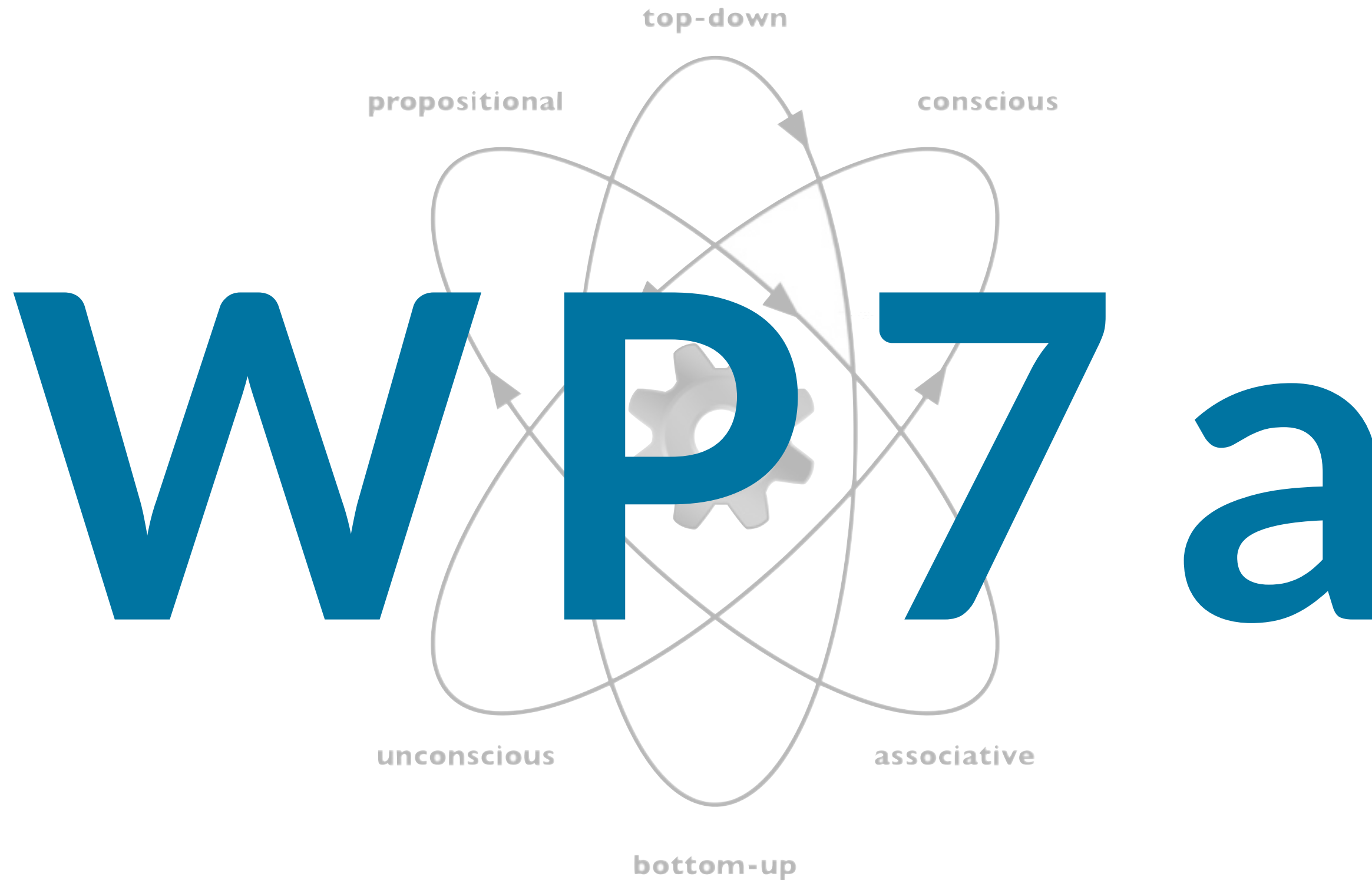


WP7 has three parts

- **WP7a:** Quality of representation:
Expertise studies (with Guillermo & Philippe, with Dalila), causal learning/associative learning studies (**Esti**, with Jan & Tom), & decision-making (Irène)
- **WP7b:** Metarepresentation : Metacognition, hypnosis, suggestion (with Zoltan, with Marcel)
- **WP7c:** Learning & consciousness: Externalizing the inner loop (**Emilie**, with Patrick; with Santiago, with Laurène)



SEIBEL(1963)'S 1023-CHOICE RT TASK

1: Stimuli

SEIBEL(1963)'S 1023-CHOICE

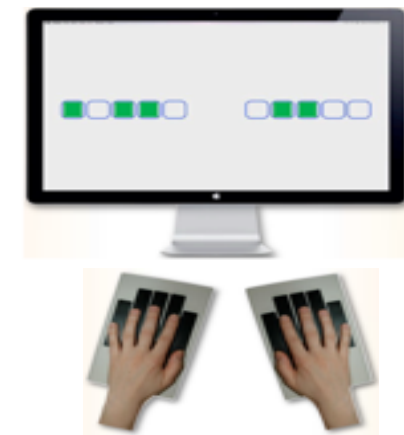
AIM

Contribute at the better understanding of motor learning expert acquisition in healthy subjects
Study of the neural correlates of chunking information process

HOW TO DO IT?

