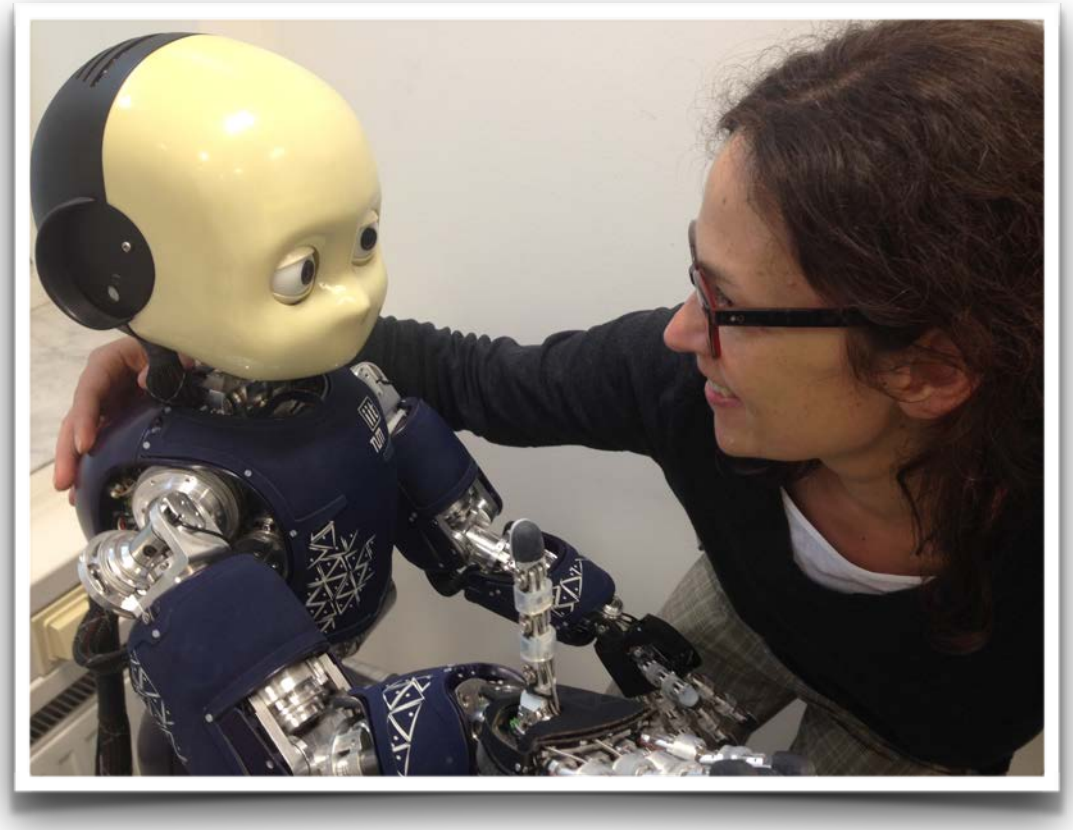
OBJECTIVE METHODS OF SOCIAL COGNITIVE NEUROSCIENCE FOR SOCIAL ATTUNEMENT



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&
Institute for Cognitive Systems, Technical University Munich
agnieszka.wykowska@ltu.se

WHY METHODS OF SOCIAL COGNITIVE NEUROSCIENCE?

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- objective measures to examine fundamental mechanisms (often implicit) of human sensing and human cognition in human-robot interaction

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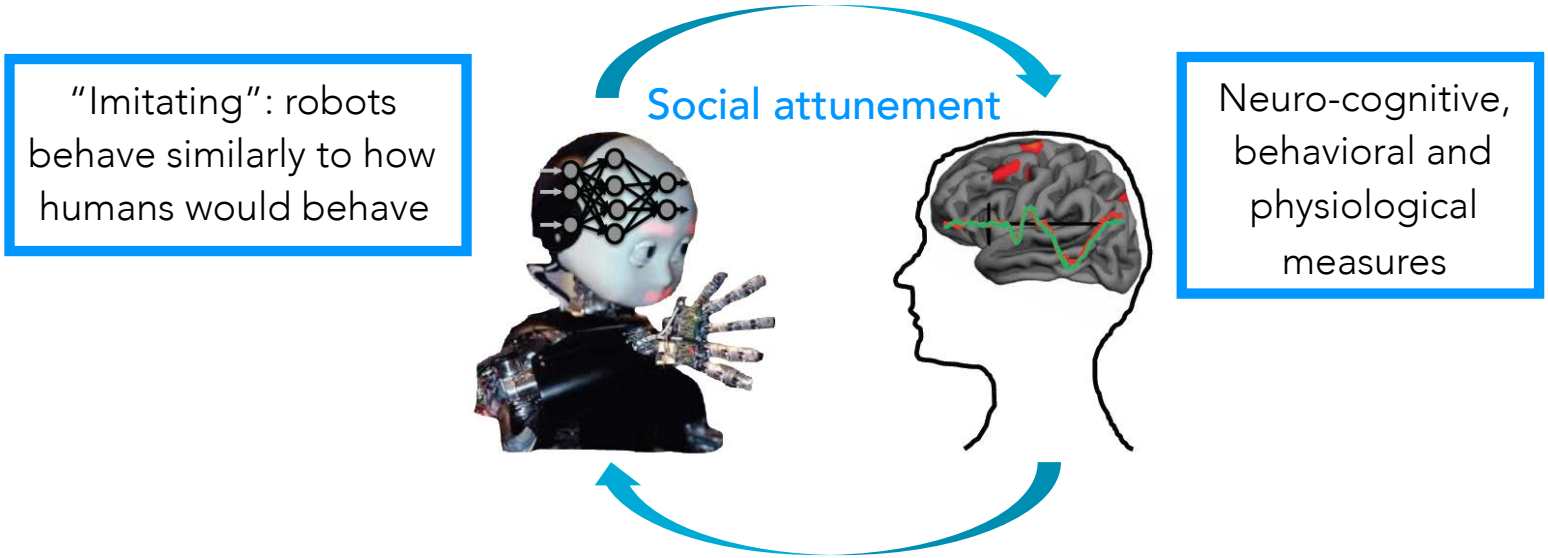
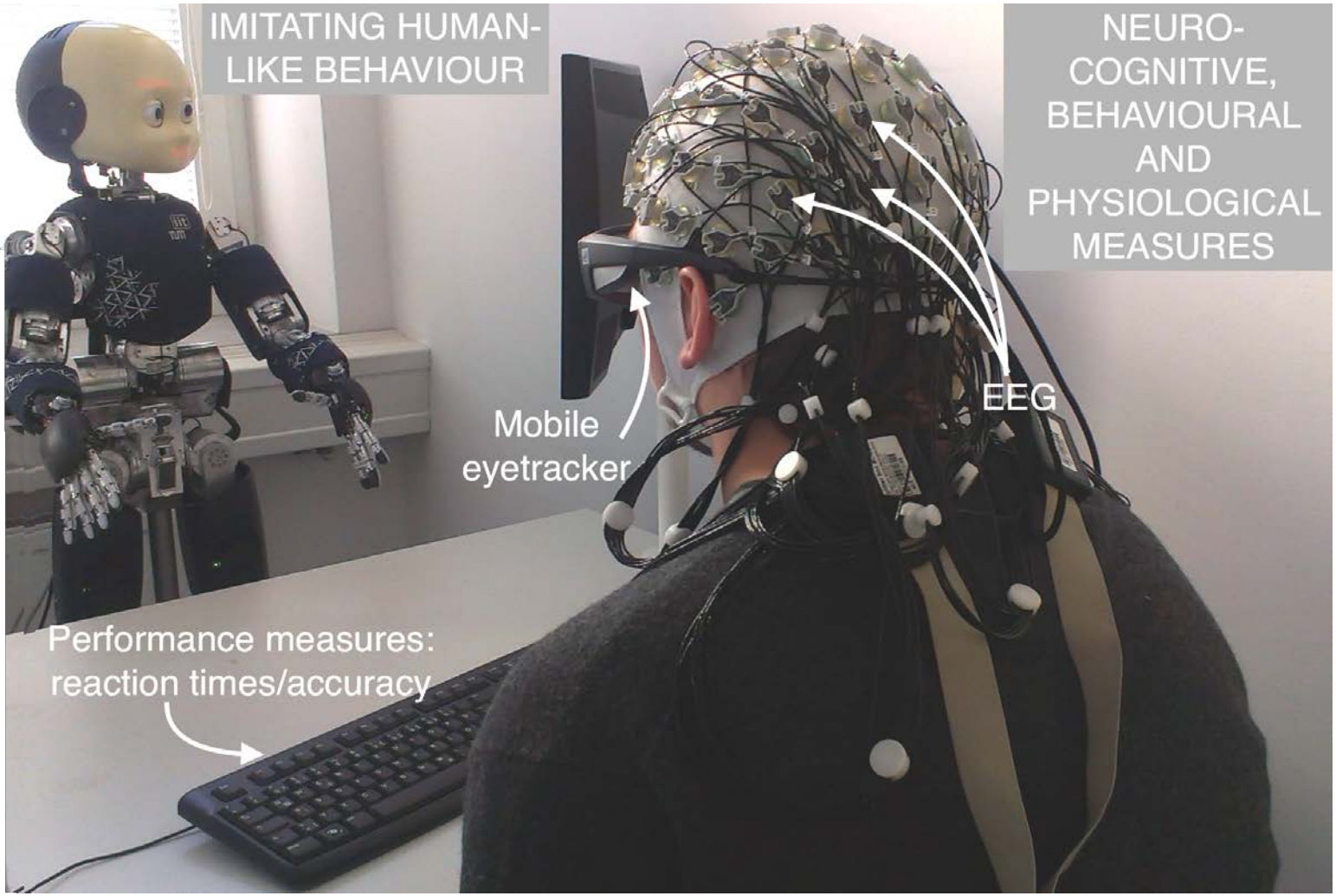


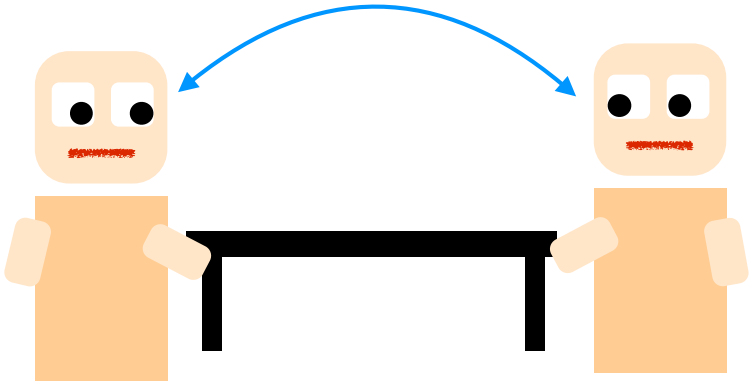
THE METHODS


IMITATING HUMAN-LIKE BEHAVIOUR
NEURO-COGNITIVE, BEHAVIOURAL AND PHYSIOLOGICAL MEASURES
EEG
Mobile eyetracker
Performance measures: reaction times/accuracy

