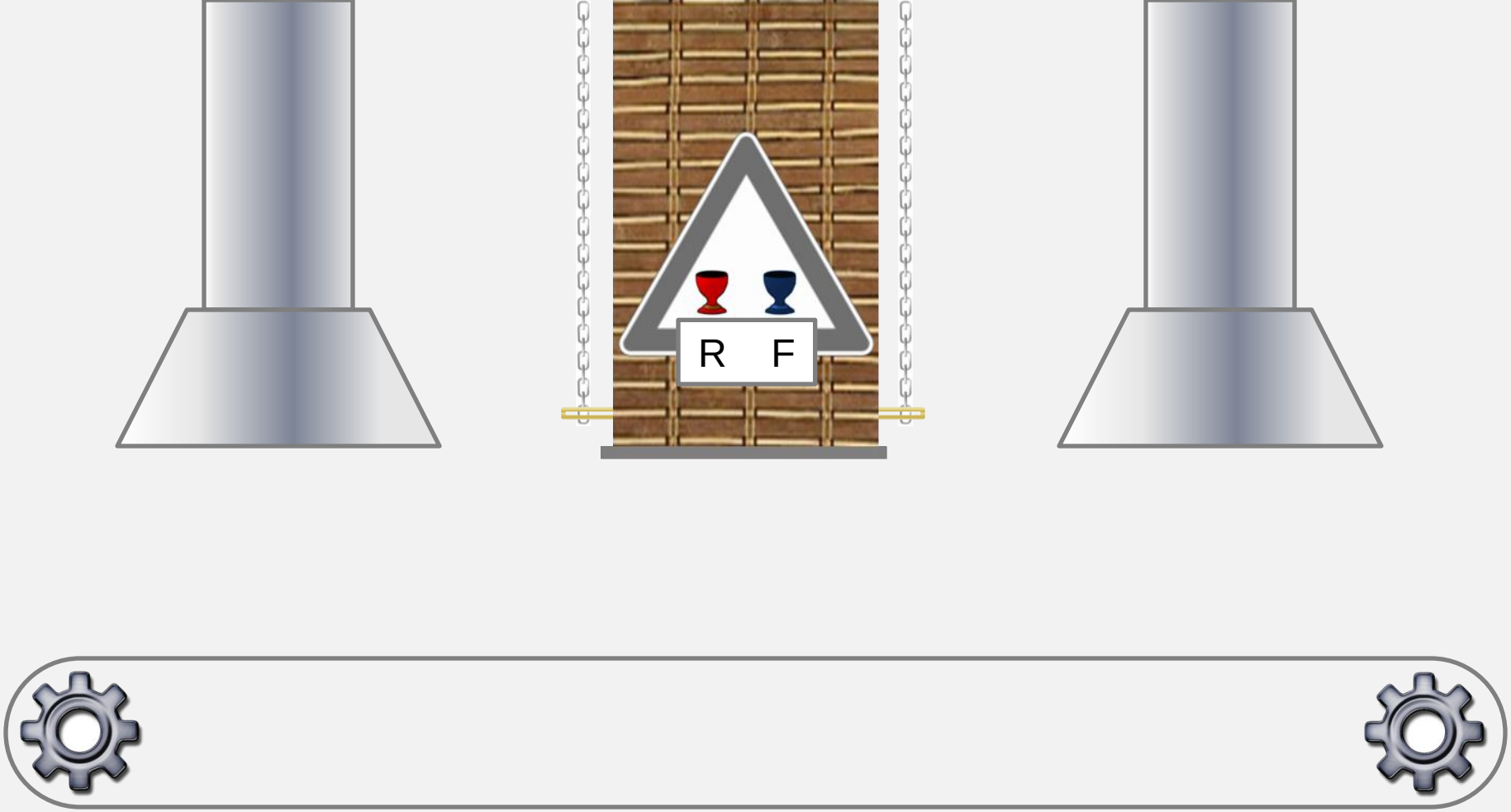








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