Sense of control during joint action

Sense of control during joint actions where the coordinated actions of several people produce a joint outcome?

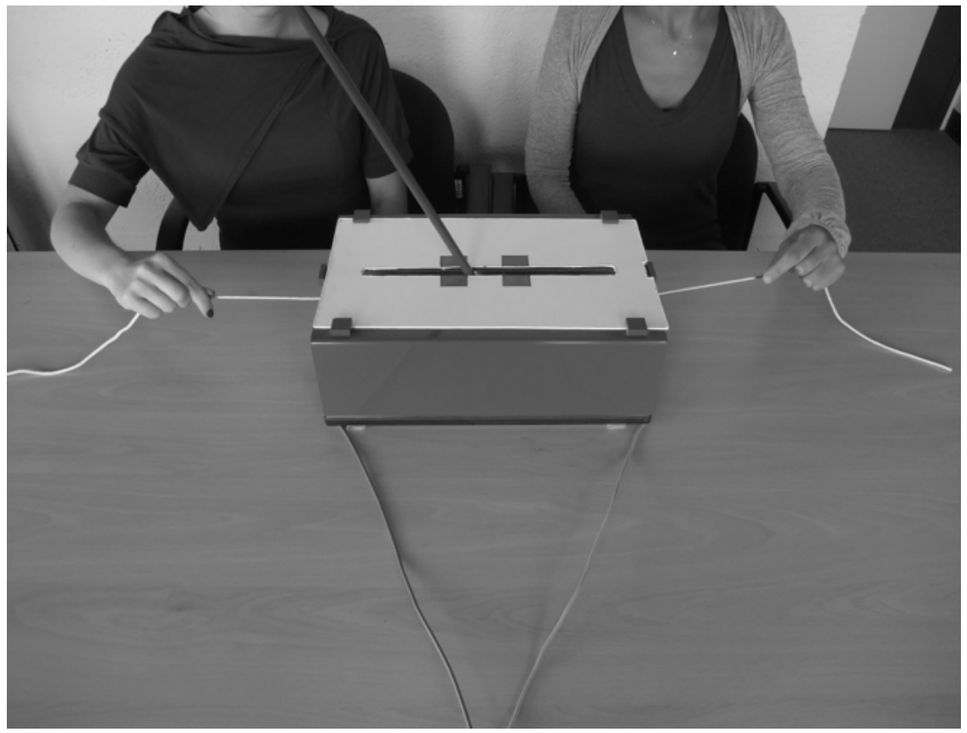
Accurate monitoring of one's own and others' contributions to joint outcomes?

Influence of joint success on individual sense of control?

Loss or increase in sense of control during joint action?

Balancing Task/Physical Coupling

Van der Wel et al., 2011, Journal of Experimental Psychology: HPP



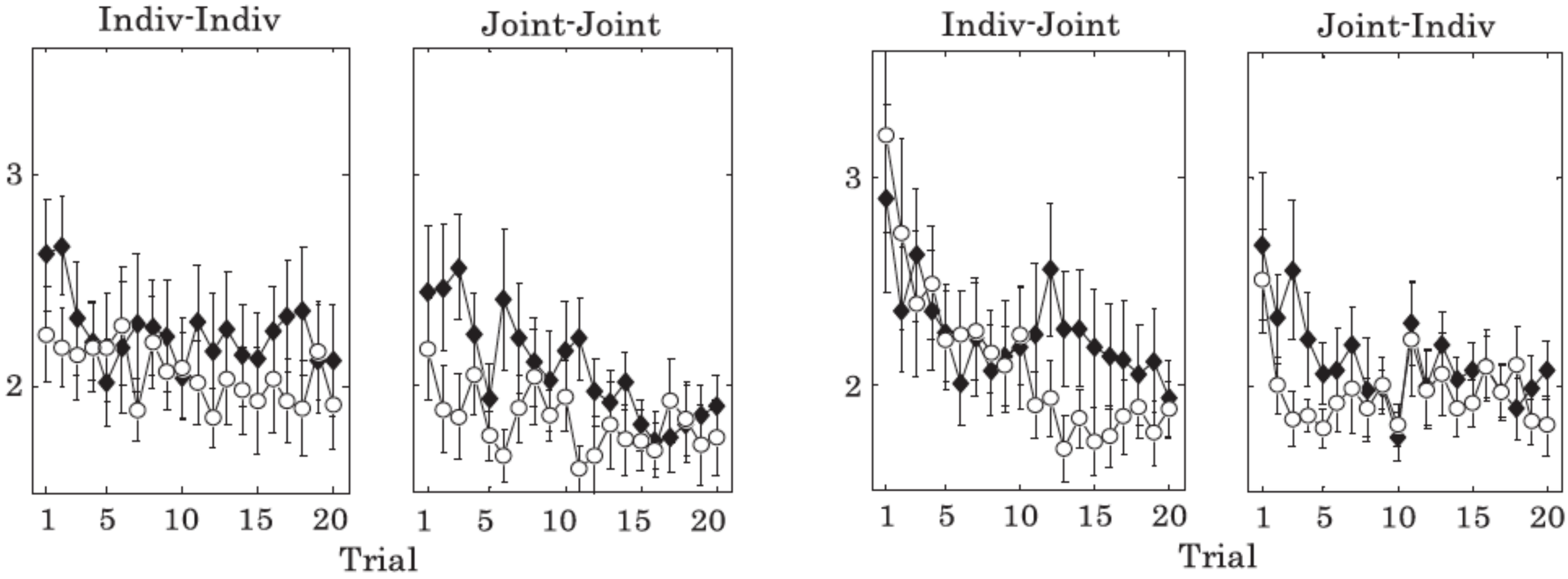
Instruction: Move between targets.
Amplitude (Distance) and tempo varied.
Main performance parameter: Accuracy of turning at a pre-specified time

