

**Dual Adaptation to Two Opposing Rotations in Altered Visual Feedback of the Hand**  
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Can humans adapt to two equal and opposite alterations in visual feedback of the hand concurrently (dual adaptation) and what cues facilitate this adaptation? Previous studies have shown that dual adaptation did not occur when each opposite rotation was coupled with background colours presented on a screen. However, it was shown to occur when each opposite rotation was coupled with targets located in different areas of workspace separated by 180°, regardless of whether background colour cues were present.

To further explore the efficacy of cues for motor adaptation, we tested whether different colour & shape cues of a cursor & target, with and without target locations separated in workspace could facilitate dual adaptation. Subjects used a stylus to control a cursor on a screen and made goal directed reach movements to targets. The visual feedback of the cursor was rotated and subjects had to adapt their reach movements accordingly. Subjects in the colour & shape cue group (Group 1) were provided with colour & shape cues of the cursor & target that were coupled with either a 30°CW or CCW rotation while reaching to targets located in a single area of the workspace. Subjects in the colour & shape & workspace cue group (Group 2) were provided with the same colour & shape cue information as Group 1 but reached to targets located in two areas of workspace, separated by 90° and coupled with either the 30°CW or CCW rotation. The experimental design of Group 2 required subjects to make overlapping and similar arm movements in order to acquire different visual targets under both rotations.

Our preliminary results show that subjects were not able to adapt to either rotation in Group 1 but did adapt to both rotations concurrently in Group 2. Our results support and extend previous findings by demonstrating that colour & shape cues alone did not facilitate dual adaptation, but if rotations were coupled with a 90° separation in workspace then that was sufficient to facilitate dual adaptation despite the overlapping and similar arm movements required to reach to targets under either rotation. This study gives us insight into the types of cues that can facilitate dual adaptation. This may reflect a component of how humans are able to seamlessly switch between different motor tasks and can have implications to enhance motor adaptation.