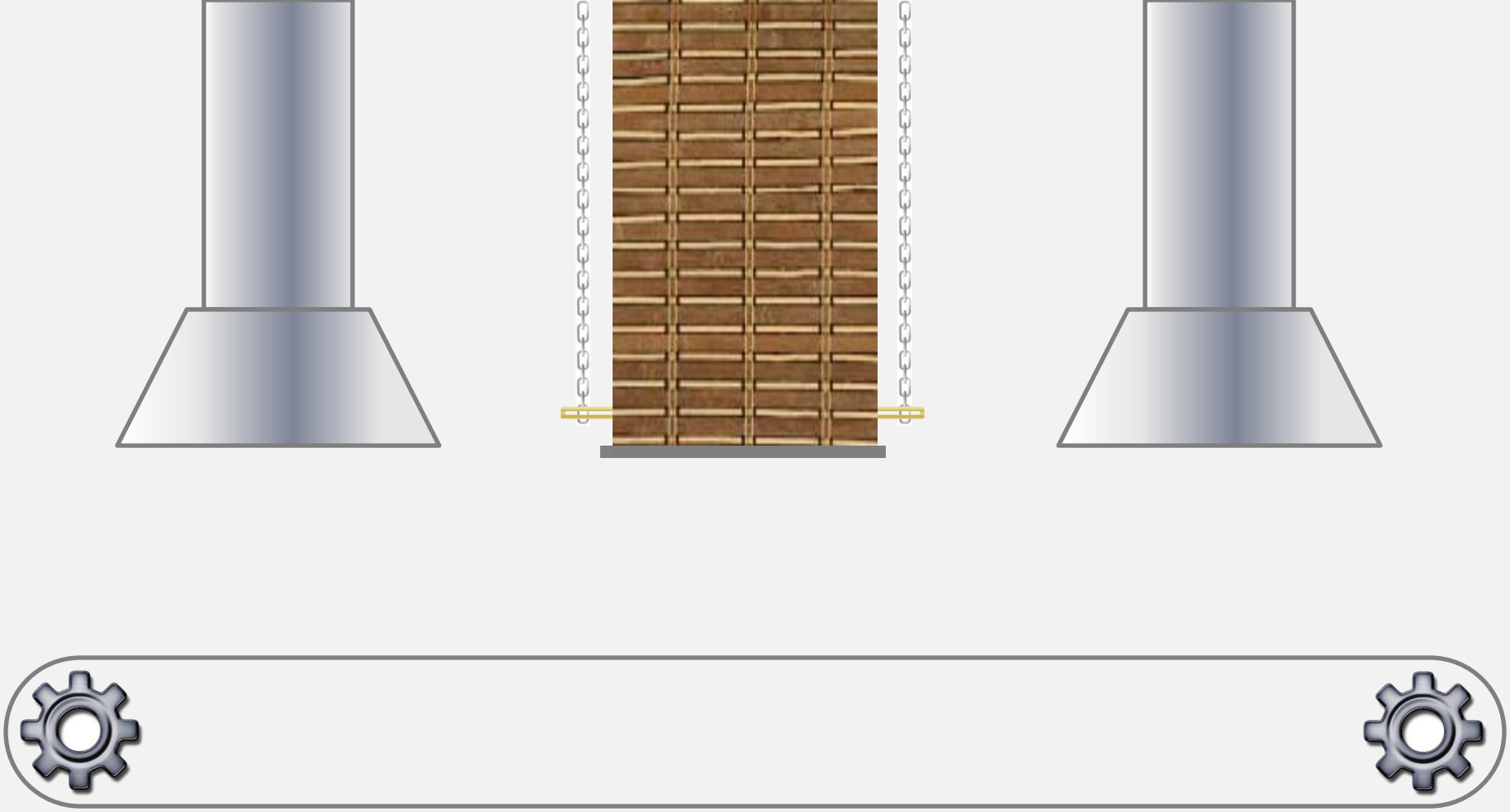
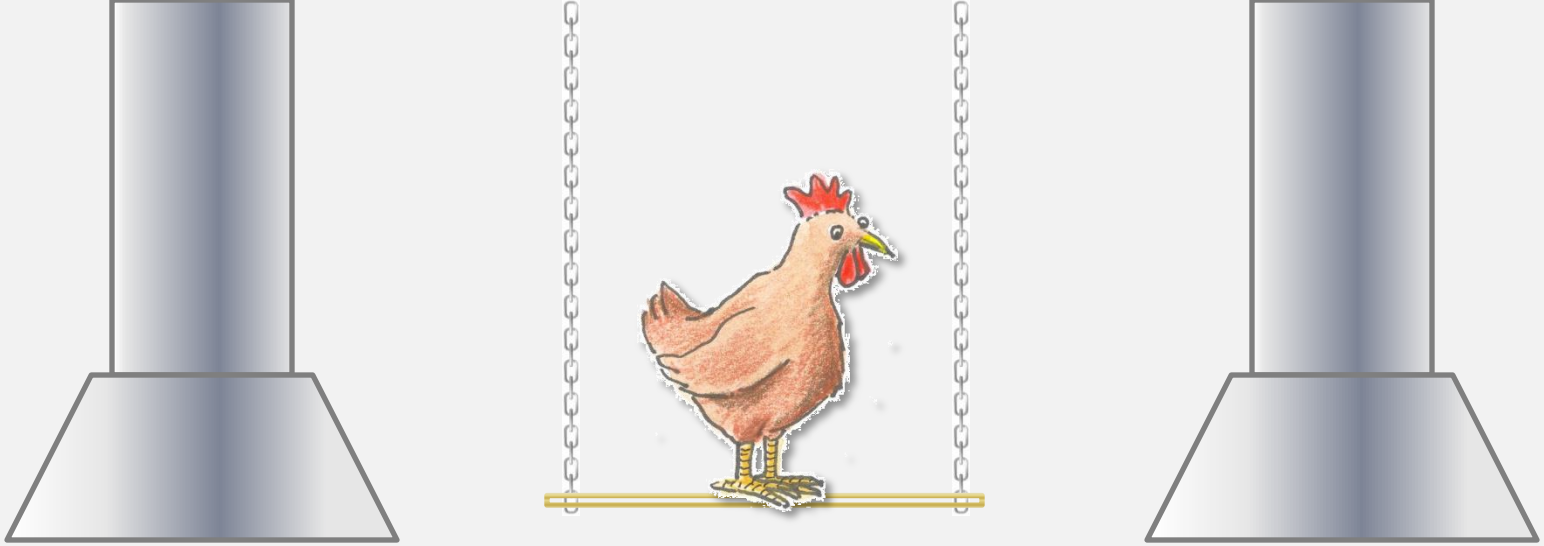
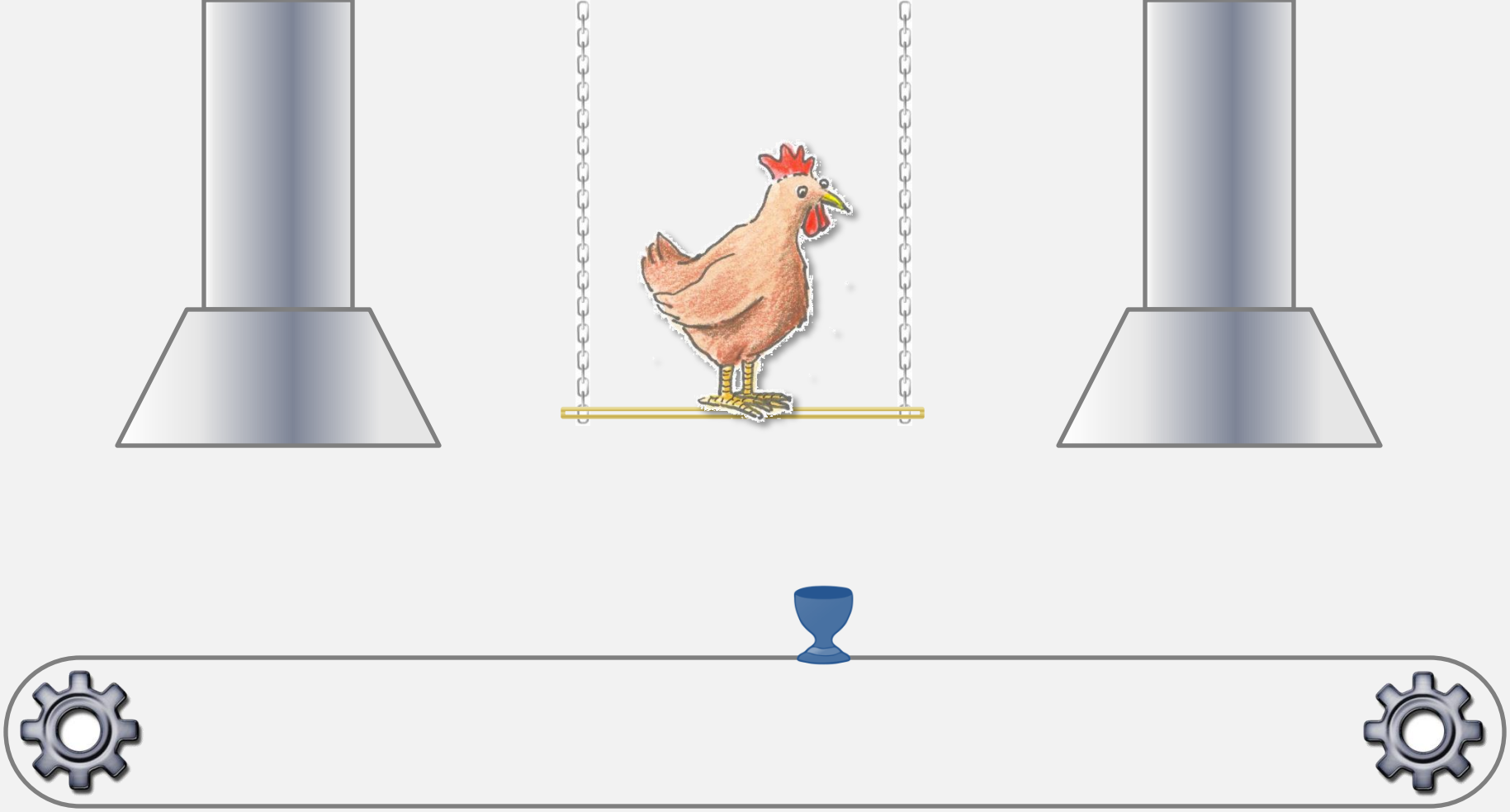