SOCIAL ATTUNEMENT

JOINT ATTENTION

–ATTENDING TO WHERE OTHERS ATTEND



JOINT ATTENTION - GAZE CUEING

POSNER CUEING

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POSNER CUEING

T

JOINT ATTENTION - GAZE CUEING

POSNER CUEING

Validly cued target

JOINT ATTENTION - GAZE CUEING

POSNER CUEING

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Validly cued target

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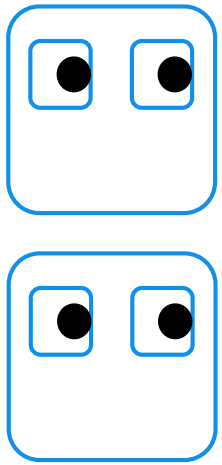
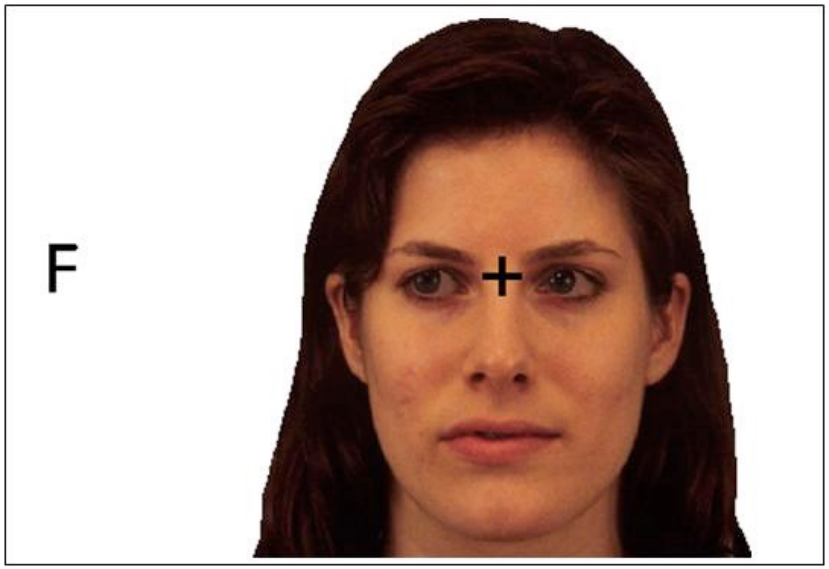
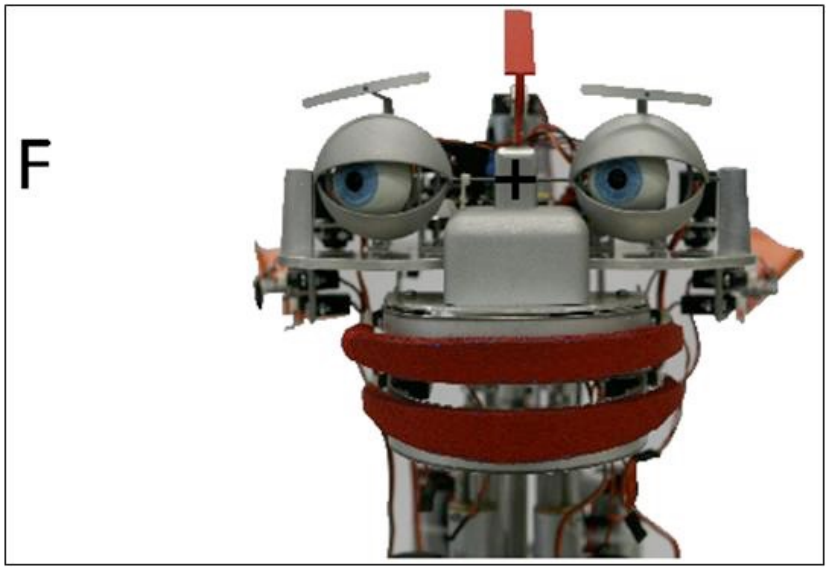
GAZE CUEING



GAZE CUEING AND ROBOTS



Karolinska Directed Emotional Faces database (KDEF, Lundqvist, Flykt & Öhman, 1998)



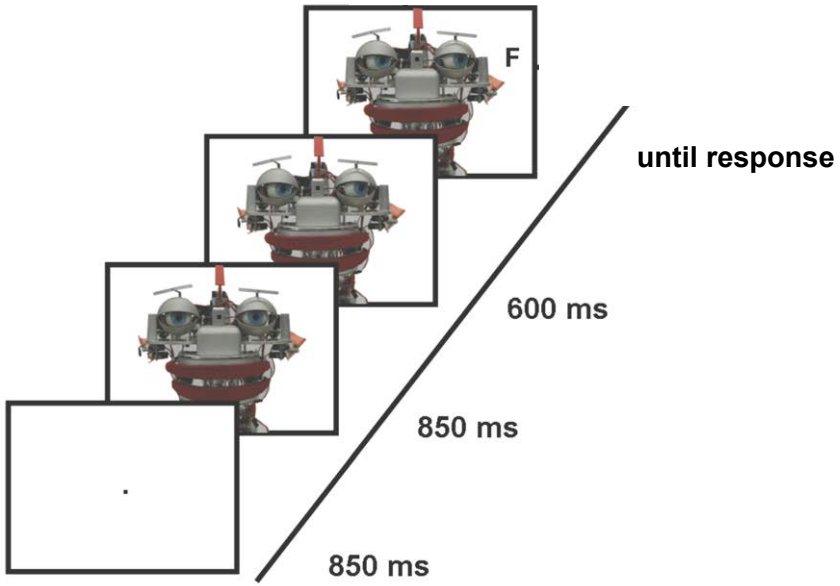
(c) LSR, TU München

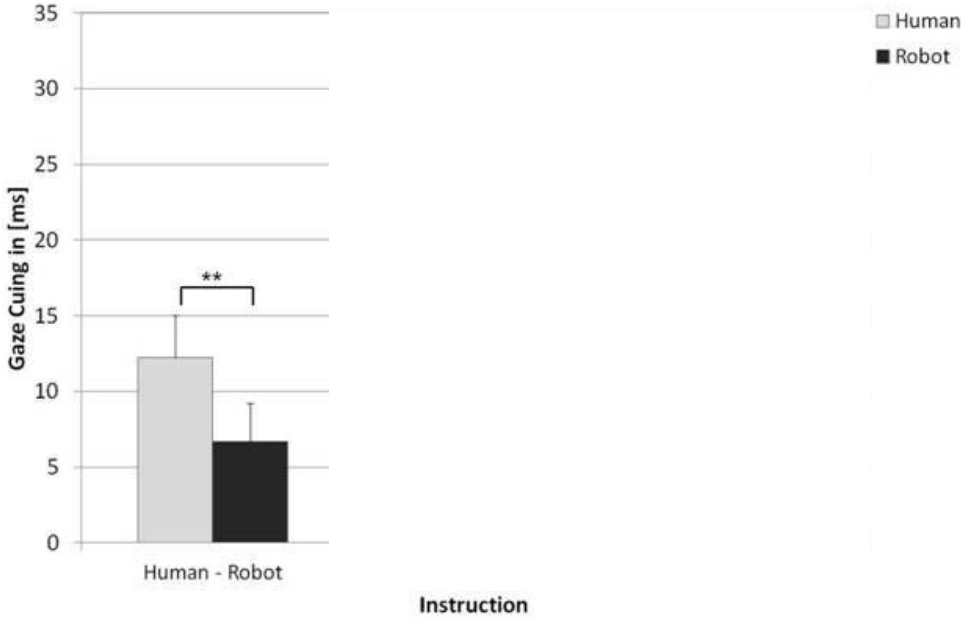
TASK: DISCRIMINATE LETTER T/F

Wiese, Wykowska, Zwickel & Müller (2012, PloS One)

GAZE CUEING AND ROBOTS

Wiese, Wykowska, Zwickel & Müller (2012, PloS One)





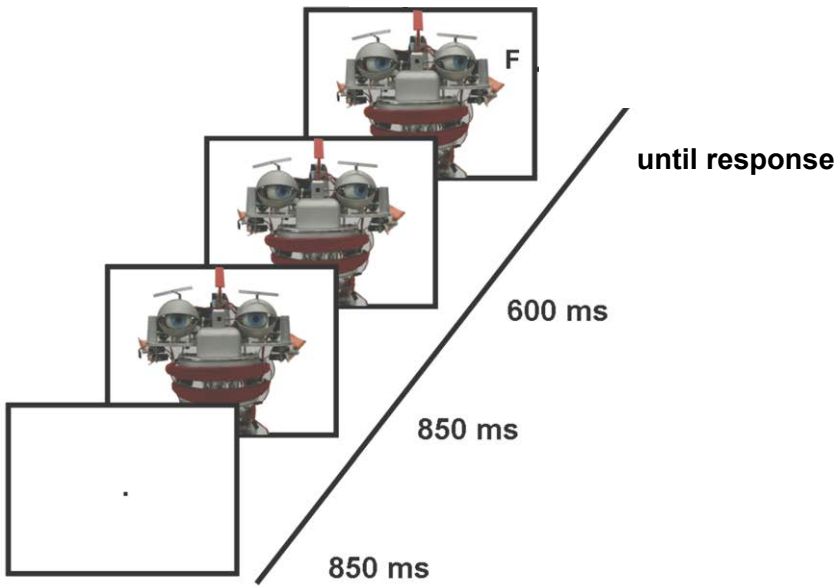
Factors:

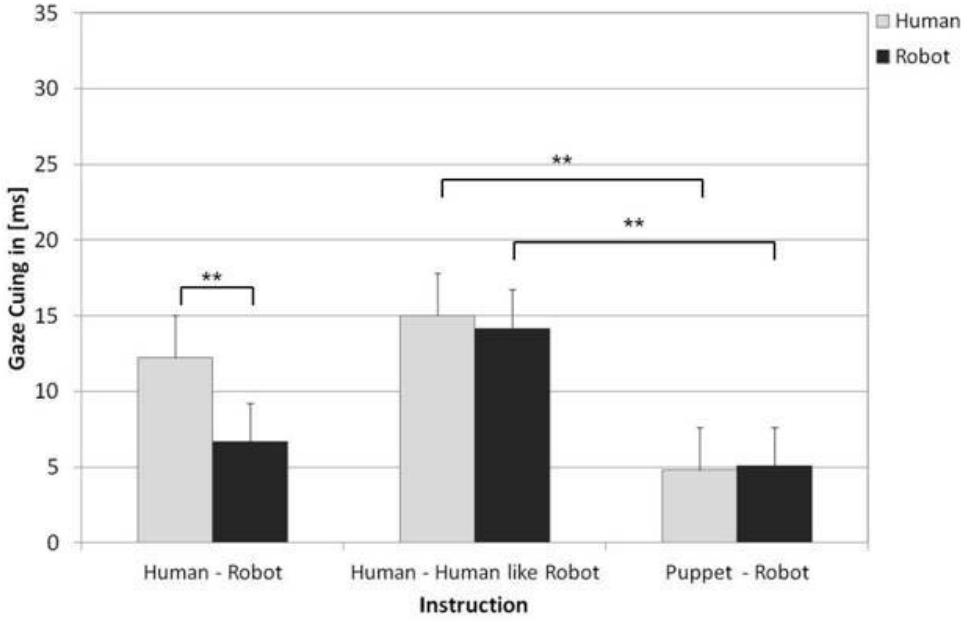
- cue type (robot vs. human)
- validity (valid vs. invalid)

GAZE CUEING: RT valid - RT invalid

GAZE CUEING AND ROBOTS

Wiese, Wykowska, Zwickel & Müller (2012, PloS One)





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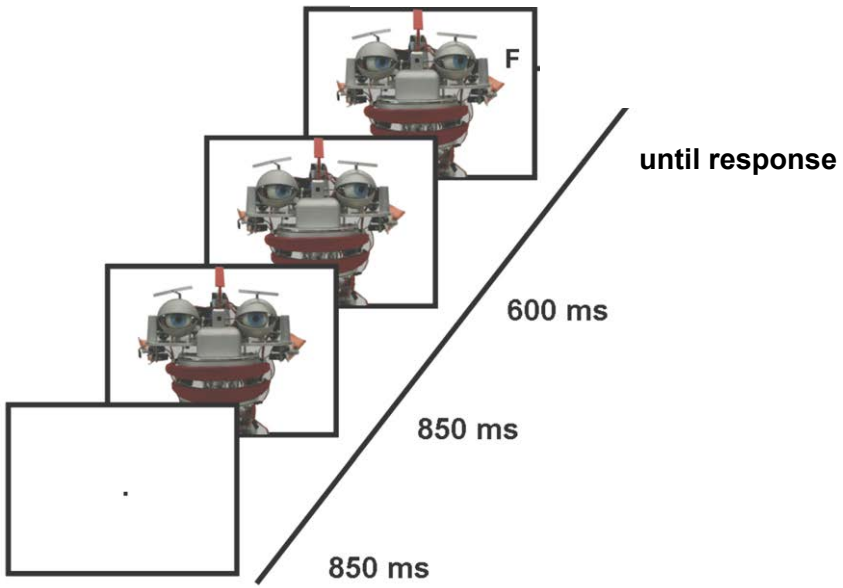
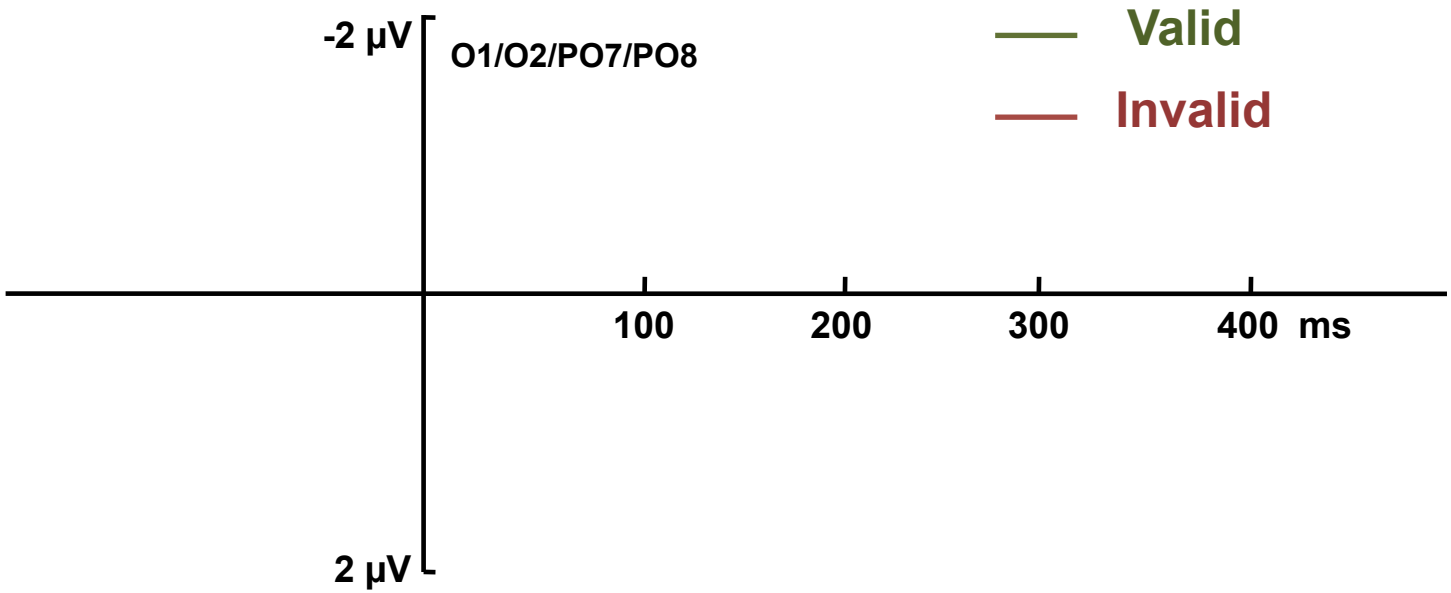
GAZE CUEING AND ROBOTS



- Within-participants instruction manipulation
- Physically identical stimuli across conditions

Wykowska, Wiese, Prosser & Müller (2014, PLoS One)

GAZE CUEING AND ROBOTS



Wykowska, Wiese, Prosser & Müller (2014, PLoS One)

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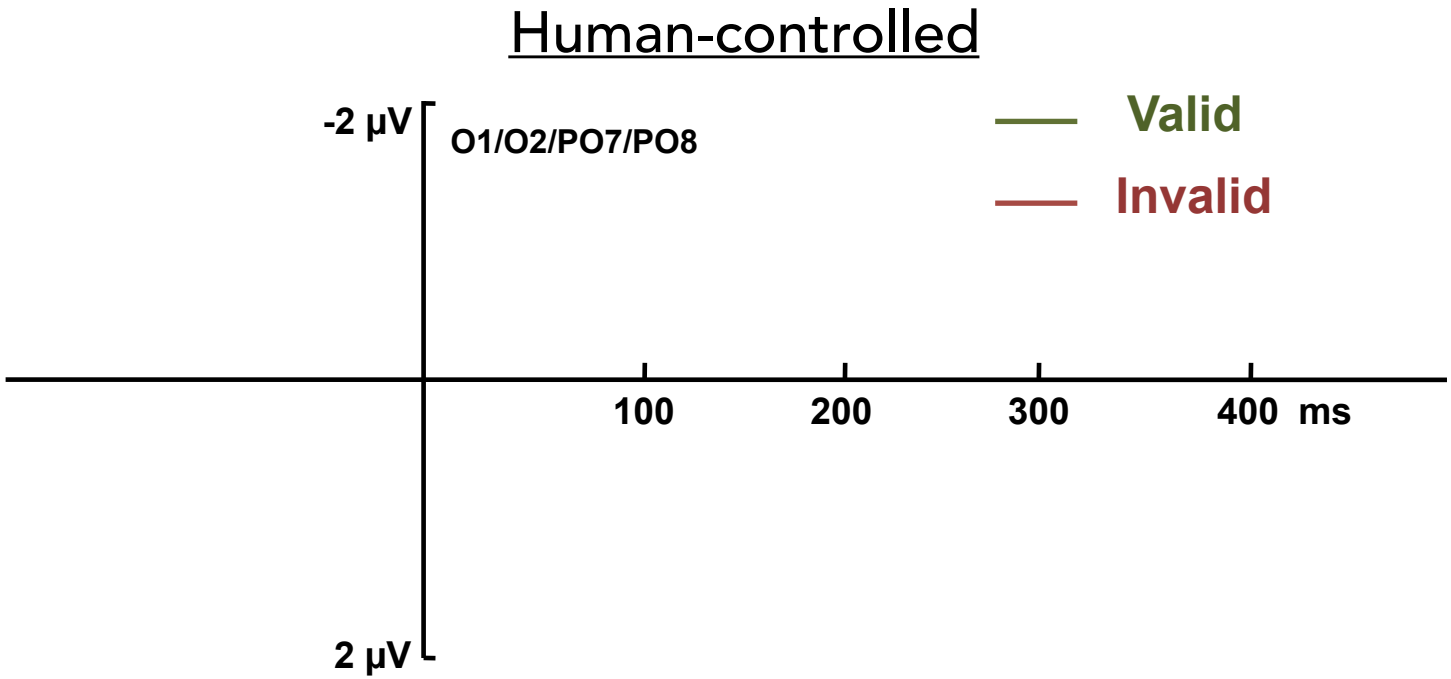

