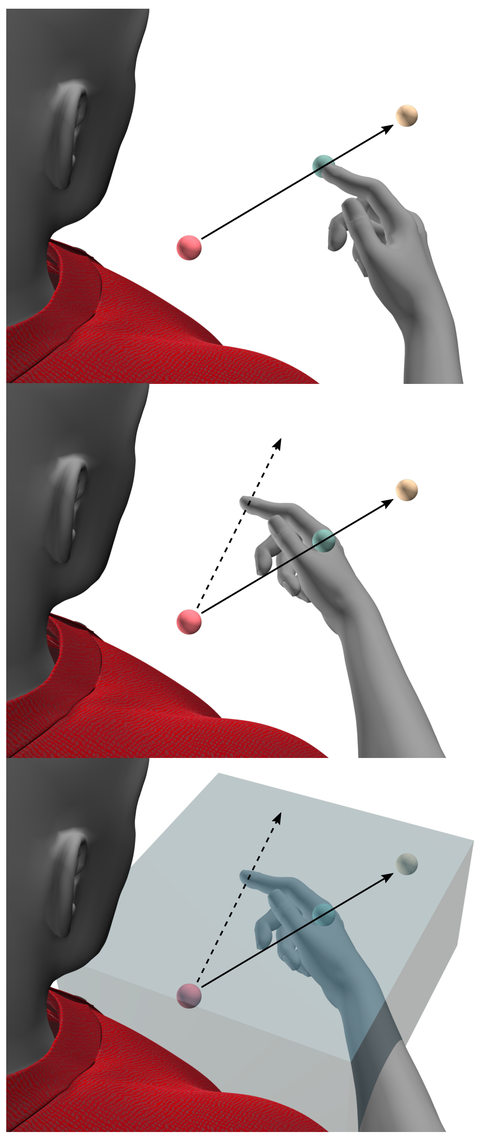
Attribution of error: adapting in virtual reality

Shanaathanan Modchalingam,
& Denise Y. P. Henriques
Centre for Vision Research, York University, Toronto, ON, Canada

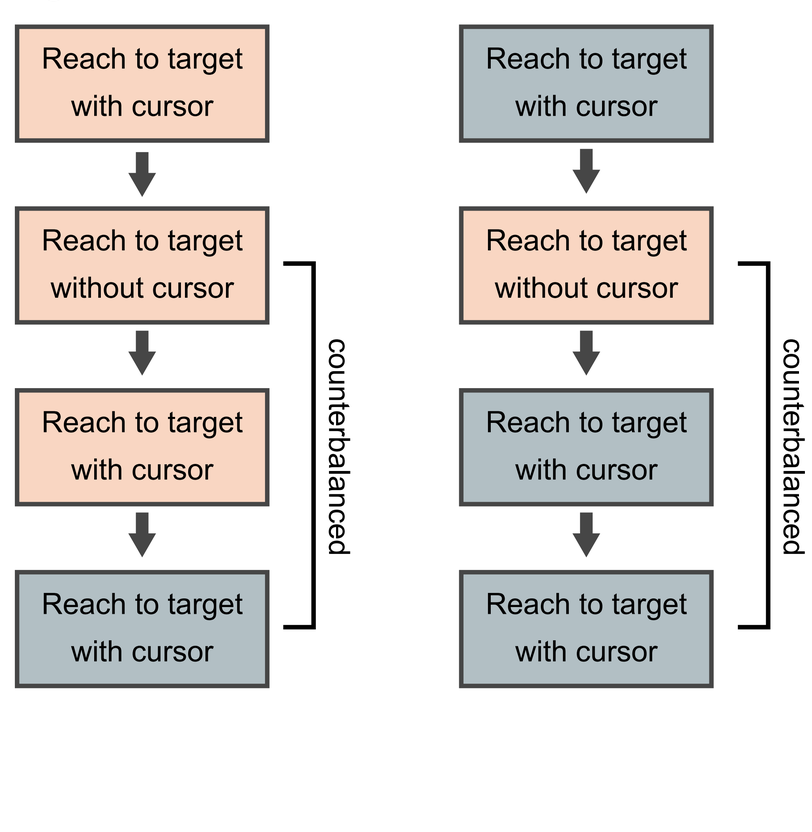
Varying environments and implicit motor adaptation

People easily adapt their motor performance to the varying demands of different environments. This adaptation is done both explicitly, via the use of cognitive strategies to counter any errors they may encounter, and implicitly. The explicit learning system can easily adapt to changing environments. However, this necessitates cognitively expensive strategies. Can the implicit learning system take environments into account?