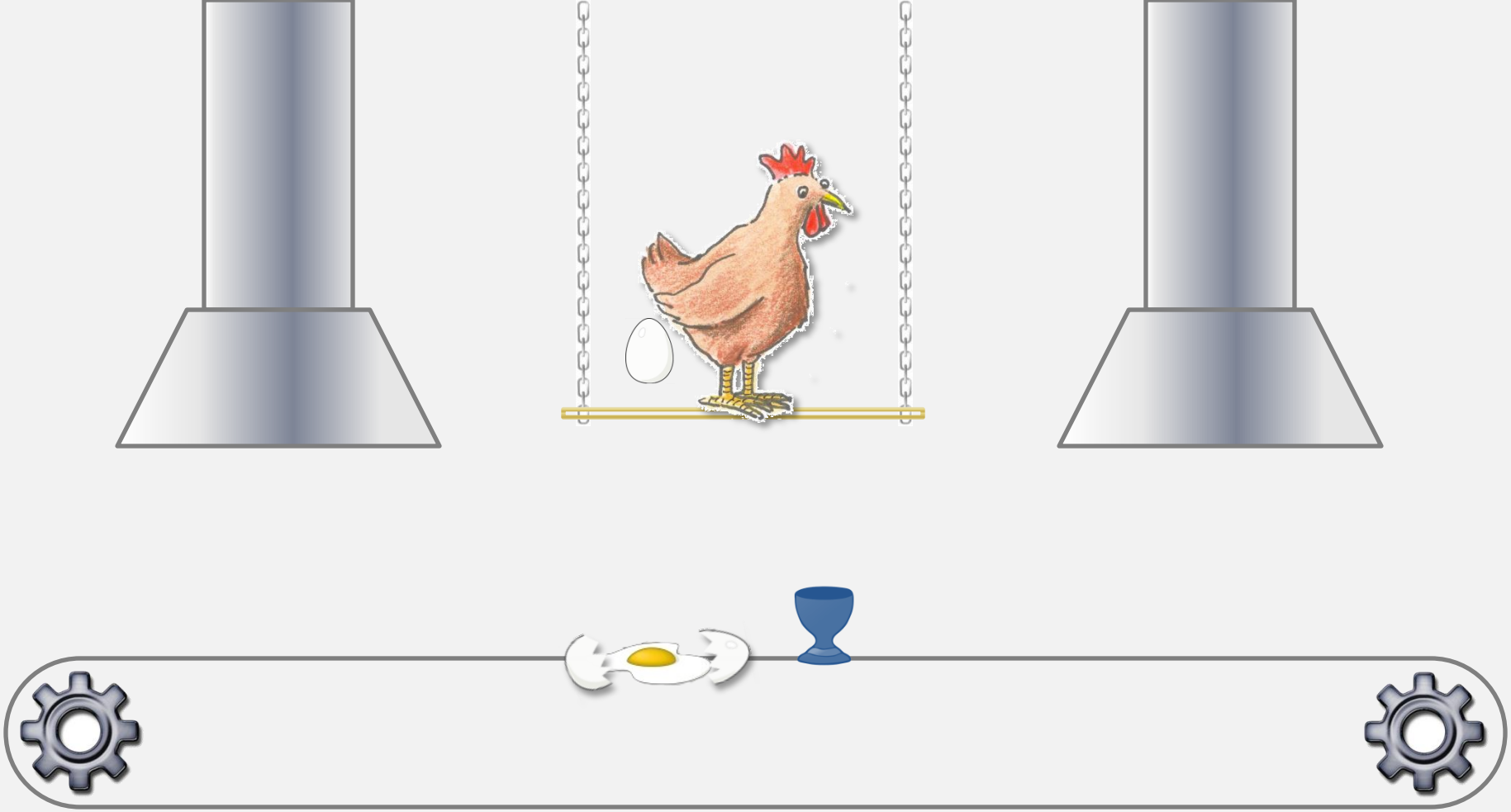
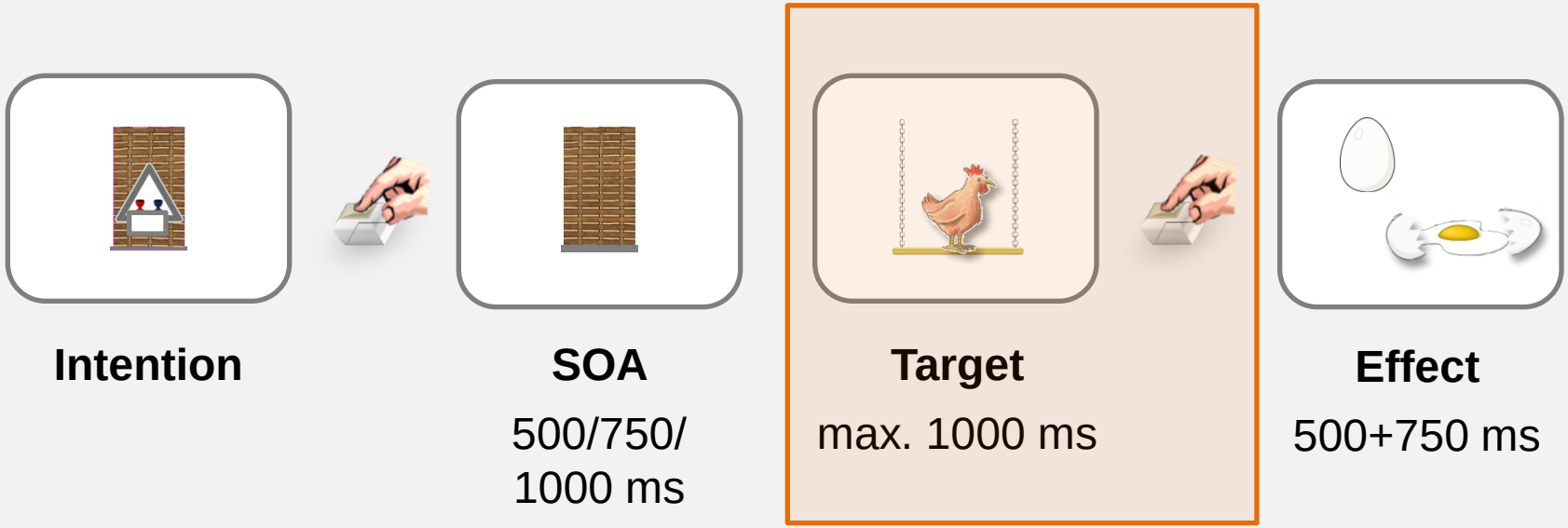