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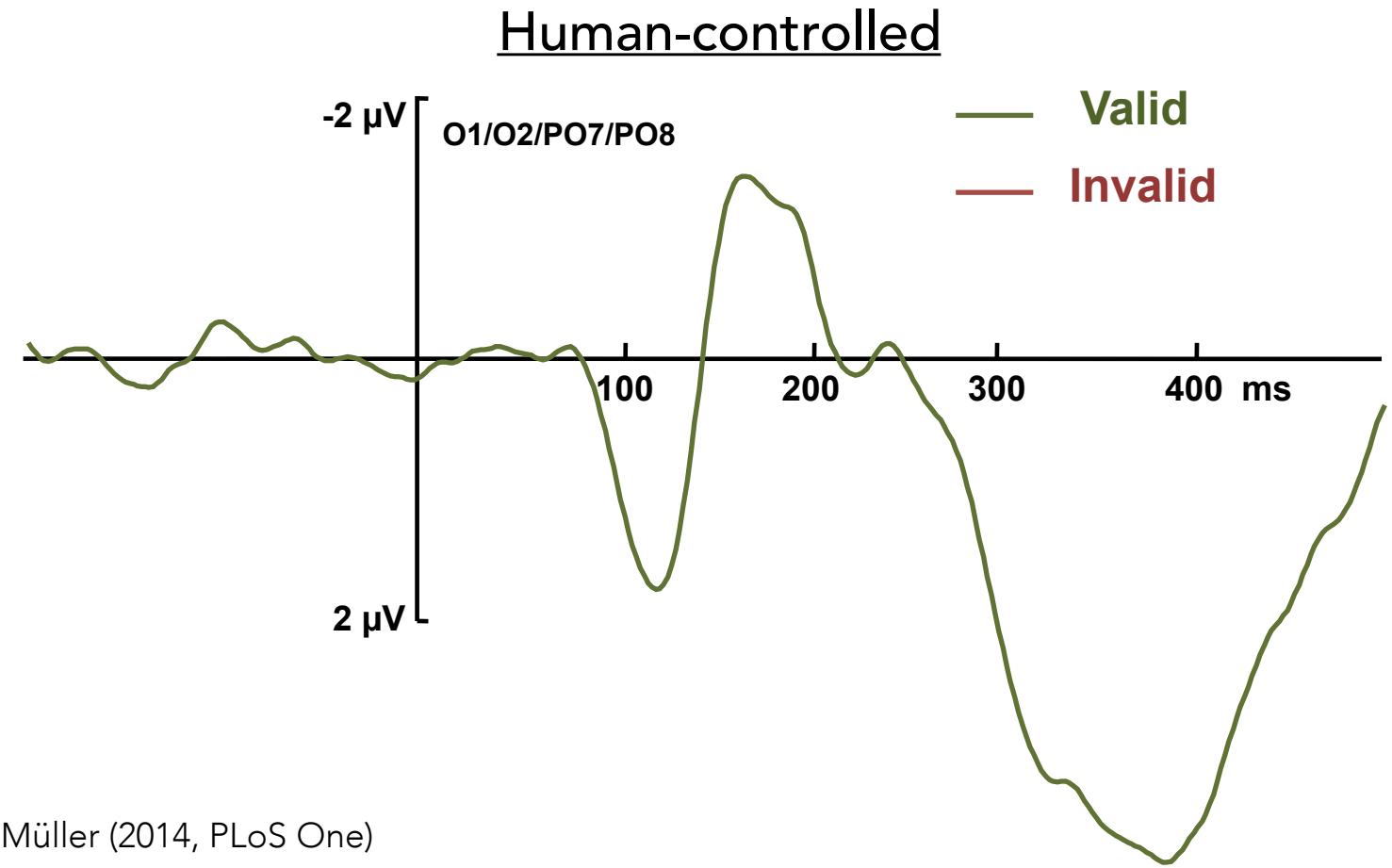

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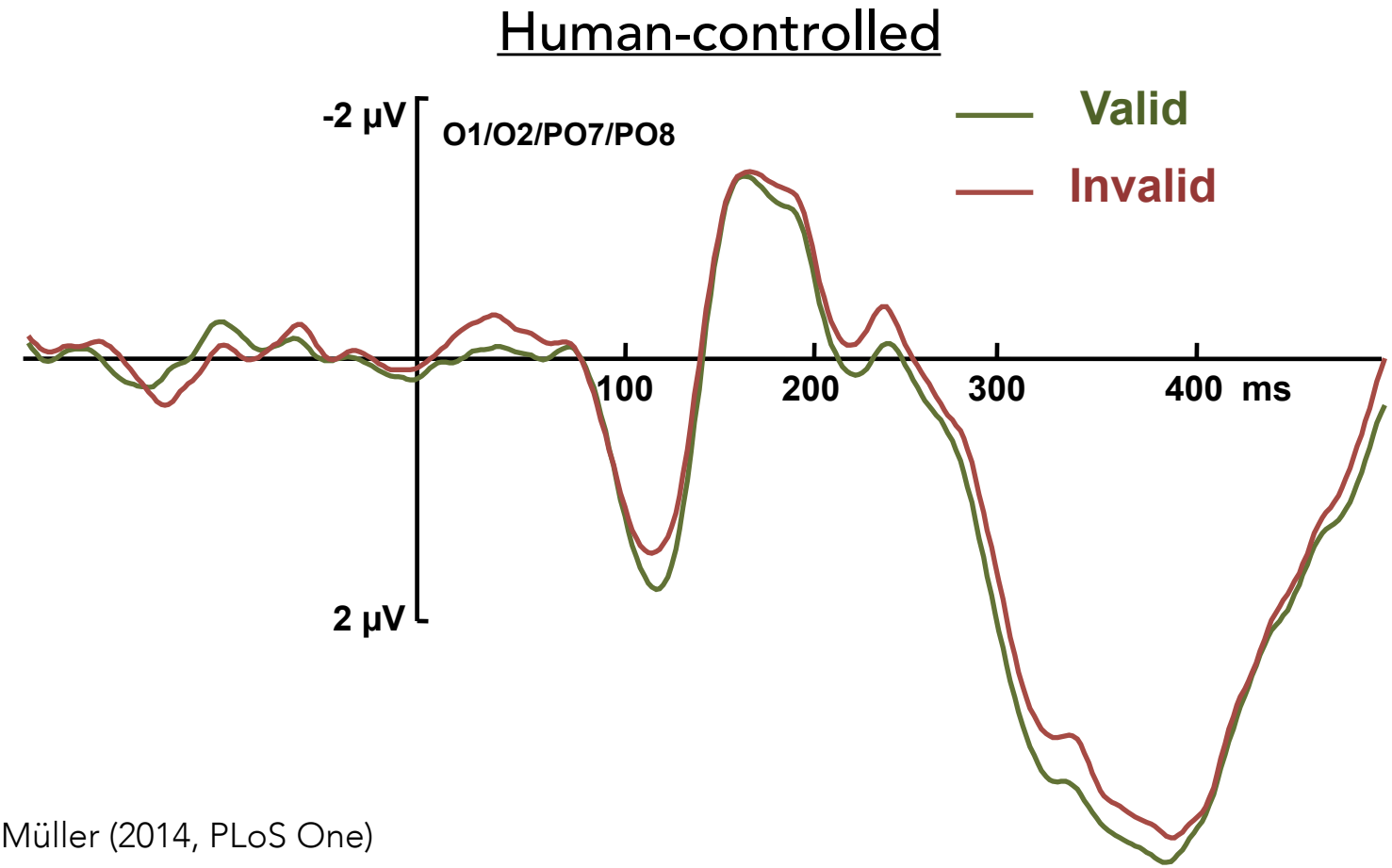

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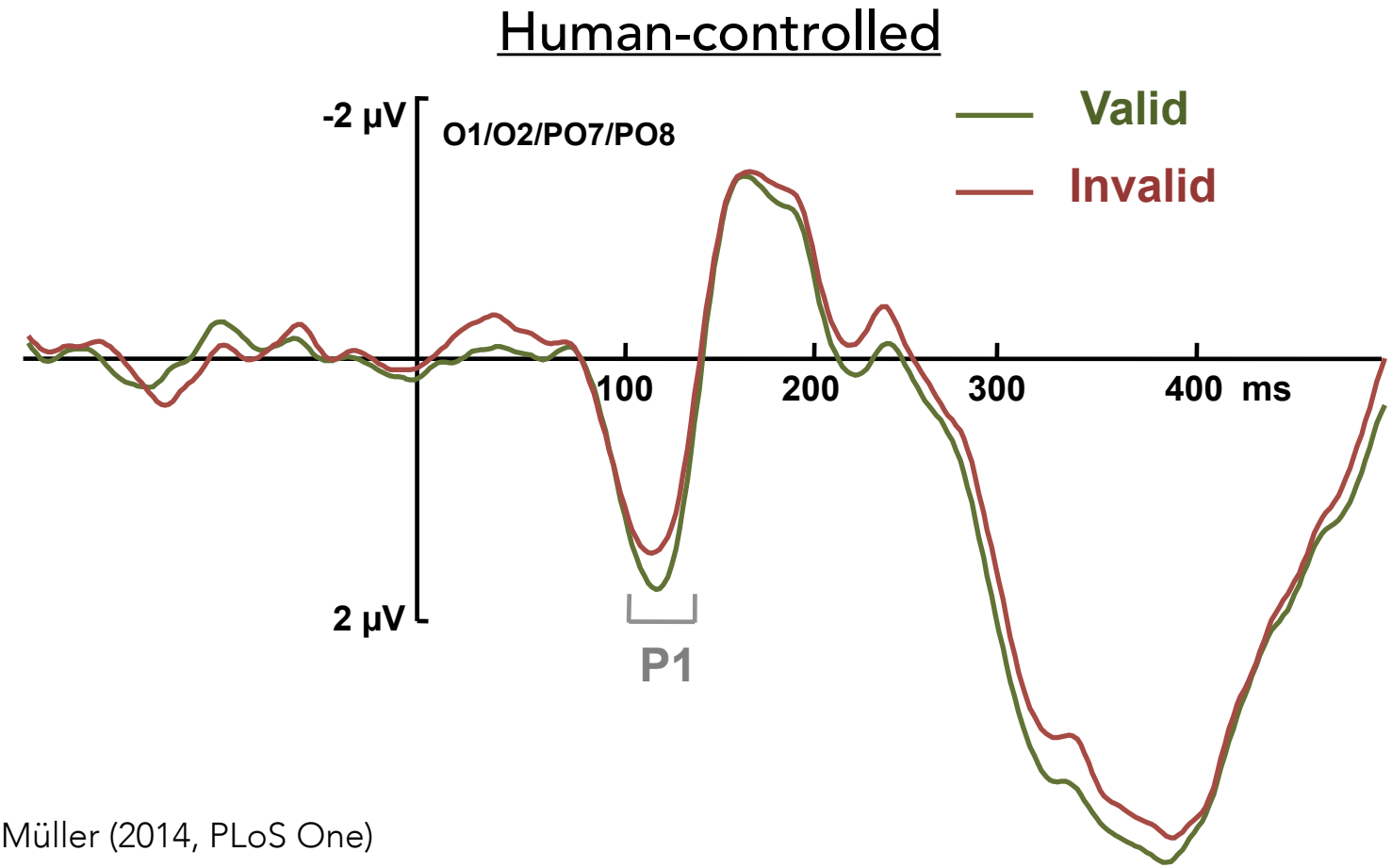