Using a multiple-Choice Reaction Time task adapted from Seibel, 1965

- The task is composed by 10 keys, one per finger that allow a total of $1024(-1)$ different combinations (**video**)
- Participant were asked to reproduce as fast as possible the combinations (stimuli) appearing on the screen.
Stimuli are **Randomly** presented!
- Participants accomplished a total of 25 sessions (+/- 1 hour/ session)
- fMRI scan was presented on 5 learning sessions (**fMRI: Sessions 1-2-4-9-25**)



UNCONSCIOUS ASSOCIATIVE LEARNING

Research Article



Nonconscious Learning From Crowded Sequences

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Axel Cleeremans¹, and Sid Kouider²**

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Psychological Science

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Subliminal Instrumental Conditioning Demonstrated in the Human Brain

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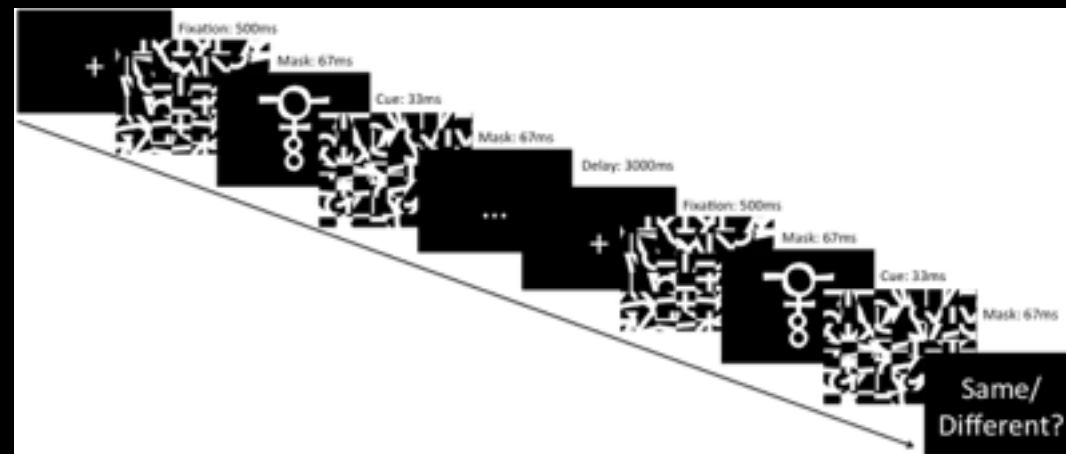
*Correspondence: mathias.pessiglione@gmail.com