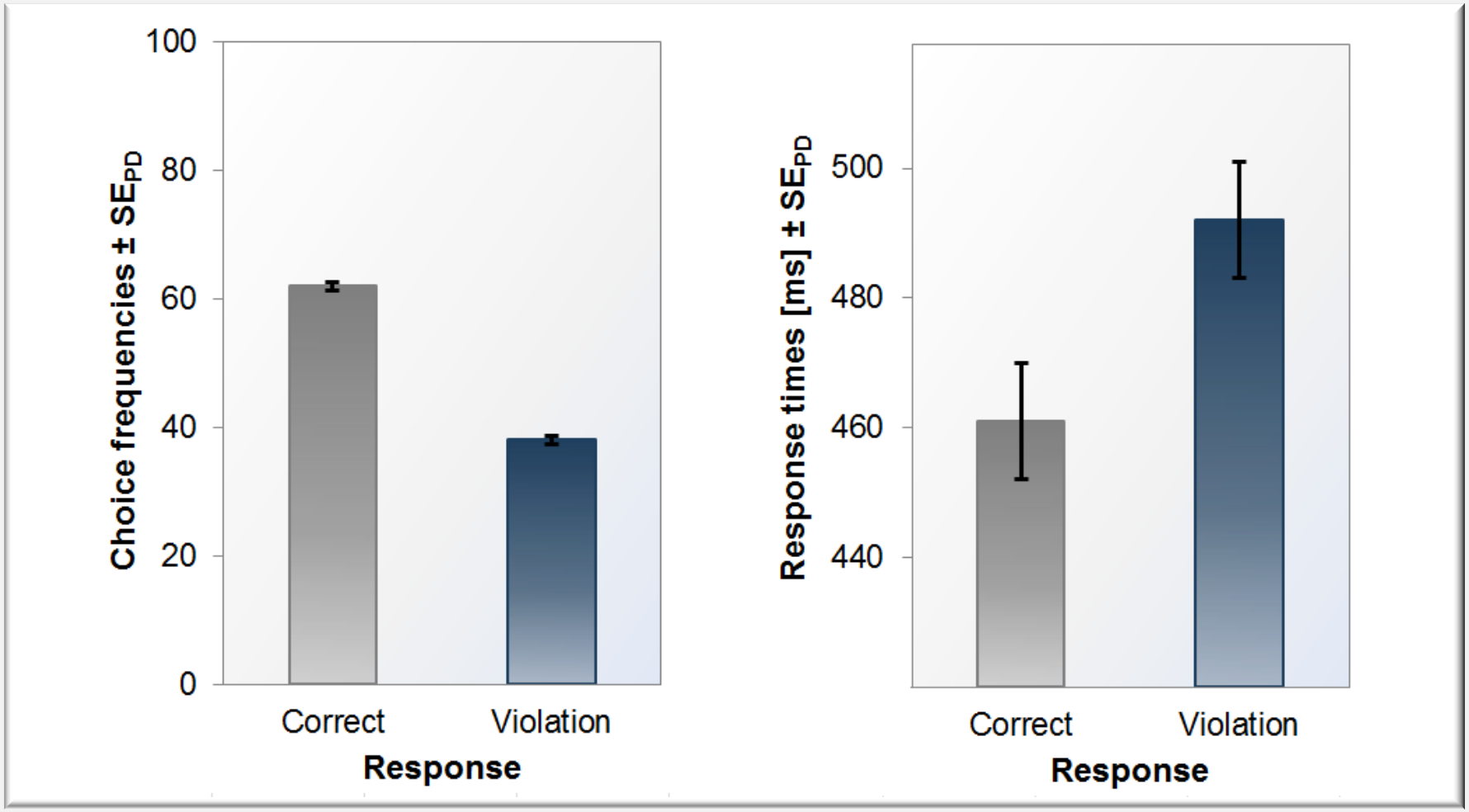




Design (Summary)