Compare bimanual and joint condition

Rob van der Wel, Rutgers University

Balancing Task/Physical Coupling

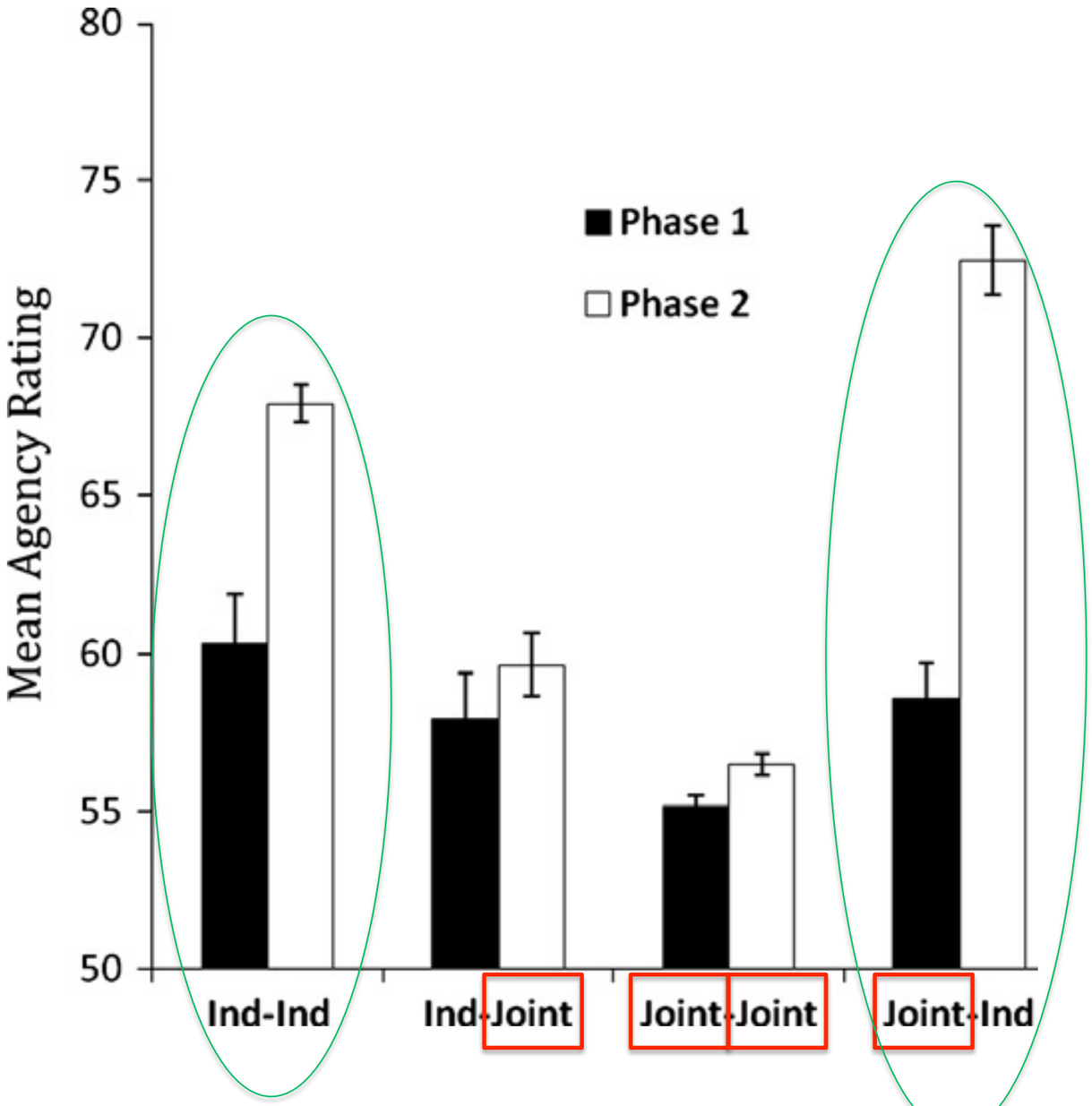
Van der Wel et al., 2012, Consciousness and Cognition



Hardly any performance differences (distance from pre-defined turning point at time of ‘turning beep’) between individual and joint. Equal improvement in all conditions

Balancing Task/Physical Coupling

Van der Wel et al., 2012, Consciousness and Cognition



In Phase 2, low control ratings in joint condition compared to an increase of control in purely individual condition due to better performance