DOI 10.1016/j.neuron.2008.07.005

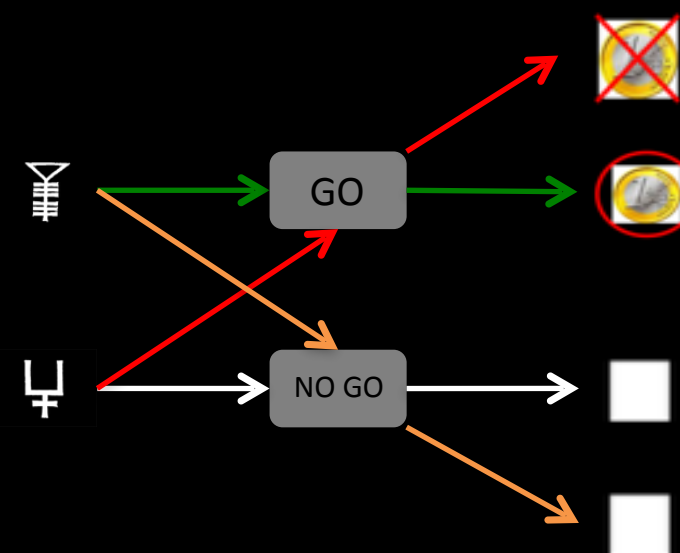
Replication



Visibility



Learning



Preference

Reward Punish Neutral



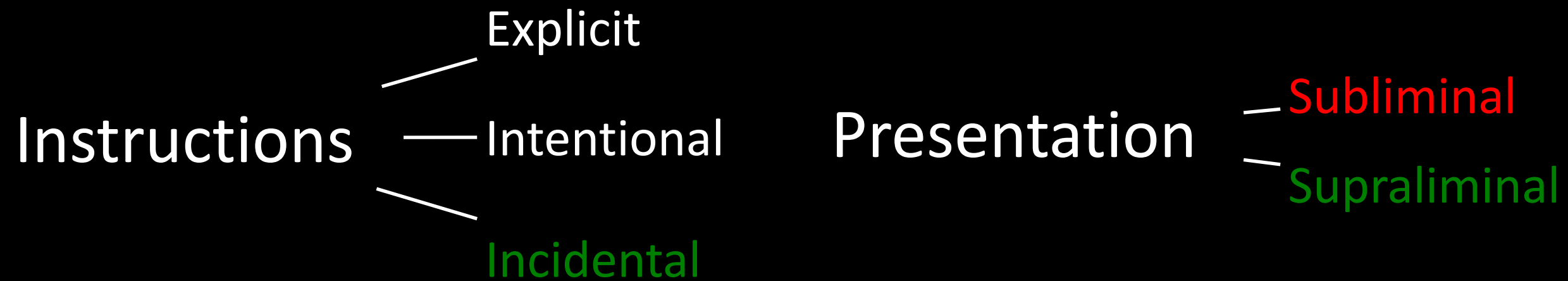
1

2

3

Can Associative Learning be Implicit?

Procedure



Learning
+
Test

Consciousness

Visibility

WP7b

Metarepresentation

TRAINING METACOGNITION

1. Training perceptual awareness through second-order judgments

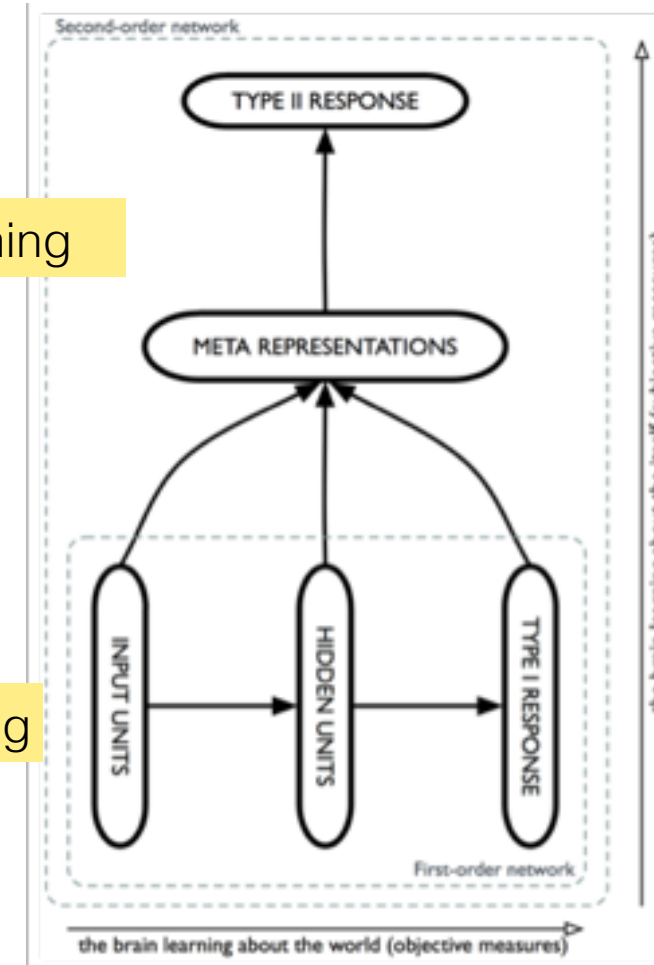
- Visual perception task
- Two groups:
 - confidence judgments vs. no confidence judgments
- Effect on Meta-d'

2nd order learning

2. What information is used for metacognitive judgments?

- Contribution of motor cortex to perceptual confidence
- EEG functional connectivity prefrontal cortex and motor cortex