Behavioural results

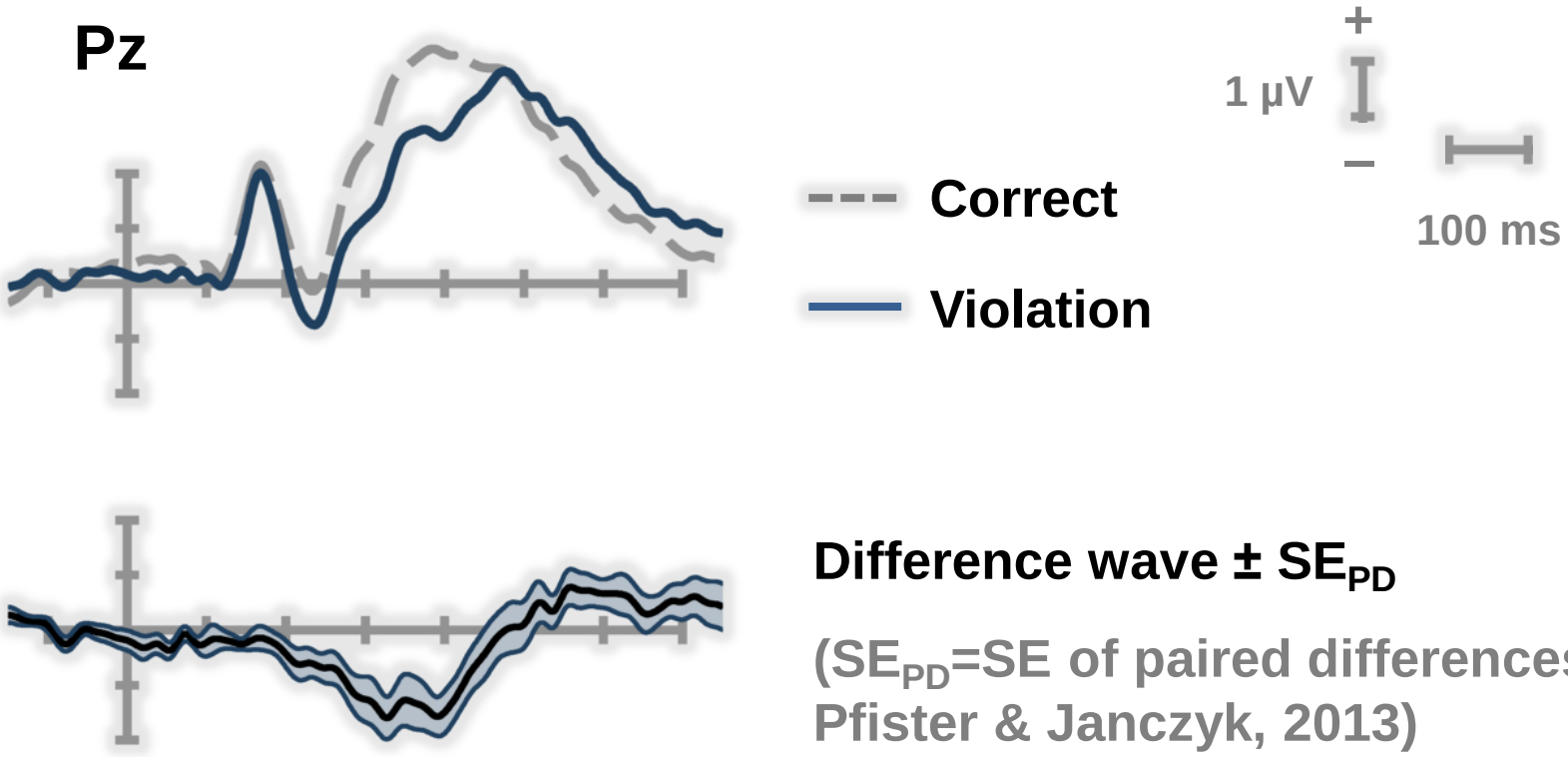


SE$_{PD}$ = Standard Error of Paired Differences (Pfister & Janczyk, 2013)

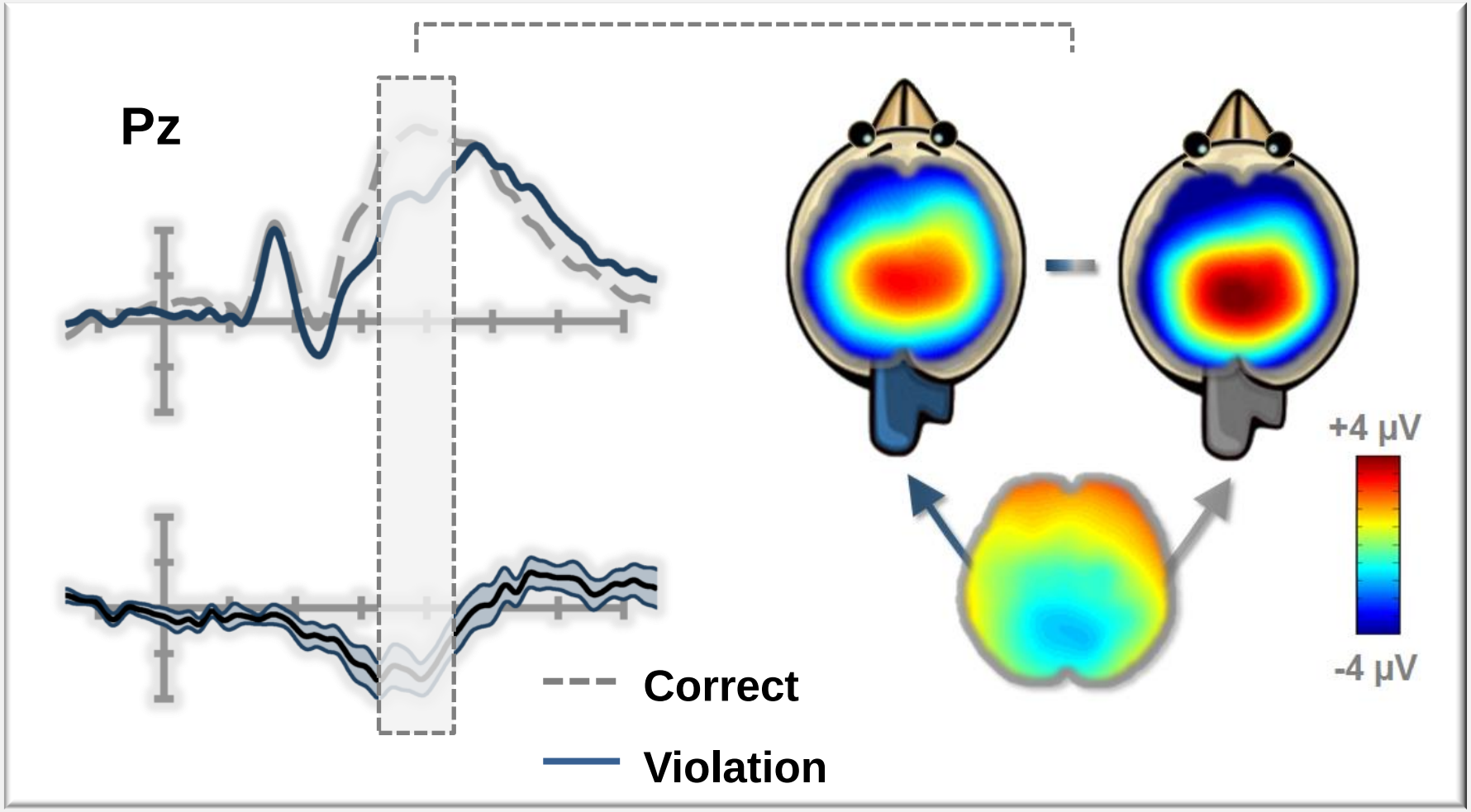
Hypotheses (revisited)