Individual bimanual action after joint action boosts sense of control

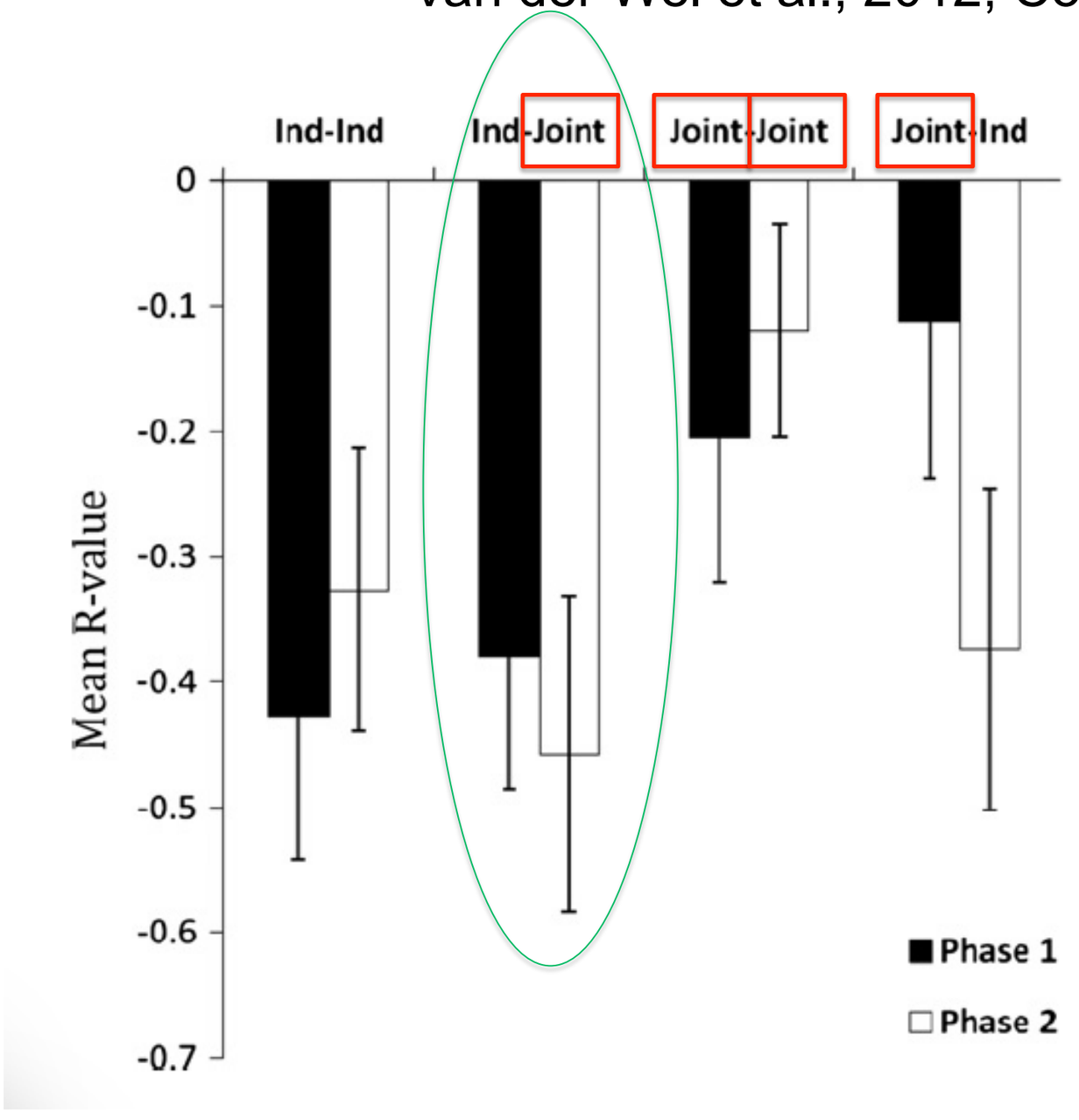
Conclusion: Lack of exclusivity reduces sense of control in joint and seems to reduce the influence of performance

0 (None at all) 100 (Full)

Experience of control over the pole

Balancing Task/Physical Coupling

Van der Wel et al., 2012, Consciousness and Cognition



Any role for performance in joint?

Significant correlations between performance error and sense of control when task is performed individually

No significant correlations between performance error and sense of control in joint conditions…

… except when joint is preceded by individual. Application of bimanual model to joint situation?

Joint Tracking Task

Dewey, Pacherie, Knoblich (2014), Cognition

John Dewey,
Finlandia University

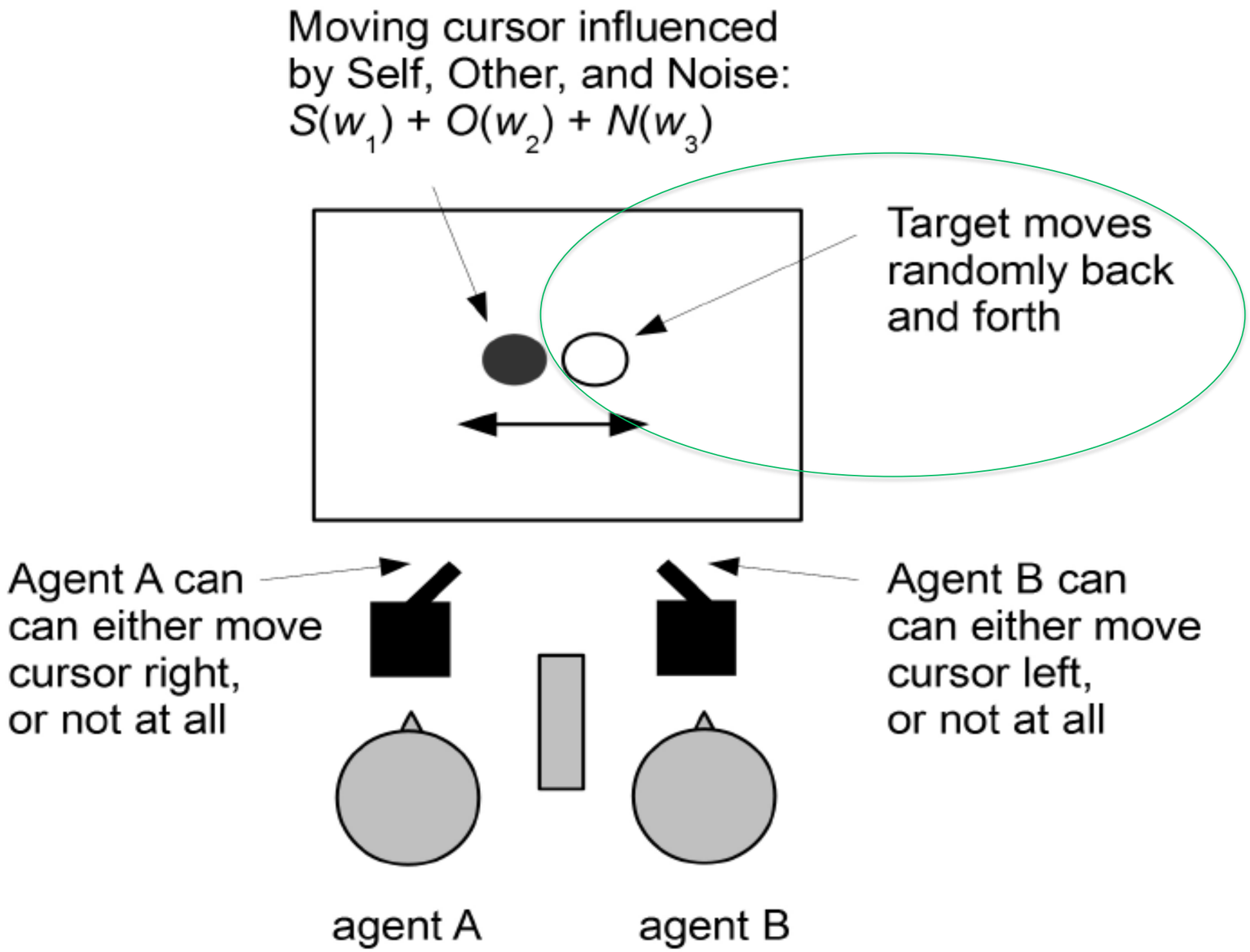
Are others' actions always treated as external perturbations reducing the individual sense of control as the previous results suggest?