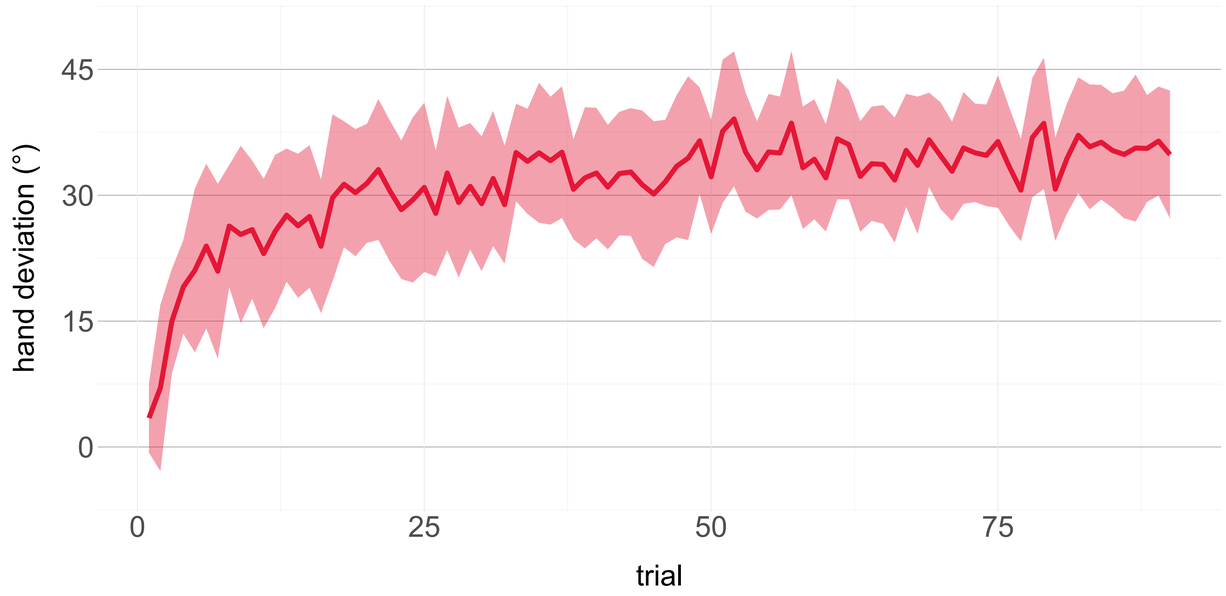
Manipulating environments

Using immersive virtual reality, we manipulated the visual environment in which participants performed reaching movements. A semi-transparent box environment was paired with a 45° visuomotor rotation. We then tested the implicit aftereffects of adaptation by having participants reach to targets without any visual indication of their hand poisition both within and without the semi-transparent box.