- Stimulus-locked ERPs: Reduced P300 amplitudes for rule violations as compared to correct responses
- Response-locked ERPs: No particular differences

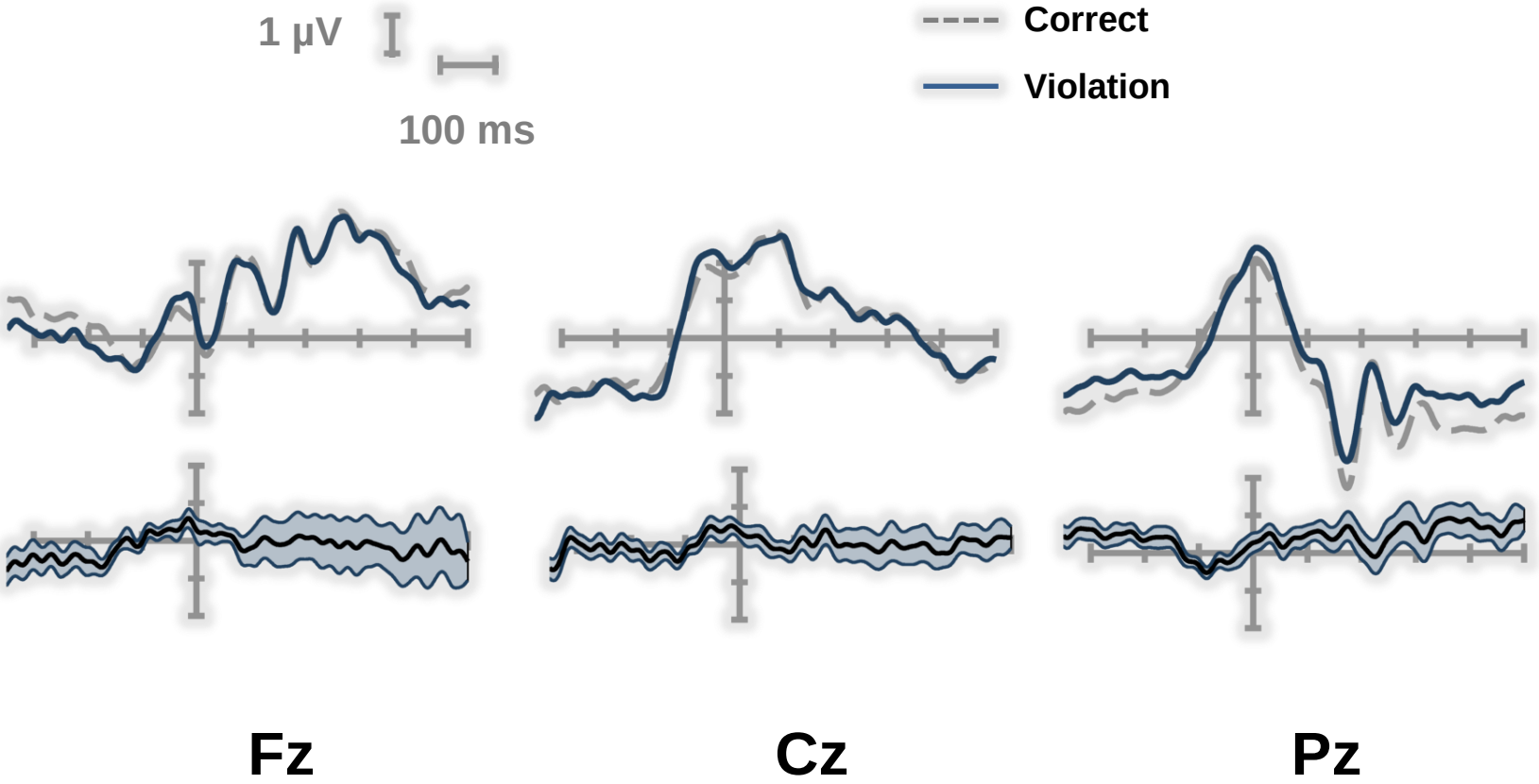
Target-locked ERPs



Topography



Response-locked ERPs



Hypotheses (revisited)

- Stimulus-locked ERPs: Reduced P300 amplitudes for rule violations as compared to correct responses ✓
- Response-locked ERPs: No particular differences ✓

Conclusions

- A rule representation cannot be suppressed even if there are no negative consequences for the agent at all.
- Results suggest an effortful detachment from environmental affordances that is mirrored in an attenuated P300 component in the EEG.