Others' actions may enhance the sense of control, e.g., when these actions reduce one's own effort and help to offset external perturbations

Joint tracking task that allowed us to independently switch on and off own control, other control, and external perturbations. Vicarious agency for others' contributions?

Joint Tracking Task

Dewey, Pacherie, Knoblich (2014), Cognition



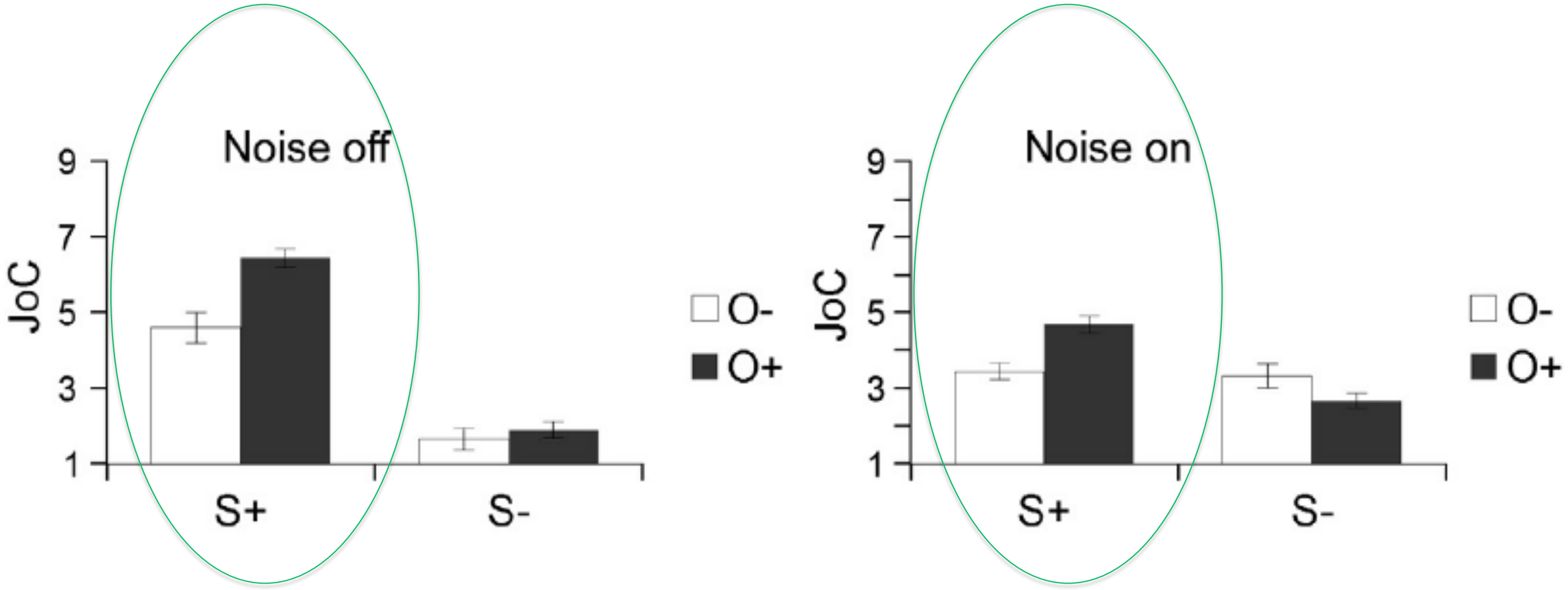
Each actors can move the cursor in only ONE direction

"How effective was your joystick at controlling the dot."

Judgment on a Likert scale from 1 (no control) to 9 (complete control).

Joint Tracking Task

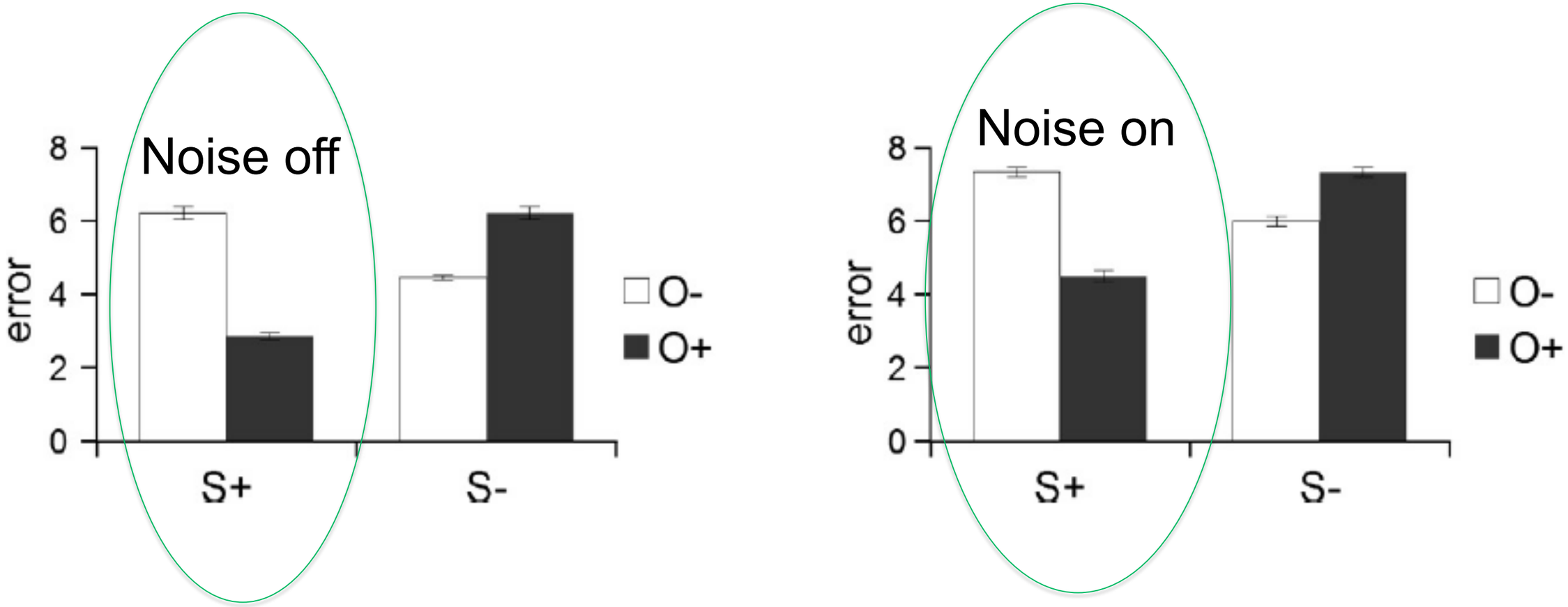
Dewey, Pacherie, Knoblich (2014), Cognition