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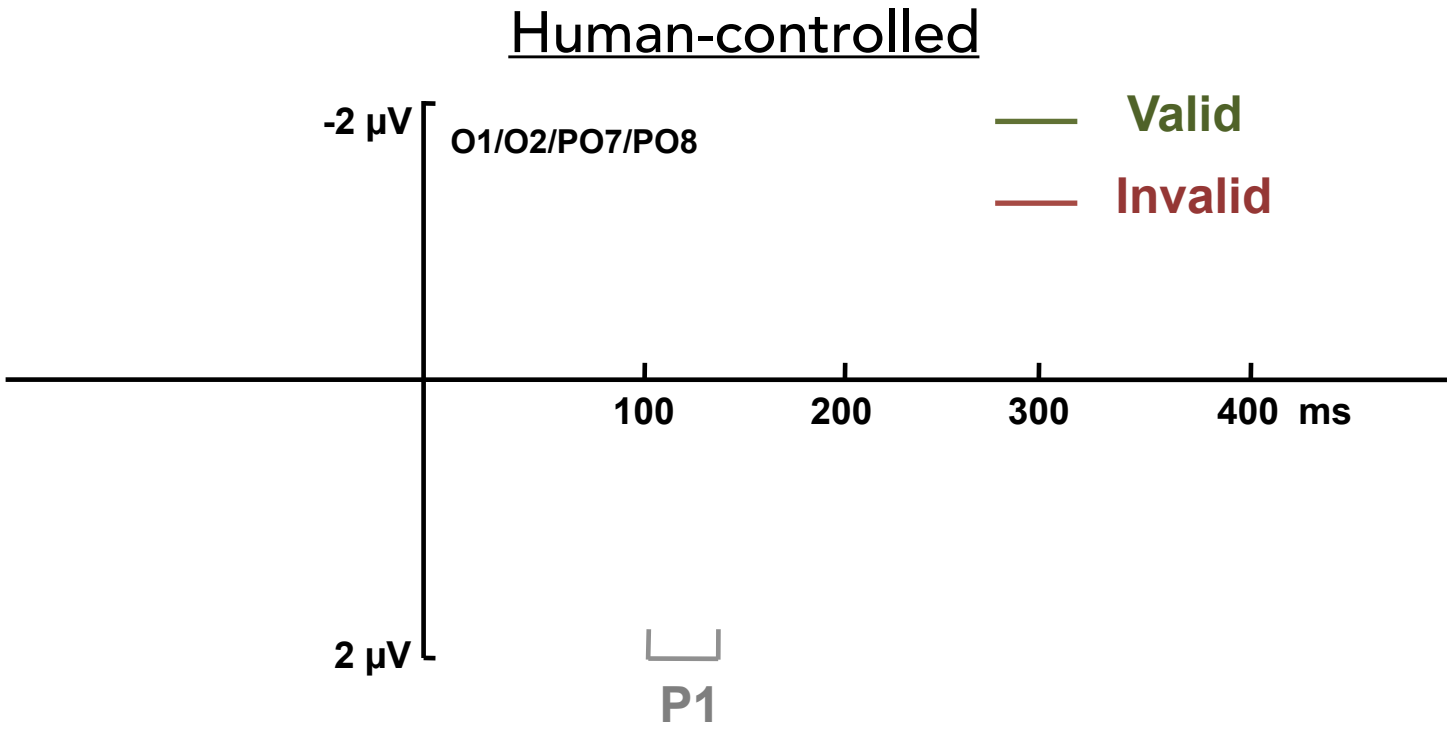

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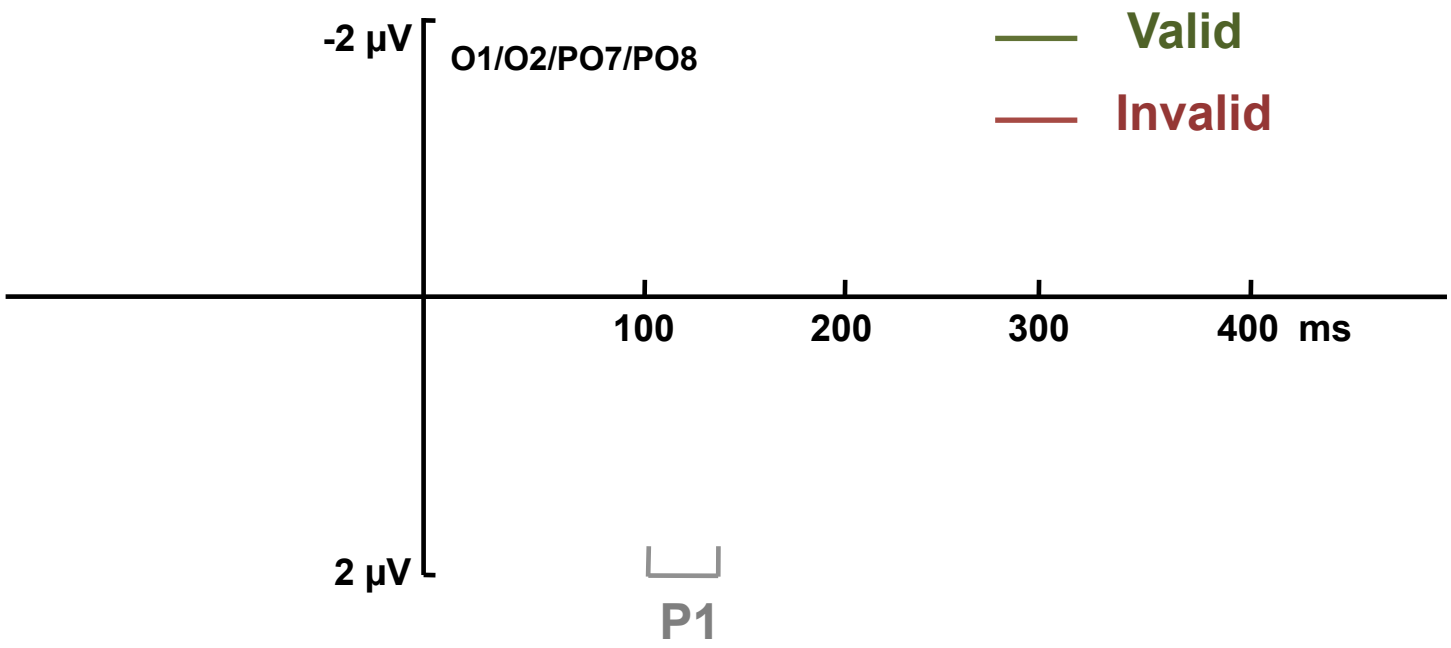

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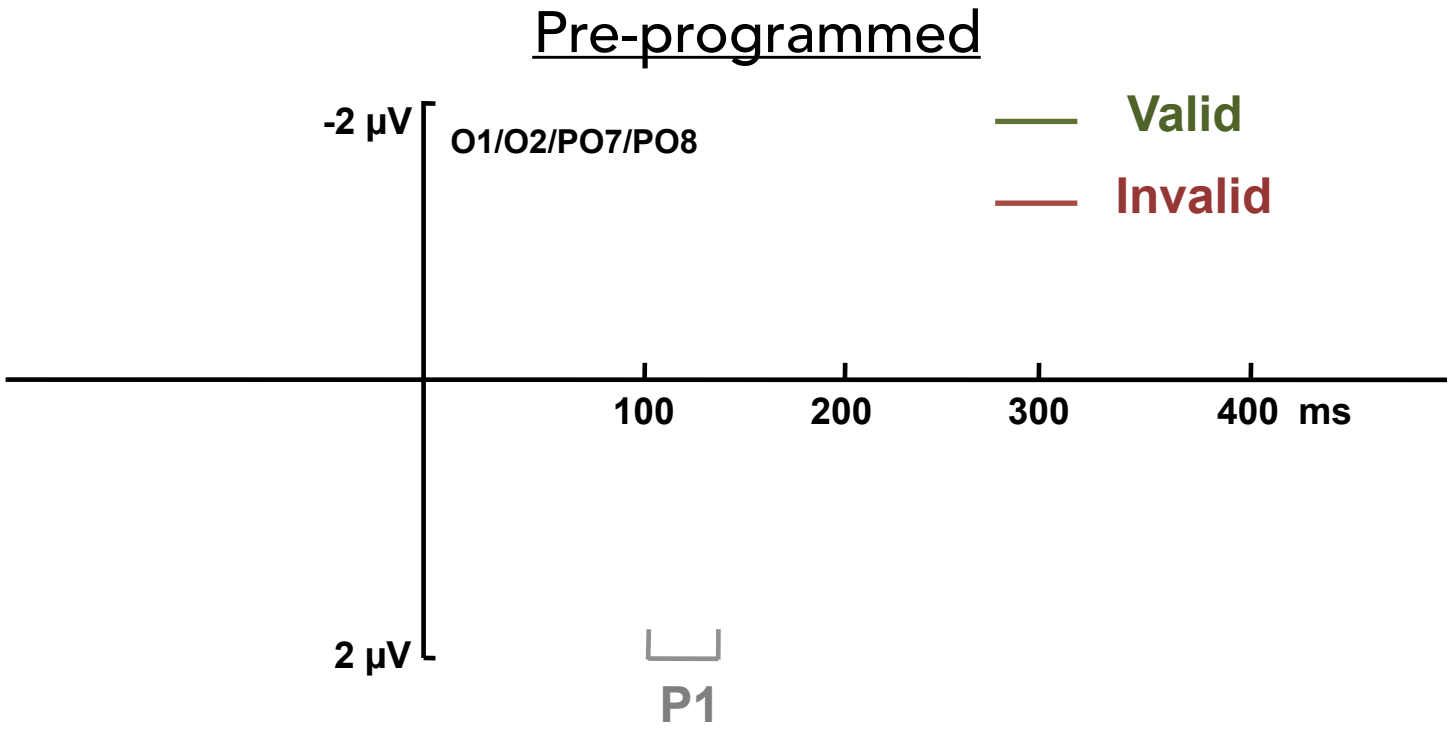

