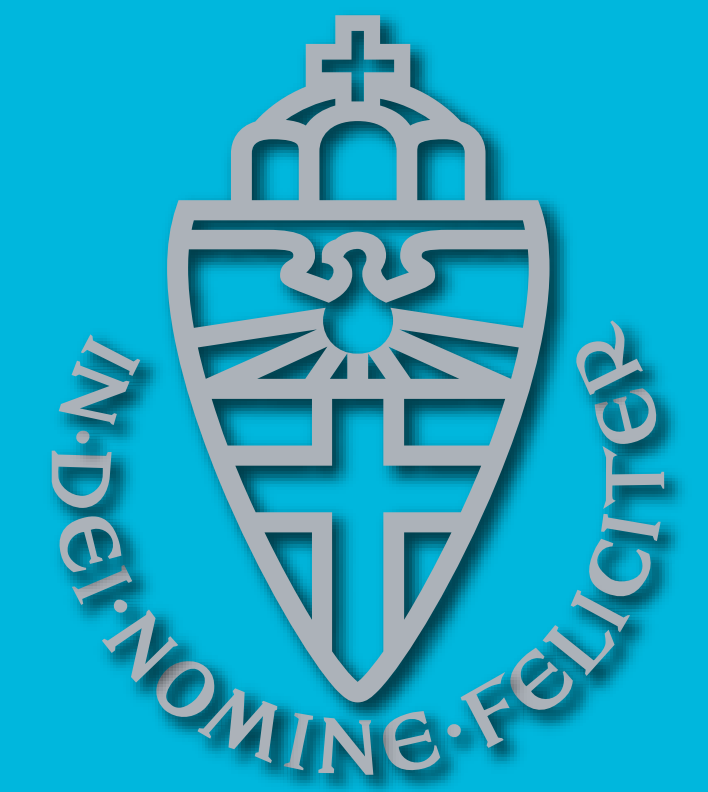


Understanding Action beyond Imitation



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Introduction

It has been argued that action observation gives rise to an automatic tendency for Imitation.

For example, in Brass et al. (2001) participants responded faster when stimulus and response movements were compatible; i.e. when the action you see and the action you need to perform are the same, performance is being enhanced.

These data are usually interpreted as a direct mapping of action observation onto corresponding motor cortices.

However, jointly acting partners often have to select different actions (i.e. incongruent) in order to be congenial and in order to reach a common goal. Here, the automatic tendency to imitate may be an obstacle.

The present study investigates the hypothesis that compatibility effects between Action Observation and Action Execution are flexible and depend on the task context.

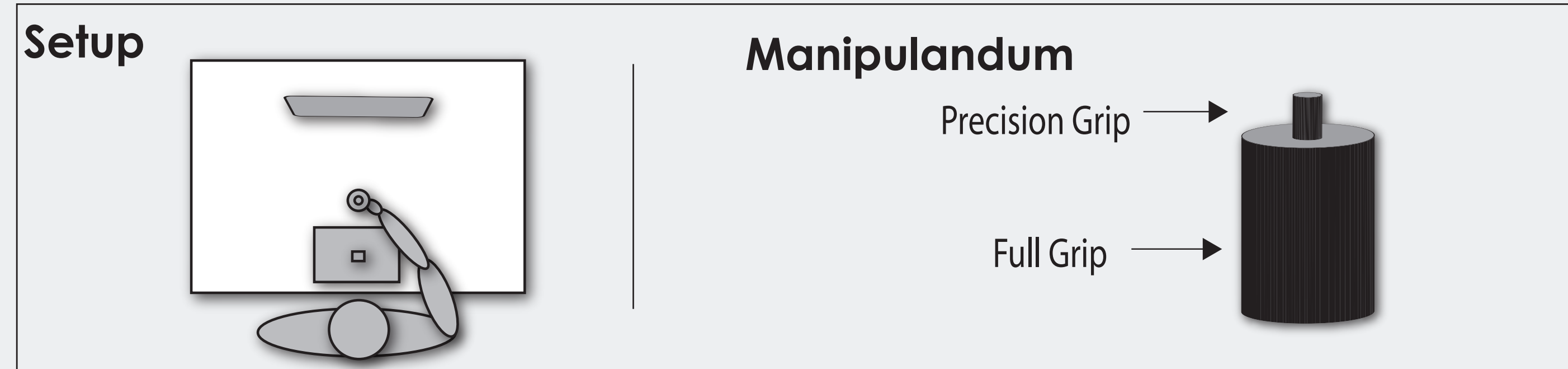
We expect the typical congruency effect that is found in Imitation to reverse in a Complementary Action; where the action you see is the opposite from the action you perform. That is, when the stimulus and response are the opposite, performance should be enhanced.