A partner's actions enhance the participant's sense of control when the participant's own joystick is functional (S+), although participant's own and other's actions are clearly distinguishable. This is true in the presence and absence of external perturbations

Joint Tracking Task

Dewey, Pacherie, Knoblich (2014), Cognition



This is because joint tracking error is much reduced by the other's contributions when one's own joystick if also active (S+).

Conclusion:
When a partner makes a crucial contribution to a successful joint action we sense (vicarious) control over the partner's actions.

Error Monitoring in Duetting Pianists

Loehr et al. (2013), Journal of Cognitive Neuroscience

Janeen Loehr,
University of
Saskatchewan

Perhaps skilled experts are better in separating own and other's contributions to a joint outcome?

Indirect EEG measures of sense of control: Expert's error components in response to violations of own or other part in a duet

Nijinsky and Ravel

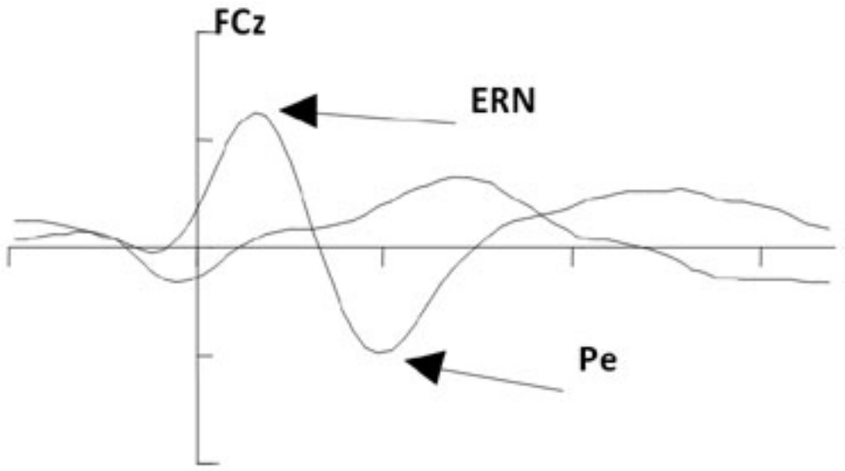
Error Monitoring in Duetting Pianists

Loehr et al. (2013), Journal of Cognitive Neuroscience

Performance on a MIDI instrument allowed us to Insert errors while duet was correctly performed (each expert uses only one hand)

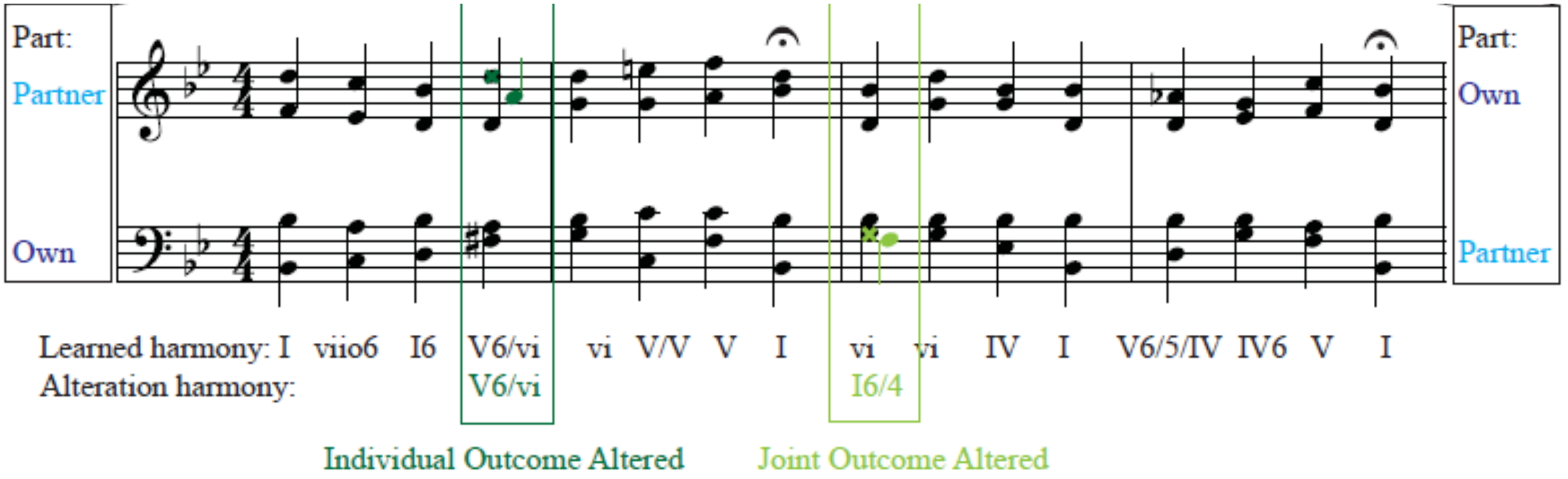
I) Feedback-related negativity (FRN): Mismatch between expected and actual feedback