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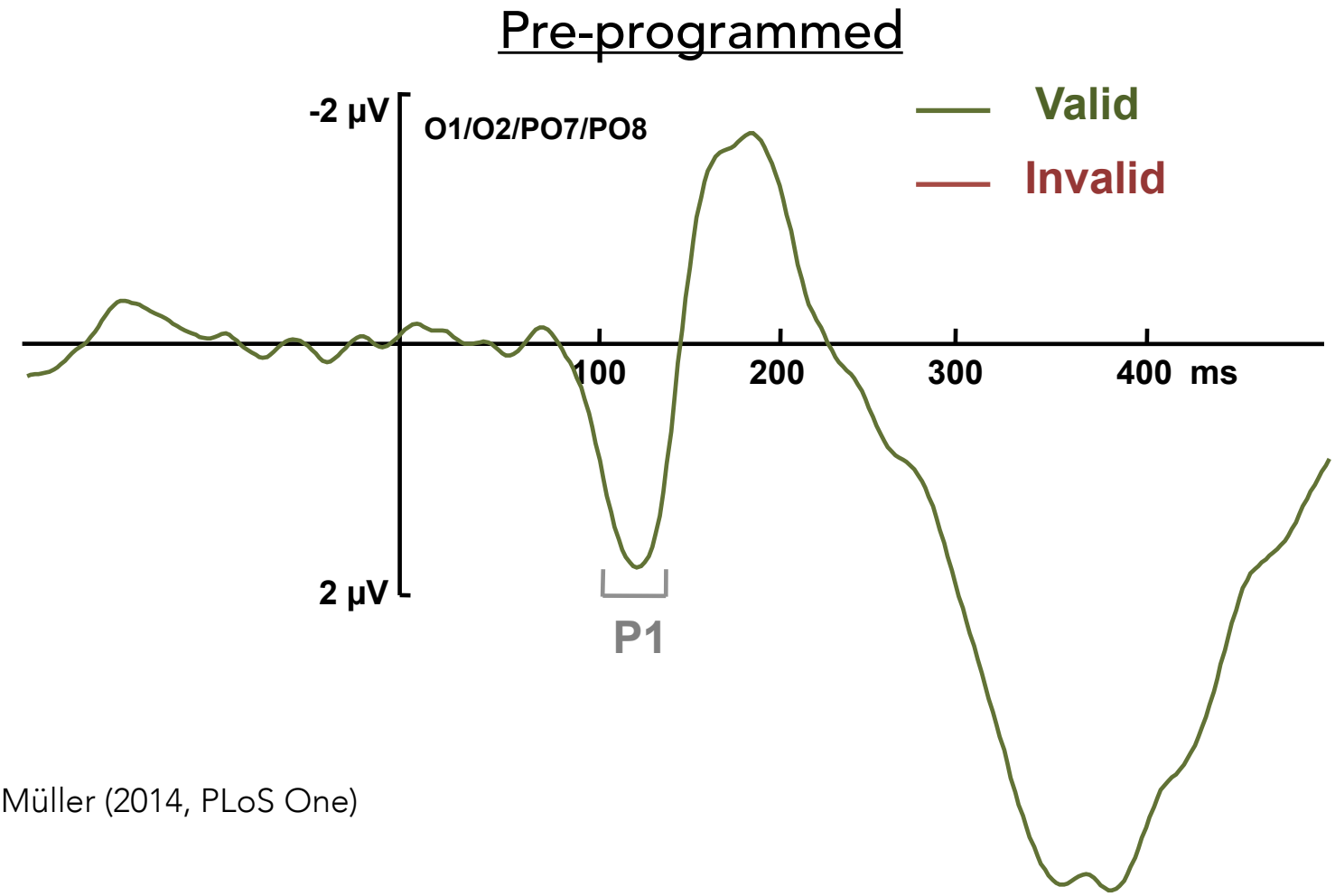

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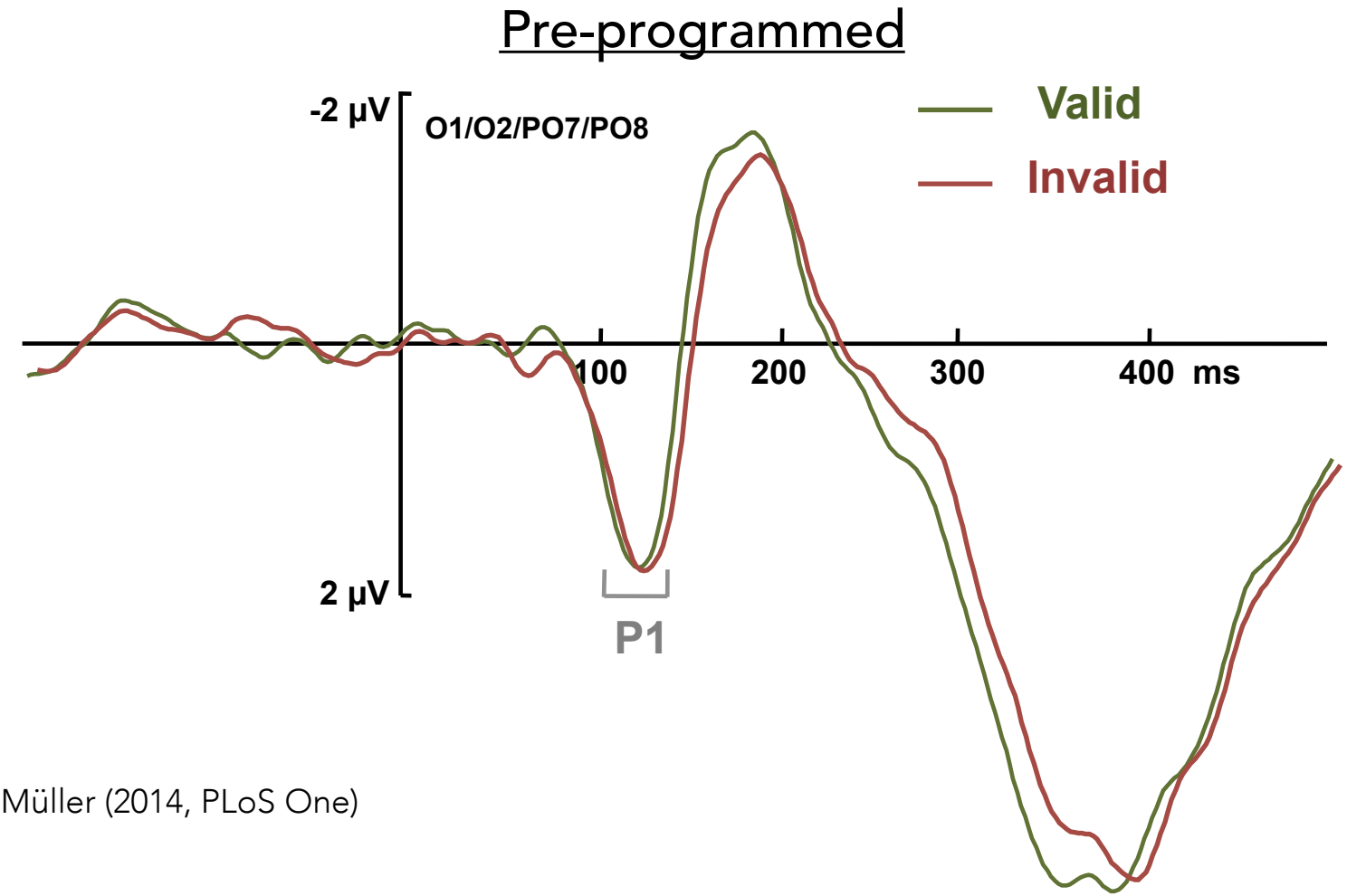

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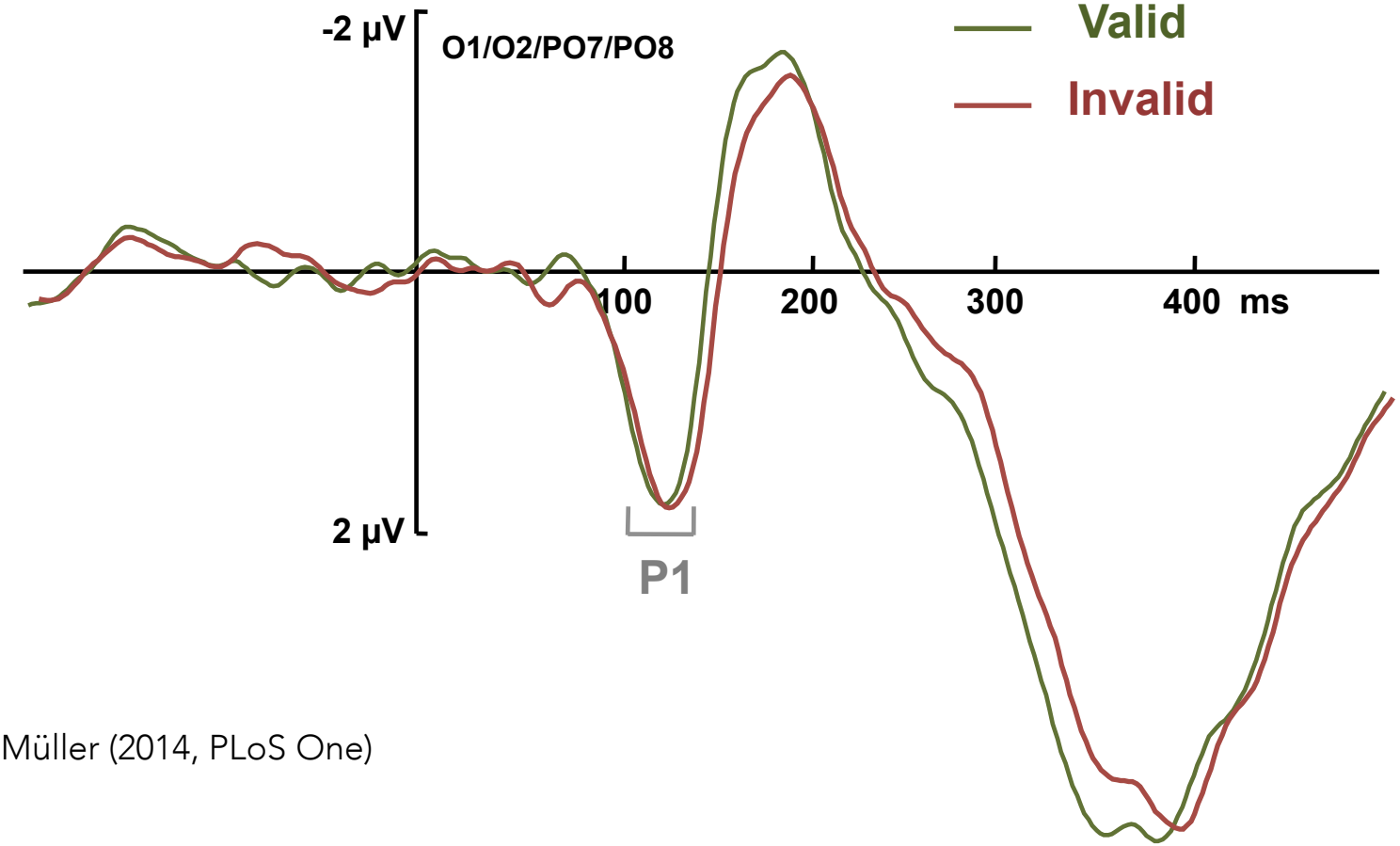