Experiment 1

Hand cueing

Heyes et al. (2005) showed that after incompatible training (e.g. closing your hand in response to seeing a hand opening), automatic imitation effects disappeared. Seeing a similar action no longer facilitated the same response. Incompatible training however, did not result in a facilitation of the opposite action.

Can we reverse the congruency effect between stimulus and response by changing the action context (Imitation or Complementary Action)?



Procedure



Participants were either in an Imitative condition or in a Complementary Action condition

Imitation: grasp the object similar to the model on the screen; do the same

Complementary Action: grasp the object complementary to the model on the screen; do the opposite

- 60 % were standard trials in which subjects performed a default action (imitation or complementary action)

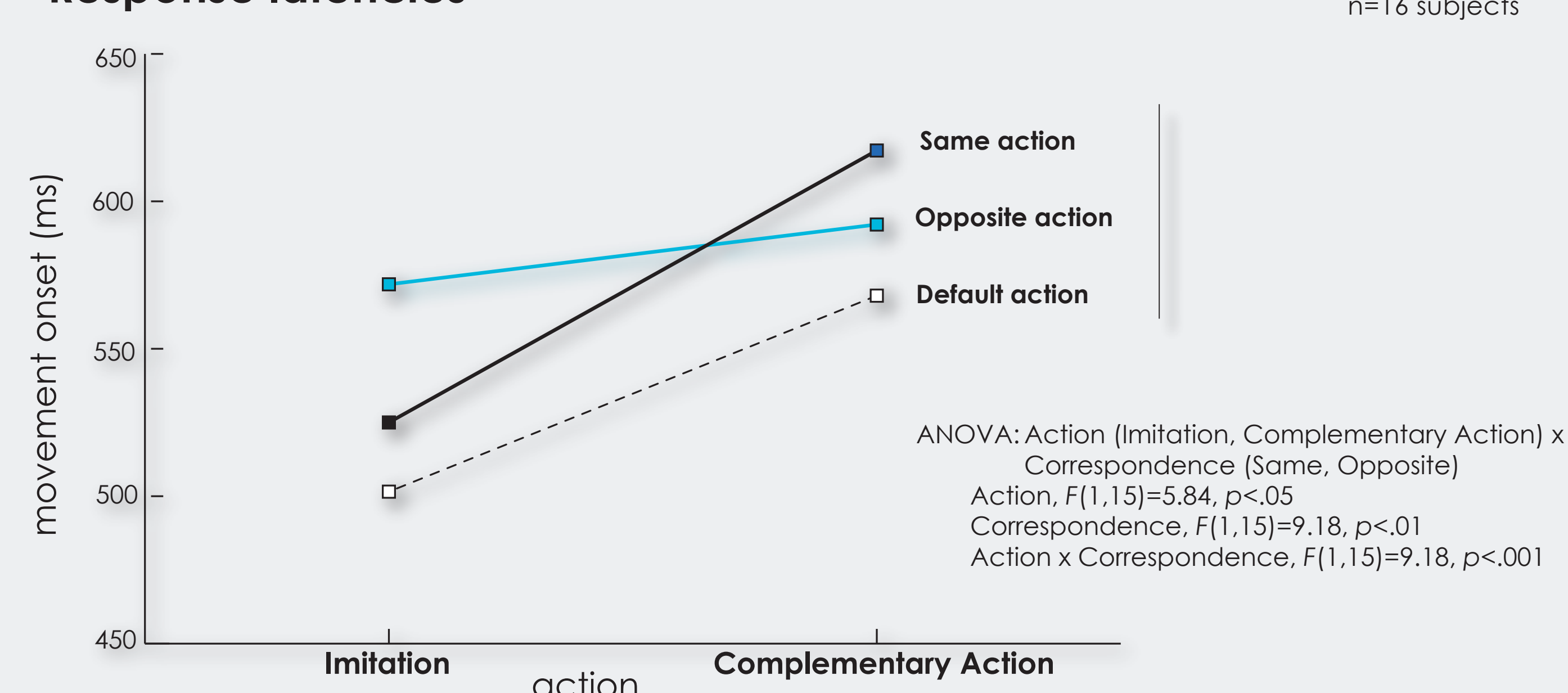
- In 40 % of the trials the color of the hand was green which signalled subjects to perform a predefined action (either full or precision grip), irrespective of the action of the model on the screen.

These actions were either the same (congruent) or the opposite (incongruent) with the posture of the model.

Data acquisition

Recording of movement kinematics with magnetic motion tracking system miniBIRD 800, 100 Hz. Movement times were recorded with a custom build responsebox

Response latencies



In the Imitation condition, participants responded faster when seeing the model performing a similar action (congruent trials). This effect reversed in the Complementary Action condition, where participants responded faster when seeing the model performing an action opposite (incongruent) from their own. The main effect for Action indicates faster RTs for Imitation than for Complementary Action.