1st order perceptual learning



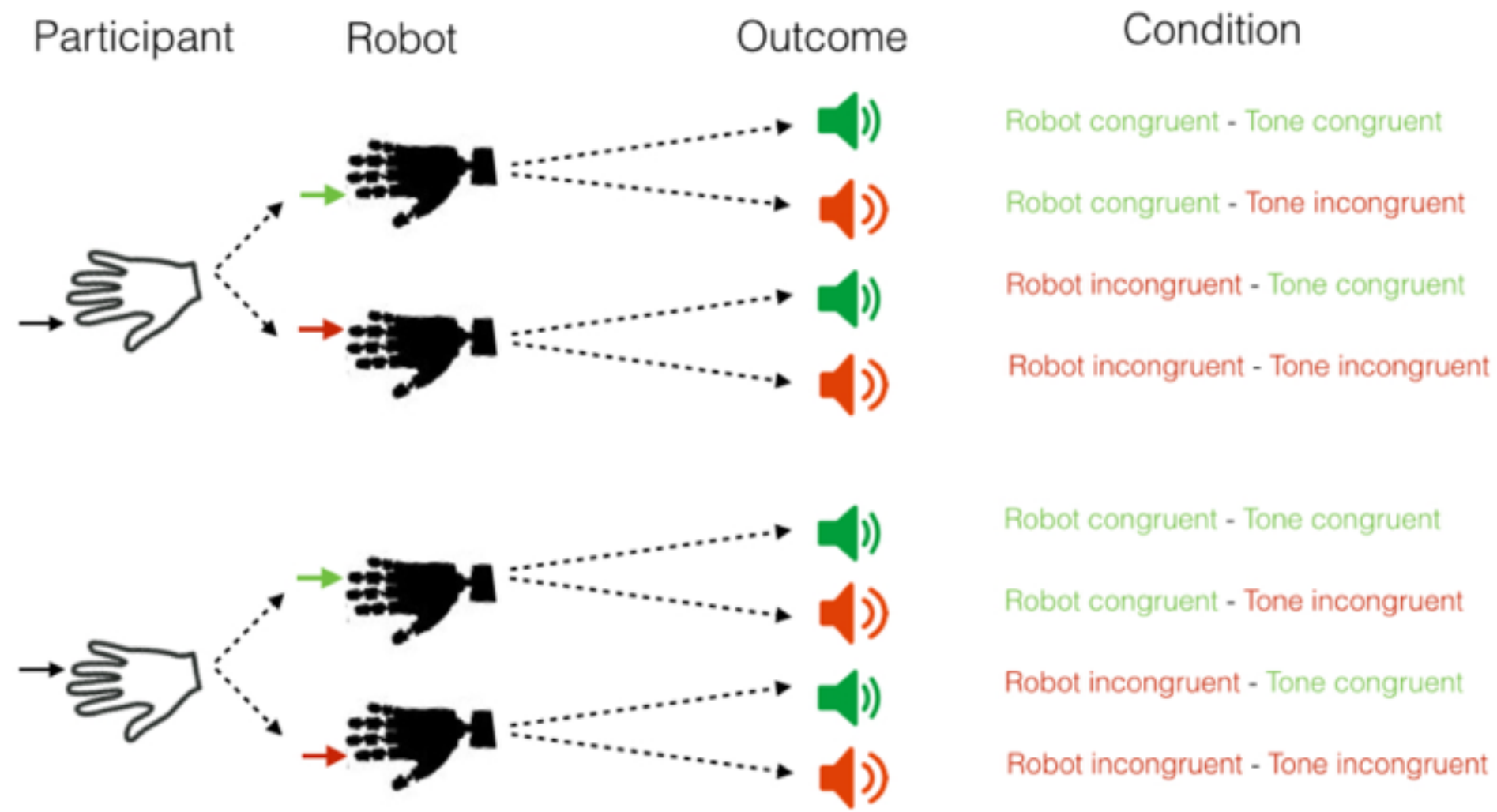


WP7C

Learning to be conscious

- robotic hand
- BCI & neurofeedback:
 - If awareness depends on learning, then we should observe a change in the temporal gap between RP and VV judgement in a Libet design involving learning to control a BCI to move an artificial effector





- Disturbances in the intention-action-outcome chain: how is agency affected by deviance?
Caspar, E.A., Desantis, A., Cleeremans, A., & Haggard, P. (under review). The sense of agency as tracking control. *Cognition*
- « Only obeying orders » : how coercion changes the sense of agency in the human brain
Caspar, E.A., Christensen, J., Cleeremans, A., & Haggard, P. (under review). How coercion changes the sense of agency in the human brain. *Current biology*
- Free will: are we all equal? A dynamical perspective of the conscious intention to move
Caspar, E.A., & Cleeremans, A., (in press). *Neuroscience of consciousness*
- The relationship between sense of agency and embodiment: The rubber hand illusion and the classical and the active paradigm
De Beir, A., Caspar, E.A., Cleeremans, A., & Vanderborght, B. (in preparation).
- Effect of outcome valence on sense of agency
Caspar, E.A., & Cleeremans, A. (in progress).



DISCUSSION