II) Error positivity (Pe): Conscious recognition of error

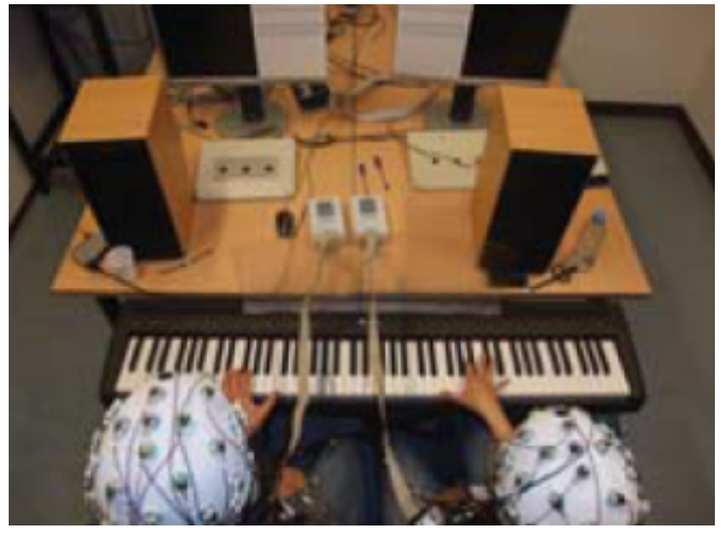


Duets/Music Experts

Loehr et al. (2013), Journal of Cognitive Neuroscience

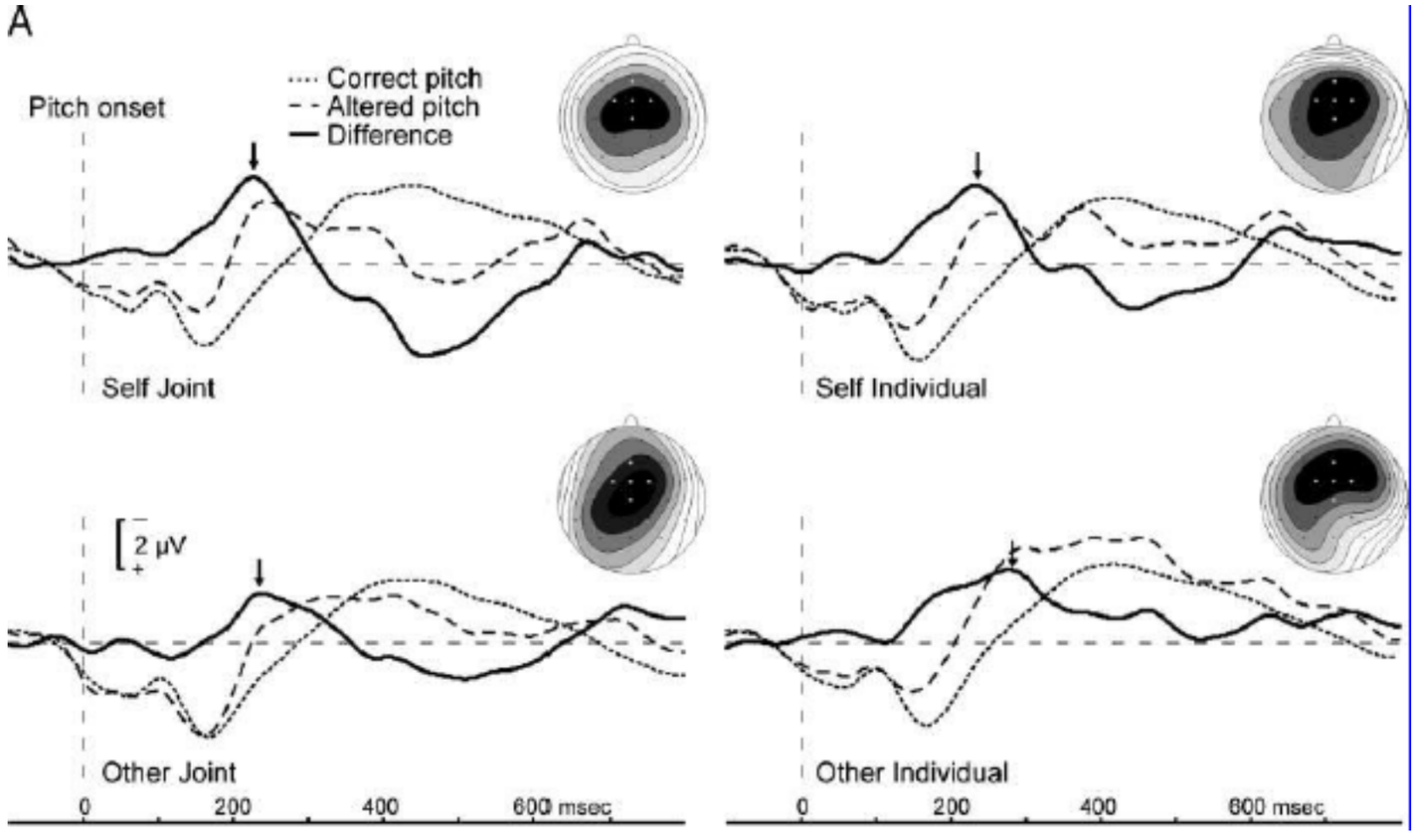


- Factor 1: Own or other pitch altered
- Factor 2: Pitch alteration affects or does not affect jointly produced harmony (equally musically expected)