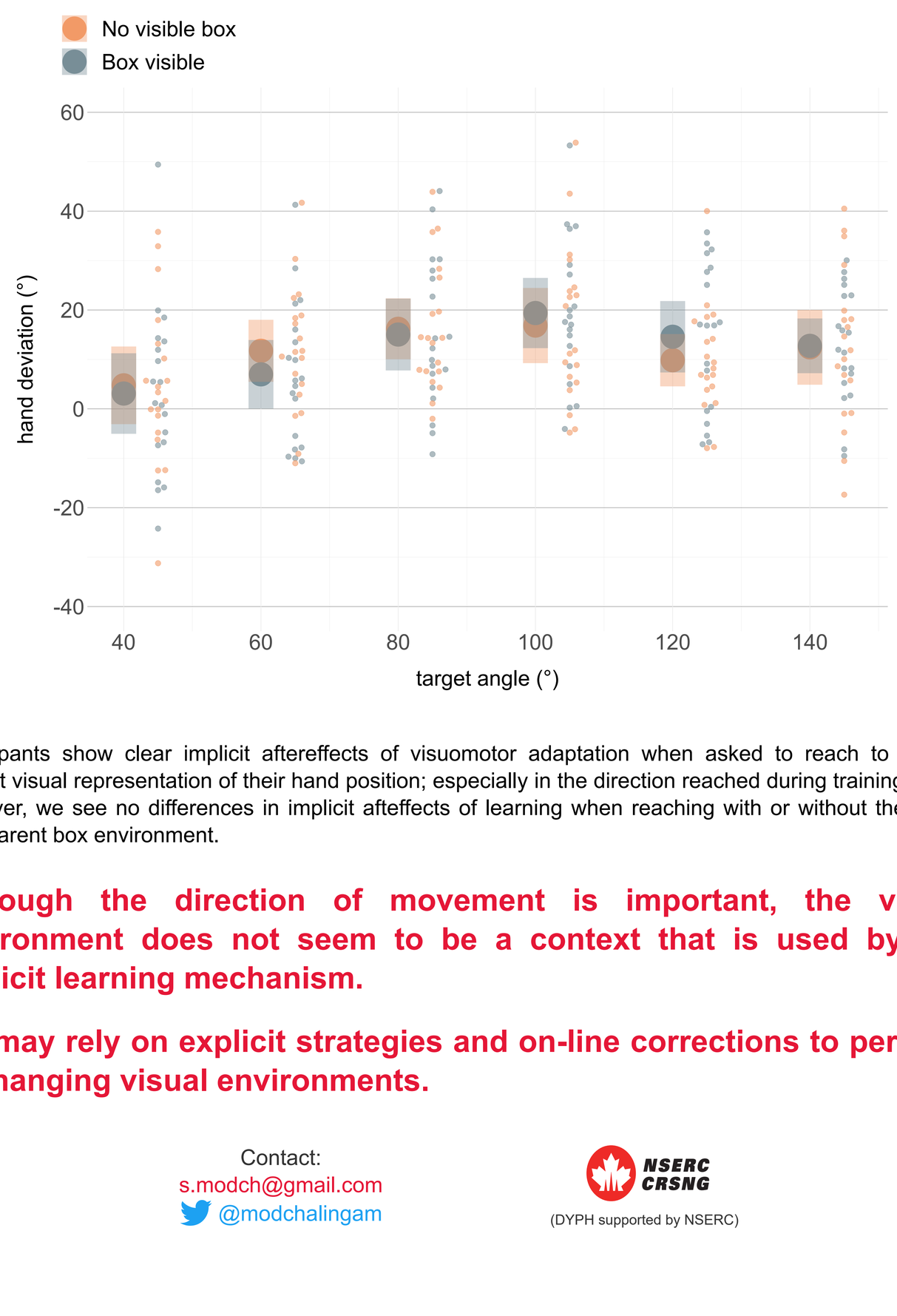
Participants adapt their reaches to counter the 45° visuomotor perturbation

Participants must deviate the movement of their hand by 45 degrees to fully counter the visuomotor perturbation



As with typical reaching paradigms, participants in immersive virtual reality were able to adapt to much of the 45° rotation. We see rapid improvements in performance during early adaptation and an eventual plateau in later adaptation.

Implicit learning is not attributed to the visual environment under which adaptation occured



Participants show clear implicit aftereffects of visuomotor adaptation when asked to reach to targets without visual representation of their hand position; especially in the direction reached during training tasks. However, we see no differences in implicit afteffects of learning when reaching with or without the semi-transparent box environment.

Although the direction of movement is important, the visual environment does not seem to be a context that is used by the implicit learning mechanism.

We may rely on explicit strategies and on-line corrections to perform in changing visual environments.

Contact:
s.modch@gmail.com
@modchalingam

(DYPH supported by NSERC)