Experiment 2

Object cueing

Experiment 1 showed the congruency effects to reverse between the two action conditions. However, on average subjects responded faster in the Imitation than in the Complementary Action condition. Does this reflect a general advantage for Imitation, or does the effect result from focussing attention on the model's hand?

For Imitation it may be advantageous to attend to the posture of the hand, whereas for Complementary Action it may be more relevant which part of the object is available.

By changing the color of the object instead of the hand we expect the main RT advantage for Imitation to disappear. In addition we predict the same pattern of congruency effects as shown in Experiment 1.

Setup was kept the same

Procedure

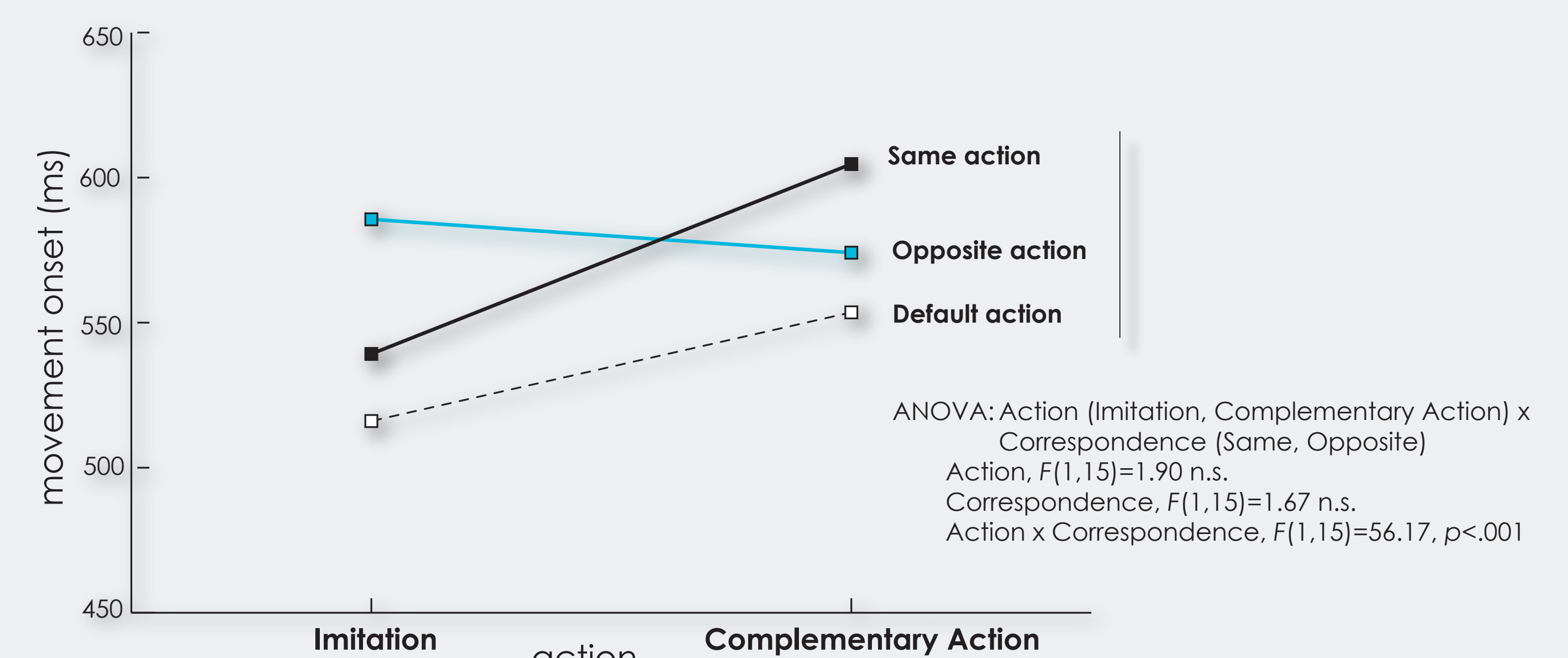


Actions were induced by either a color cue or by context (Imitation or Complementary Action)

Stimuli were adjusted; instead of coloring the hand, the predefined action (full or precision grip) was induced by a colored object (green).

Response latencies

n=16 subjects



The main RT advantage for Imitation over Complementary Action in experiment 1 was due to the way of cueing; when cueing the predefined actions by means of a colored object instead of a colored hand, both main effects for Action and Correspondence disappeared.

Conclusion

In addition to previous work by Heyes et al. (2005) the present study showed congruency effects to reverse in a Complementary Action condition.

Our findings argue against the notion of an automatic tendency for Imitation. They rather suggest that stimulus response mappings between Observation and Action may be controlled actively, depending on the task that is to be performed.

These results support our hypothesis that observed actions are not mapped automatically onto the motor cortices in a one to one fashion. Instead, the mapping between Action Observation and Action Execution may be controlled flexibly to allow people to interact with others efficiently, beyond the notion of Imitation.