FRN

Loehr et al. (2013), Journal of Cognitive Neuroscience

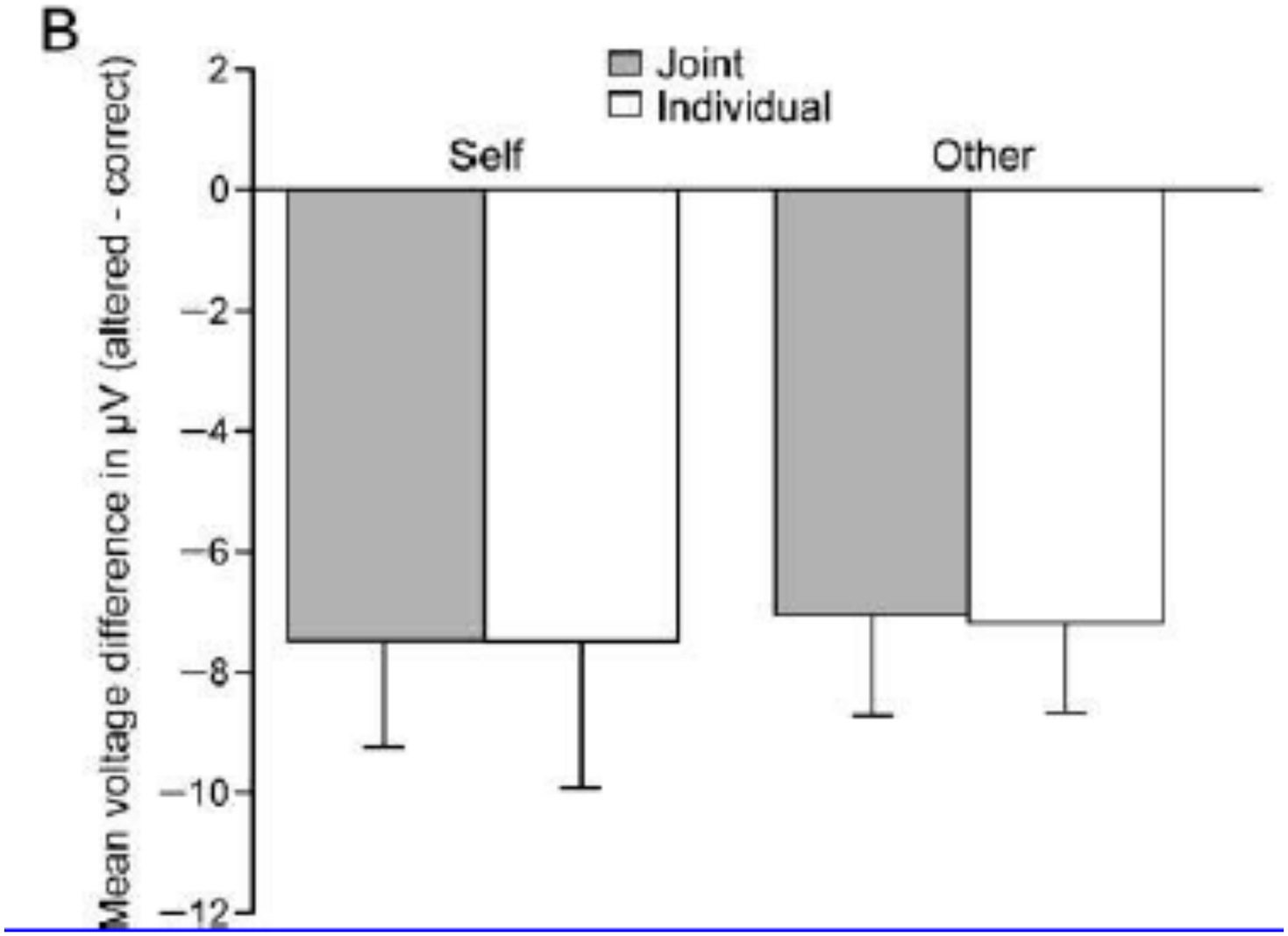


FRN (feedback related negativity) equally strong in all conditions

All error types have equal weight

FRN

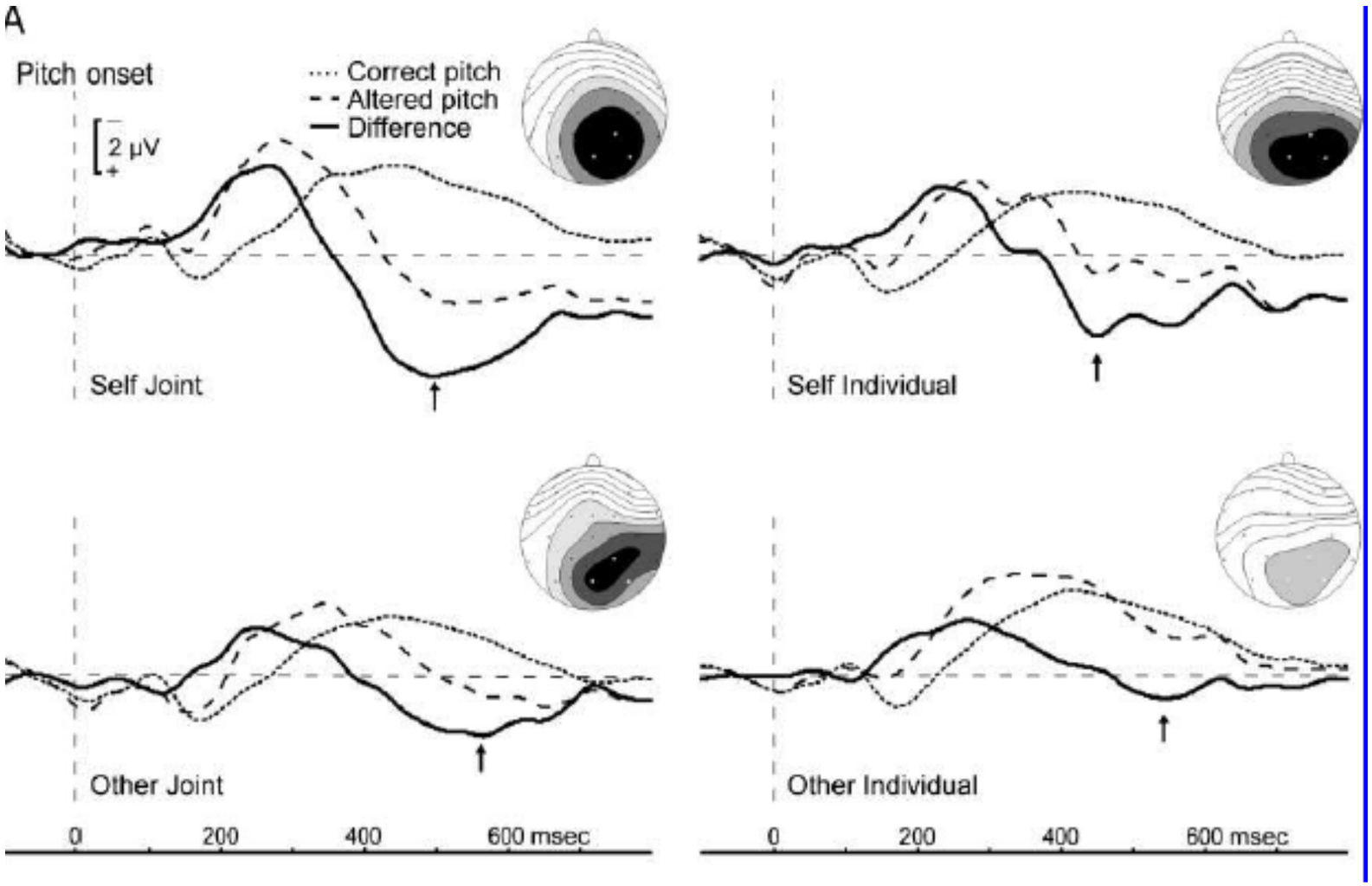
Loehr et al. (2013), Journal of Cognitive Neuroscience