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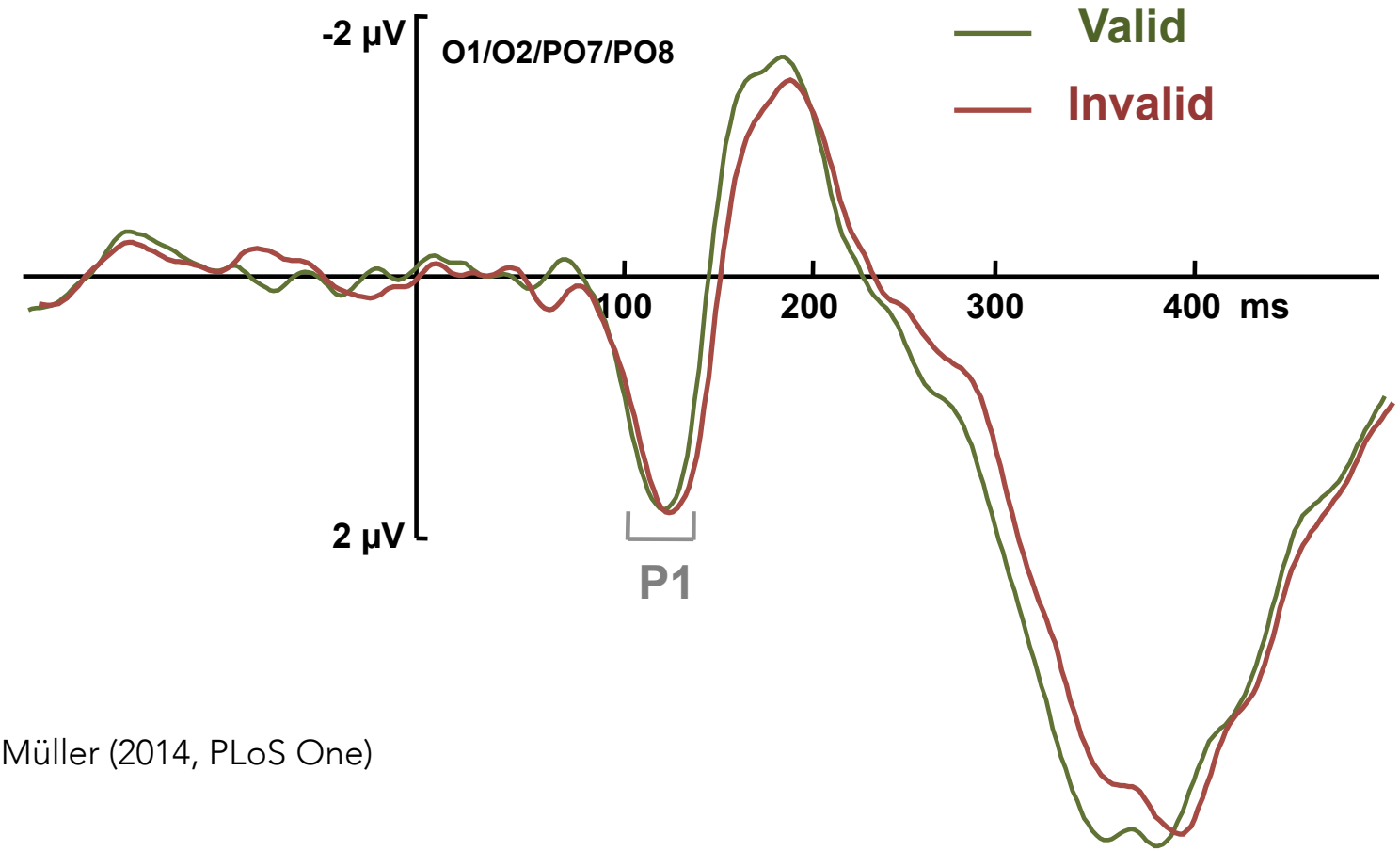


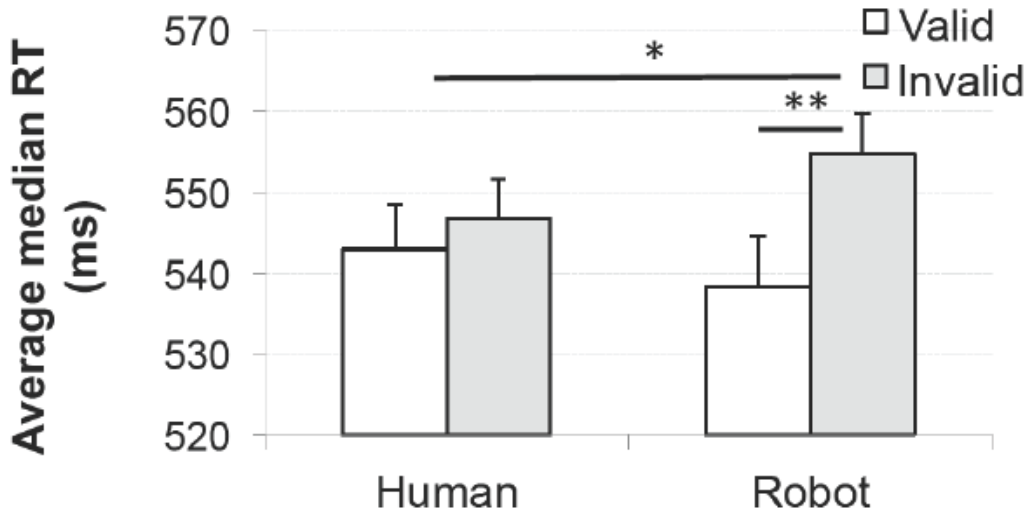
Wykowska, Wiese, Prosser & Müller (2014, PLoS One)

EARLY ATTENTIONAL PROCESSES modulated by higher-order social cognition

APPLICATION TO THERAPEUTIC DOMAINS

GAZE CUEING - THE CASE OF AUTISM

DO PATIENTS WITH ASD ALSO FOLLOW GAZE OF HUMANS MORE THAN GAZE OF ROBOTS?



Wiese, Müller, & Wykowska (2014). Using a gaze-cueing paradigm to examine social cognitive mechanisms of individuals with autism observing robot and human faces. LNCS, 8755, 370-379. DOI: 10.1007/978-3-319-11973-1_38

JOINT ATTENTION, ROBOTS AND AUTISM

EXPERIMENTAL DESIGN

Test:

