Actors and Agency in the Mediated Sequential Simon Task
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1 Introduction
Recent studies suggest we encode the experiences of others and thus extend our attention to incorporate their conflict episodes. A well-known aspect of executive control is that after responding to one conflict, repeated conflict becomes easier; an effect that has been named conflict adaptation. Here, we combined these two observations and predict that a change in the identity of another will affect our own conflict adaptation effect.

To test this, the Simon Task was adapted to include an avatar – an animated, visual representative of the participant – that was portrayed as it were experiencing the conflict. Using a camera and kinesthetic modeling, we manipulated the degree to which the avatar’s movements mirrored the participant’s, and thus the amount of control or agency that could be exercised. Furthermore, the avatar’s identity was sometimes switched between trials, which affected subsequent conflict control, even though the avatar was completely irrelevant to the task.

Any given trial, reaction time (RT) was predicted to be affected by four processes. The Simon Effect refers to the delay due to incongruence between stimulus and response location. Conflict adaptation (or priming/feature integration) refers to modulations in this conflict effect due to repeated occurrences. The latter has been demonstrated to be affected by context; changes in the task, or the task-irrelevant similarity between previous and current trials. Reduce conflict adaptation. The present study investigates whether the relationship between the subject and their avatar modulates the effect of irrelevant context changes.

2 Method
The Microsoft Xbox 360 Kinect controller is a motion sensing input device that uses a depth camera (30 fps, 574x432 FHD) to track up to 6 persons. The skeletal information concerns estimated 3D spatial position of 20 joints. In the study we used it for tracking body gestures: both moving hands in left or right directions were detected as the subject responded. From the skeletal spatial information we calculated the joint orientation of the subject. In the dynamic condition of the present study, the joint orientation was projected onto the avatar, giving it participant-avatar congruence in bodily motion.

Procedure
Each trial started only after both hands were detected for at least 1 s within a small distance from one another. Stars and circles projected left and right of a fixation. Participants were instructed to respond left or circles, right to stars. They were also informed that the avatar was completely irrelevant to the task.

Measures
1) Onset of detected hand movement – Onset of stimulus = RT
2) Amount of movement detected for passive hand = Incorrect velocity

Design
Sixteen participants, blocked design of avatar animation (static vs dynamic), randomized within blocks for stimulus location, response location and avatar identity, to provide conditions of comparability (compatible vs incompatible), N=1 compatibility and avatar change (repetition vs alternation), 256 trials, ca. 20 minutes.

3 Results
1) Conflict (C): stimulus response incongruity increases RT
HERE: responding right to start left increases RT. We also found an interesting effect of conflict on passive hand motion, possibly similar to the LRP.

2) Conflict adaptation (CA): repeated conflict decreases RT
HERE: after 1, responding left to circle right then increases speed. Solid conflict effects (one bar chart) were observed despite the lack of milliseconds precision in the Kinect.

3) Contextual conflict adaptation (CCA): changes in context disrupt CA
HERE: with 2, changes in avatar gender affect CCA. We found a small reduction of CA with changes in avatar gender, despite the irrelevance of the avatar for the task.

4 CCA depends on relation between context and task
HERE: gender-switch is stronger with static conditions. In dynamic conditions (subject-avatar congruence), changes in avatars no longer affected the conflict adaptation effect.

4 Discussion
The findings underline the importance of agency and relevance in sequential conflict tasks. Agency offers an otherwise irrelevant aspect of the task induces a “change-blindness” in terms of executive control. We interpret this in terms of self-referencing: the avatar is an extension of the self that we are prevented from seeing it changing. Like our body, the avatar may change, but always references a paradoxically constant self.

Platform
The study demonstrates the benefits and limitations of using the Kinect for psychometric research. Rather than “a reaction (directionation)”, the controller provides continuous output that shows the influence of cognitive effects over time. It also becomes possible to measure effects across multiple response modalities simultaneously, rather than merely the single finger used in a keypress. However, the controller does not have a great resolution (Kinect 2+), requires a rather large lab (Kinect 2+), and is not particularly accurate in timing (Kinect 2+=).

Conclusions
Finally, the study could serve as a platform for running experiments in a virtual environment. We provided tentative evidence of a bi-directional association between the avatar and the subject. Therefore, we hope the illustrated framework could facilitate research across psychological sciences, for instance in fields of implicit stereotypes and embodied cognition (by changing the avatar), or social effects (by adding avatars). To this end, we provide open source for interested researchers. The Helsinki Institute for Information Technology is also always interested in possible collaborators. Please contact me for if you have comments or requests for information.

References

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