More to come

T-20 **Keep tracking: Effects and aftereffects of dishonesty**

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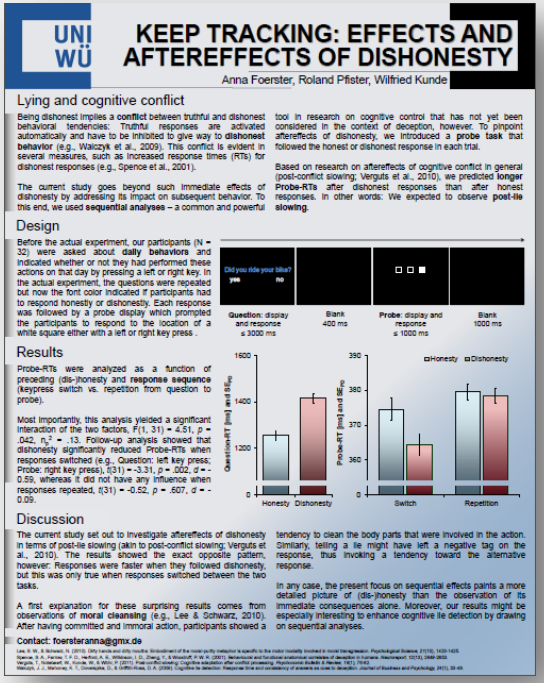
Posters, Tuesday, 15:00 - 17:00



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KEEP TRACKING: EFFECTS AND AFTEREFFECTS OF DISHONESTY

Anna Foerster, Roland Pfister, Wilfried Kunde

Lying and cognitive conflict

Being dishonest implies a **conflict** between truthful and dishonest behavioral tendencies: Truthful responses are activated automatically and have to be inhibited to give way to **dishonest behavior** (e.g., Walczyk et al., 2009). This conflict is evident in several measures, such as increased response times (RTs) for dishonest responses (e.g., Spence et al., 2001).

The current study goes beyond such immediate effects of dishonesty by addressing its impact on subsequent behavior. To this end, we used **sequential analyses** – a common and powerful tool in research on cognitive control that has not yet been considered in the context of deception, however. To pinpoint aftereffects of dishonesty, we introduced a **probe task** that followed the honest or dishonest response in each trial.

Based on research on aftereffects of cognitive conflict in general (post-conflict slowing; Verguts et al., 2010), we predicted **longer Probe-RTs** after dishonest responses than after honest responses. In other words: We expected to observe **post-lie slowing**.

Design

Before the actual experiment, our participants (N = 32) were asked about **daily behaviors** and indicated whether or not they had performed these actions on that day by pressing a left or right key. In the actual experiment, the questions were repeated but now the font color indicated if participants had to respond honesty or dishonesty. Each response was followed by a probe display which prompted the participants to respond to the location of a white square either with a left or right key press .

Results

Probe-RTs were analyzed as a function of preceding (dis-)honesty and **response sequence** (keypress switch vs. repetition from question to probe).

Most importantly, this analysis yielded a significant interaction of the two factors, $F(1, 31) = 4.51$, $p = .042$, $\eta_p^2 = .13$. Follow-up analysis showed that dishonesty significantly reduced Probe-RTs when responses switched (e.g., Question: left key press; Probe: right key press), $t(31) = -3.31$, $p = .002$, $d = -0.59$, whereas it did not have any influence when responses repeated, $t(31) = -0.52$, $p = .607$, $d = -0.09$.

Discussion

The current study set out to investigate aftereffects of dishonesty in terms of post-lie slowing (akin to post-conflict slowing; Verguts et al., 2010). The results showed the exact opposite pattern, however: Responses were faster when they followed dishonesty, but this was only true when responses switched between the two tasks.

A first explanation for these surprising results comes from observations of **moral cleansing** (e.g., Lee & Schwarz, 2010). After having committed and immoral action, participants showed a tendency to clean the body parts that were involved in the action. Similarly, telling a lie might have left a negative tag on the response, thus invoking a tendency toward the alternative response.

In any case, the present focus on sequential effects paints a more detailed picture of (dis-)honesty than the observation of its immediate consequences alone. Moreover, our results might be especially interesting to enhance cognitive lie detection by drawing on sequential analyses.

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Lee, S. W. S. & Schwarz, N. (2010). Dirty hands and dirty mouths: Embodiment of the moral-purity metaphor is specific to the motor modality involved in moral transgression. *Psychological Science*, *21*(10), 1423-1425.
Spence, S. A., Farrow, T. F. D., Herford, A. E., Wilkinson, I. D., Zheng, Y. & Woodruff, P. W. R. (2001). Behavioural and functional anatomical correlates of deception in humans. *Neuroreport*, *12*(13), 2849-2853.
Verguts, T., Notebaert, W., Kunde, W. & Wühr, P. (2011). Post-conflict slowing: Cognitive adaptation after conflict processing. *Psychonomic Bulletin & Review*, *18*(1), 75-82.
Walczyk, J. J., Mahoney, K. T., Doverspike, D. & Griffith-Ross, D. A. (2009). Cognitive lie detection: Response time and consistency of answers as cues to deception. *Journal of Business and Psychology*, *24*(1), 39-49.