Early social communication scale

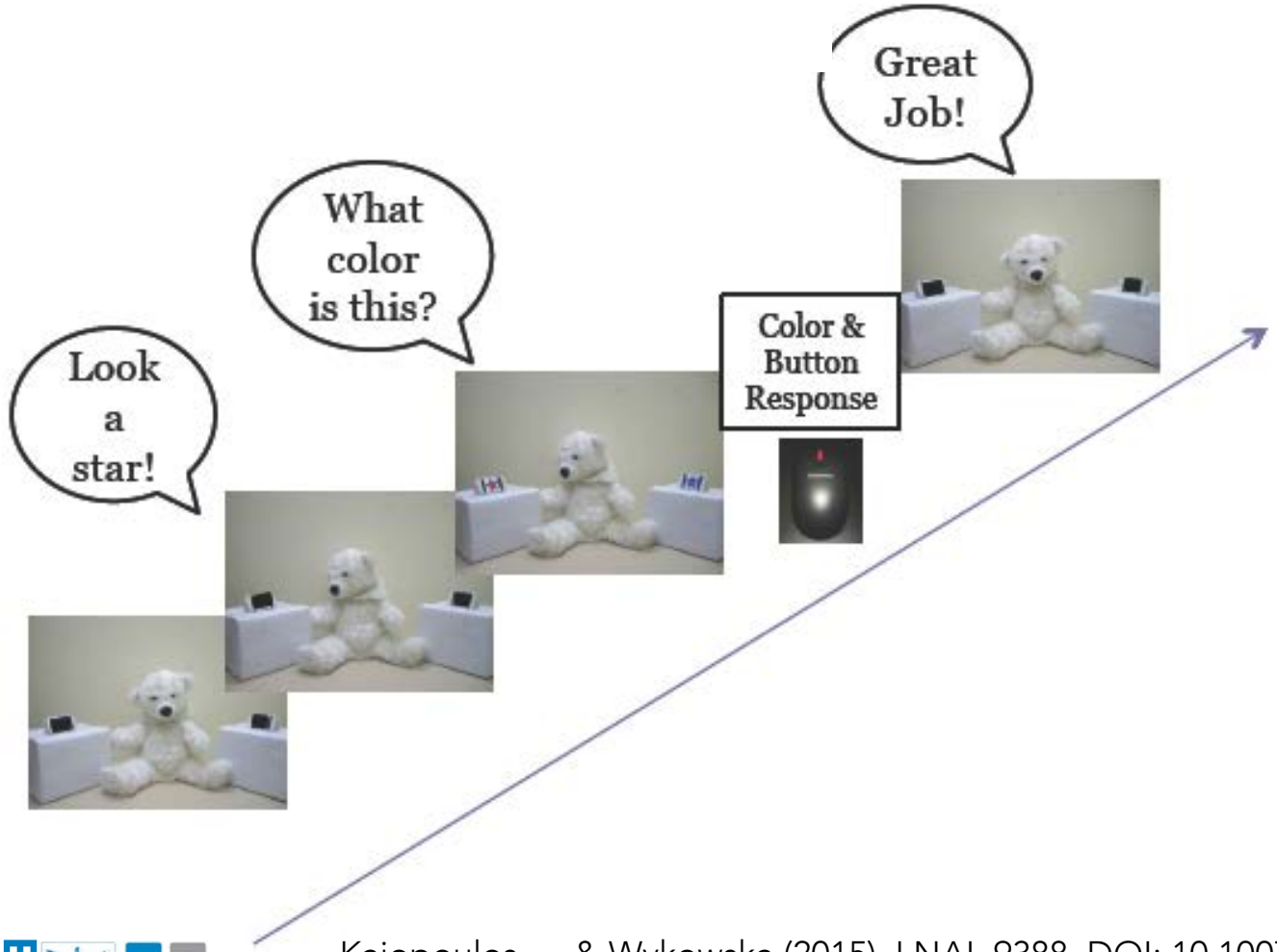
Training: 6 sessions

Kajopoulos, .., & Wykowska (2015). LNAI, 9388. DOI: 10.1007/978-3-319-25554-5_30

In collaboration with Tan Yeow Kee and social robotics team A*STAR Singapore

JOINT ATTENTION, ROBOTS AND AUTISM

EXPERIMENTAL DESIGN



Kajopoulos, .., & Wykowska (2015). LNAI, 9388. DOI: 10.1007/978-3-319-25554-5_30
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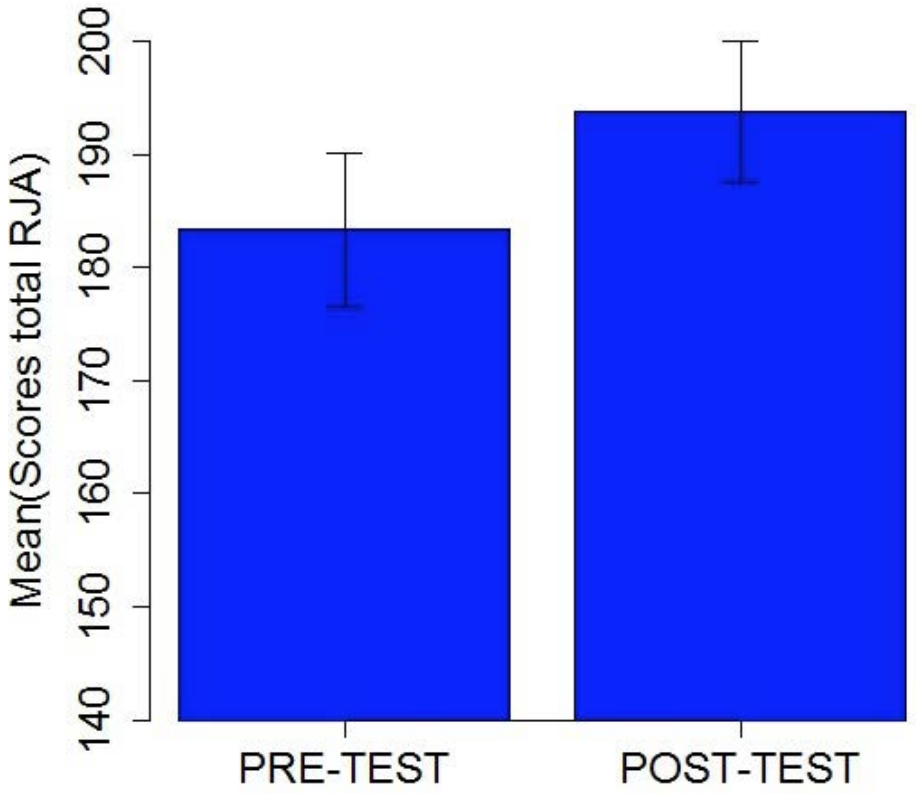
JOINT ATTENTION, ROBOTS AND AUTISM

RESULTS: RESPONDING TO JOINT ATTENTION

(NO EFFECT ON INITIATION OF JOINT ATTENTION)

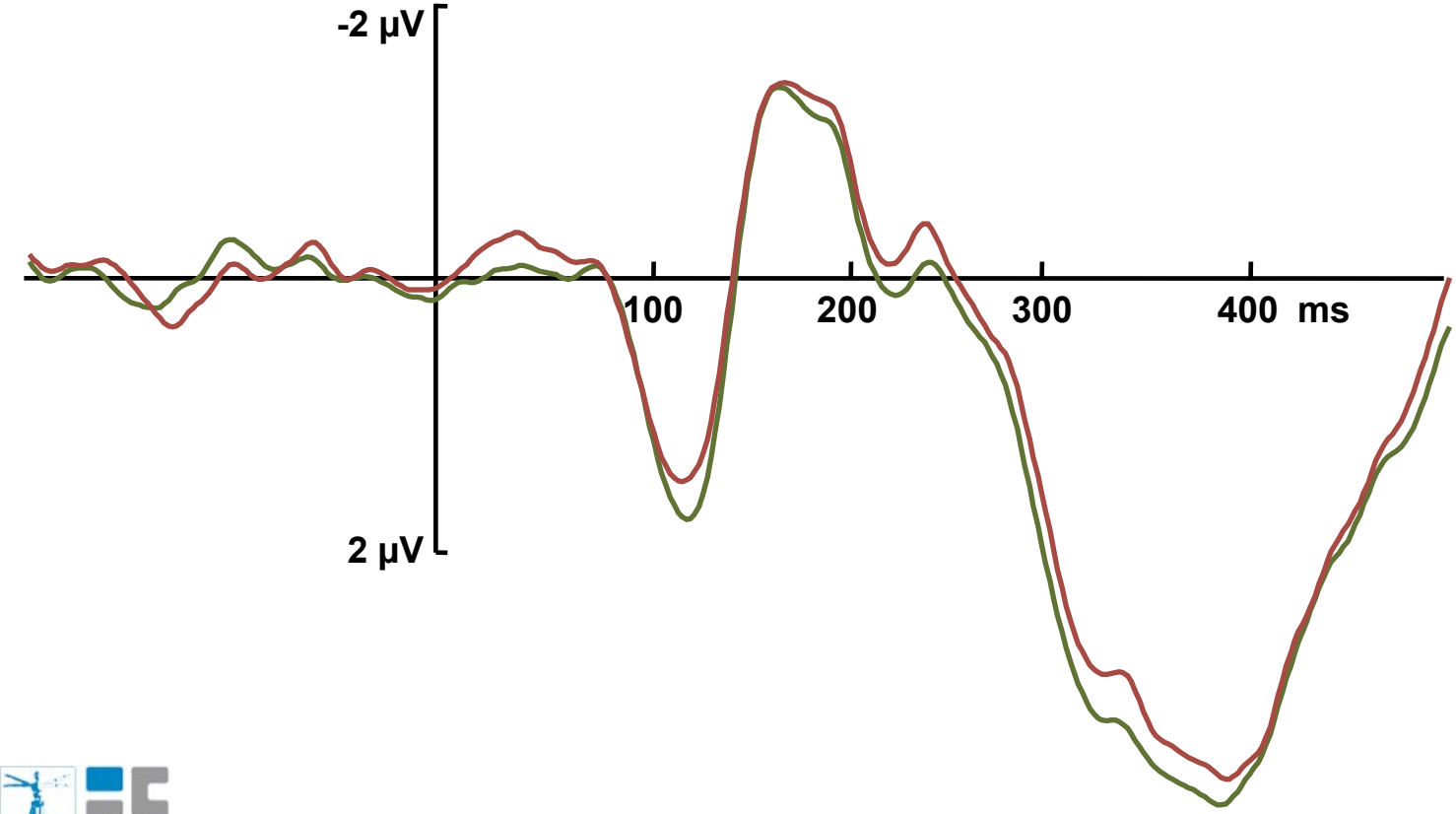


Kajopoulos, .., & Wykowska (2015). LNAI, 9388. DOI: 10.1007/978-3-319-25554-5_30

In collaboration with Tan Yeow Kee and social robotics team A*STAR Singapore

NEXT STEPS

EEG: EXAMINING WHICH STAGES OF PROCESSING ARE TARGETED BY THE ROBOT-ASSISTED THERAPY

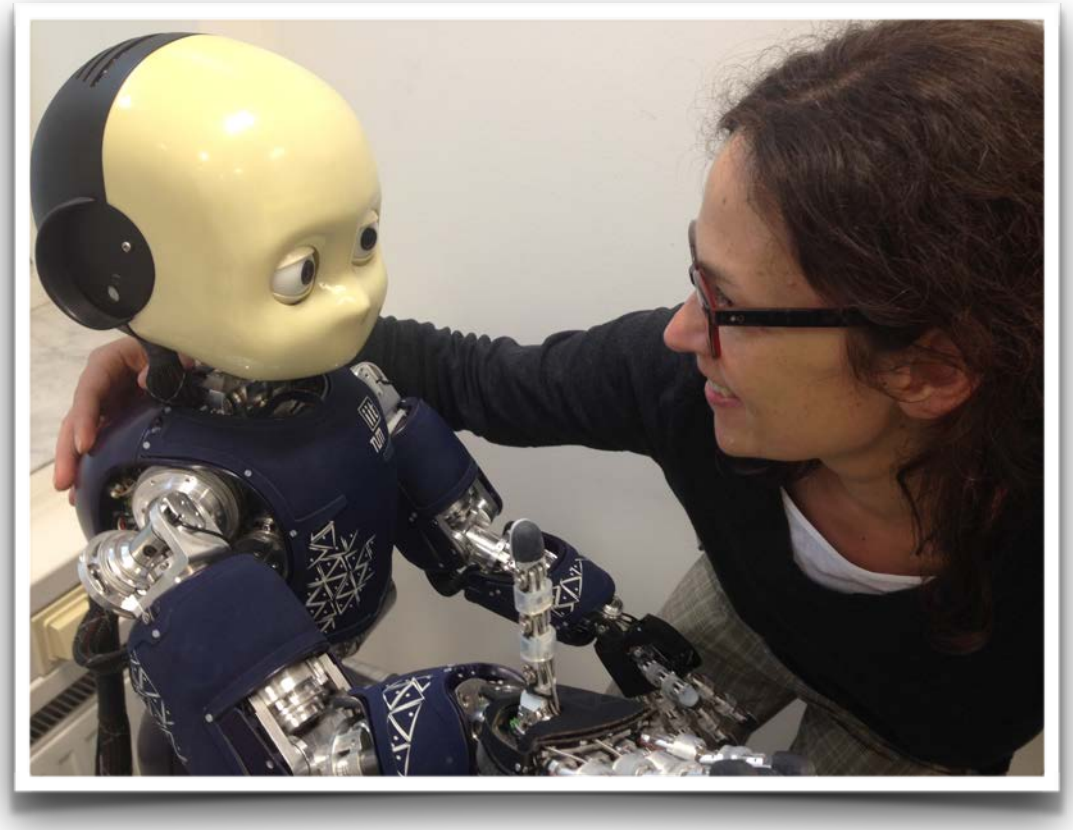


CONCLUSION

METHODS OF COGNITIVE NEUROSCIENCE (WHICH INCLUDES WELL DESIGNED EXPERIMENTAL SETUP) ALLOW FOR TARGETING SPECIFIC MECHANISMS OF THE HUMAN BRAIN

—> WELL-TAILORED THERAPIES TO THE NEEDS OF USERS

OBJECTIVE METHODS OF SOCIAL COGNITIVE NEUROSCIENCE FOR SOCIAL ATTUNEMENT



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