FRN (feedback related negativity) equally strong in all conditions

Pe

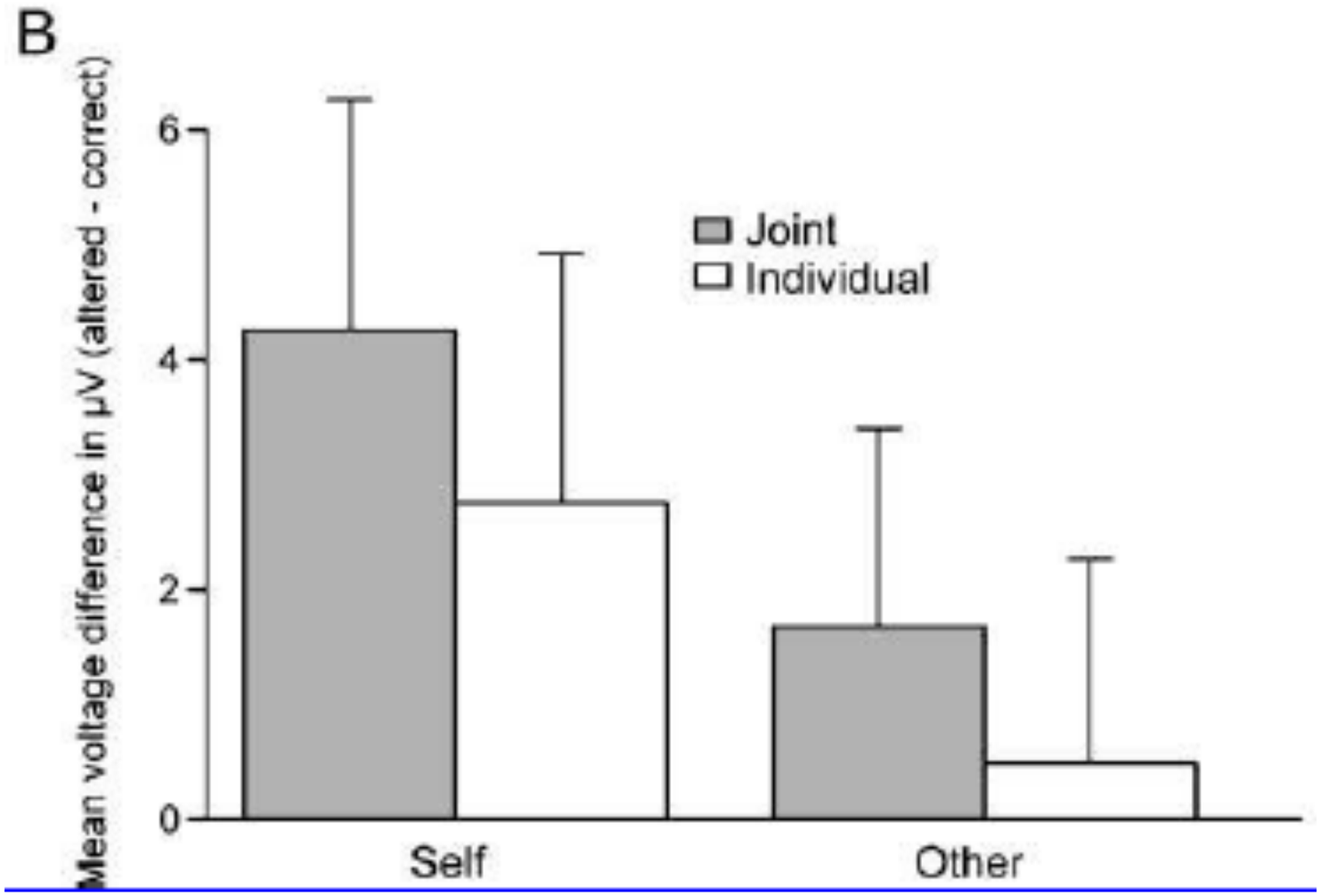
Loehr et al. (2013), Journal of Cognitive Neuroscience



Pe (error positivity) stronger for self and for alteration of joint outcome

Pe

Loehr et al. (2013), Journal of Cognitive Neuroscience



Pe (error positivity) stronger for self and for alteration of joint outcome

Conclusions

Determining one's own contribution to a joint action can be challenging

In highly coordinated joint actions the individual sense of control is reduced and largely independent of individual performance parameters and success.

Others' contributions are mistaken for one's own when they improve the joint outcome.

Expertise seems to improve the sense of control during joint action. Experts monitor joint outcomes as well as the individual contributions causing them