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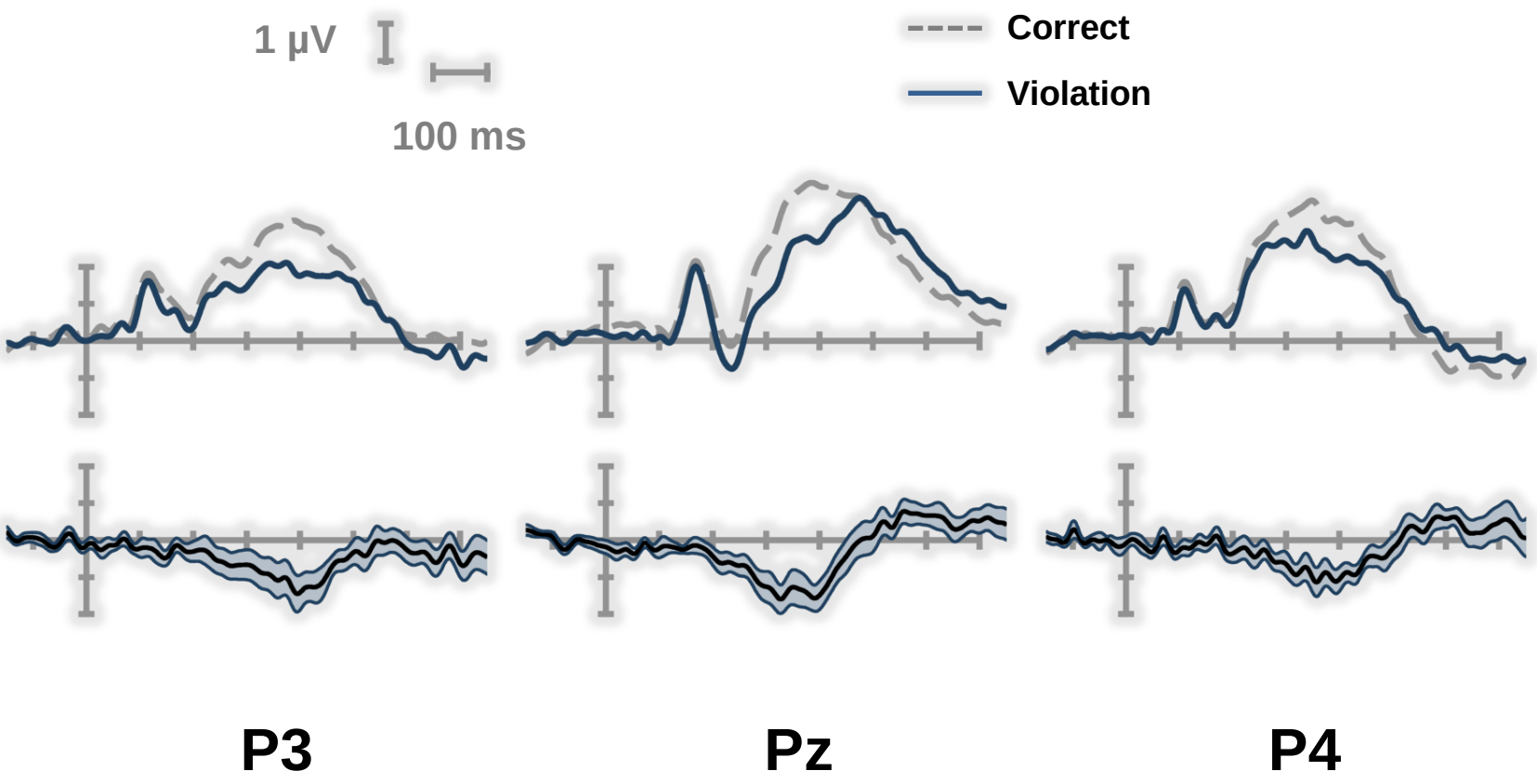
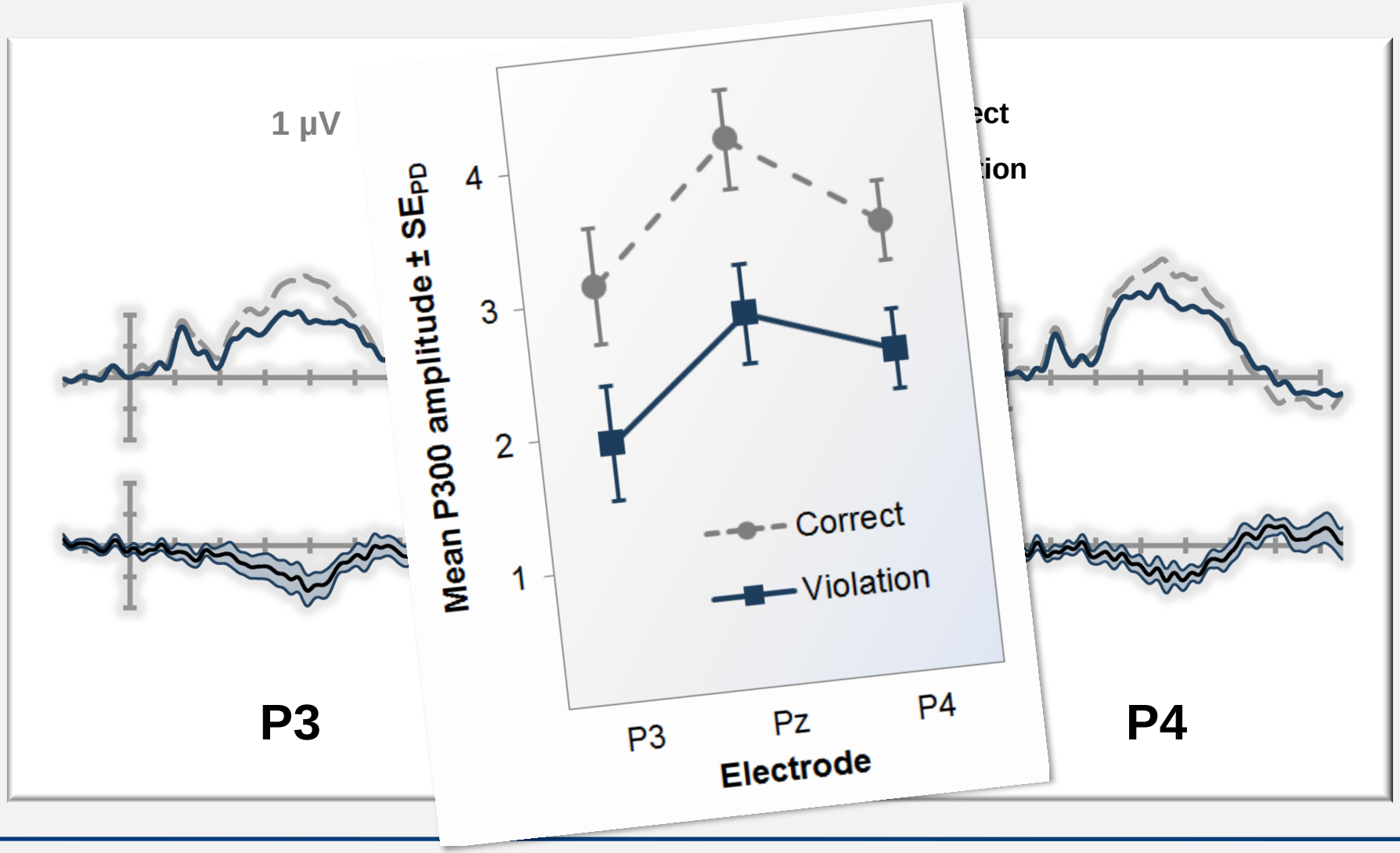
Target-locked ERPs & Difference Waves



Target-locked ERPs & Difference Waves



ERN / N_E

Response-locked ERPs:

Correct vs. errors

- **Correct**
- **Error**