

1. Introduction

The plasticity of the human sensorimotor system is impressively demonstrated by adaptation to a lateral offset of the visual field. Traditionally such an offset is produced by wearing wedge prisms in front of the eyes. Subjects wearing such an optical device will produce remarkable errors in the direction of the lateral offset when asked to point rapidly to a target. These errors will diminish over several trials, inducing a temporal shift of visuomotor coordinates. The subsequent removal of the prisms results in a transient negative visuomotor after-effect (see fig. 1).

The observed adaptive shift is restricted to the limb exposed to the displacement. In this study I used left-right reversed visual feedback so that subjects observed movements and corresponding pointing errors of their left hand which were actually performed with their right hand. The goal was to test the assumption that this experimentally generated vision of the left hand will induce an adaptive shift on the visuomotor representation of that hand.

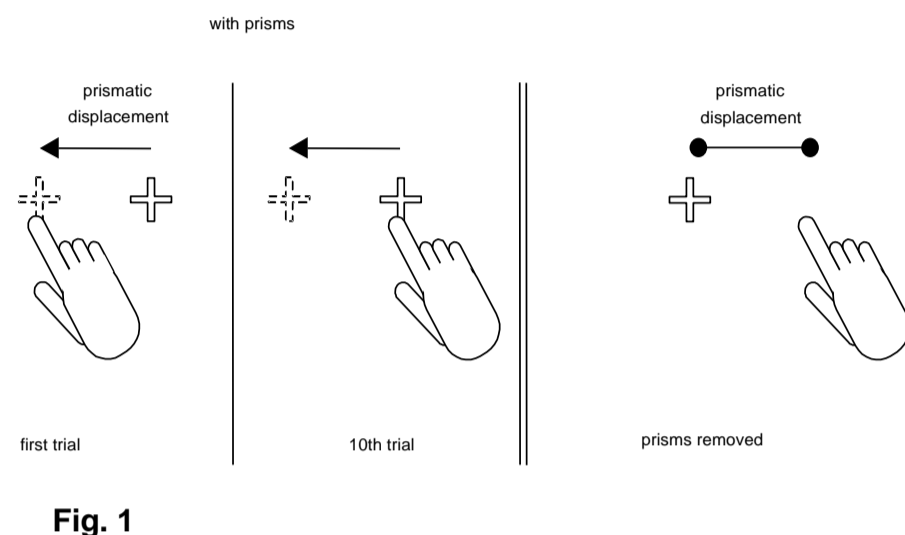


Fig. 1

2. Experiments

Two different setups were used to horizontally reverse visual feedback. In all cases visual feedback could be displayed either non-reversed or reversed. Subjects were exposed to both types of visual feedback in different trials. Visual feedback of Ss hands (or virtual hands) was provided on a monitor (see fig. 2 & 4) only after the start of the movement. Direct sight of Ss arms was prevented at all times. Aiming accuracy errors were recorded to both sides of the target in separate trials, but only those to the right (or with reversed feedback to the left) are reported here. The visuomotor after-effect provided a measure of adaptation.

Setup 1 (fig. 2):

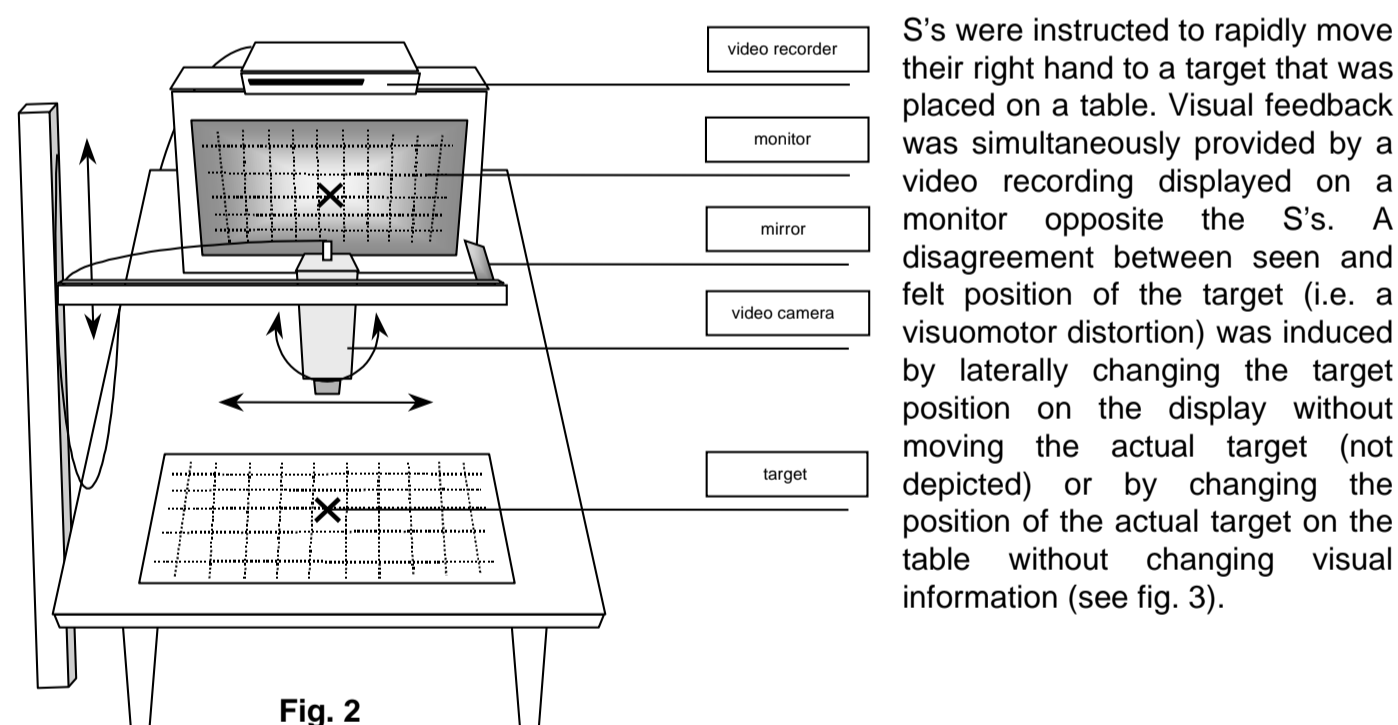


Fig. 2

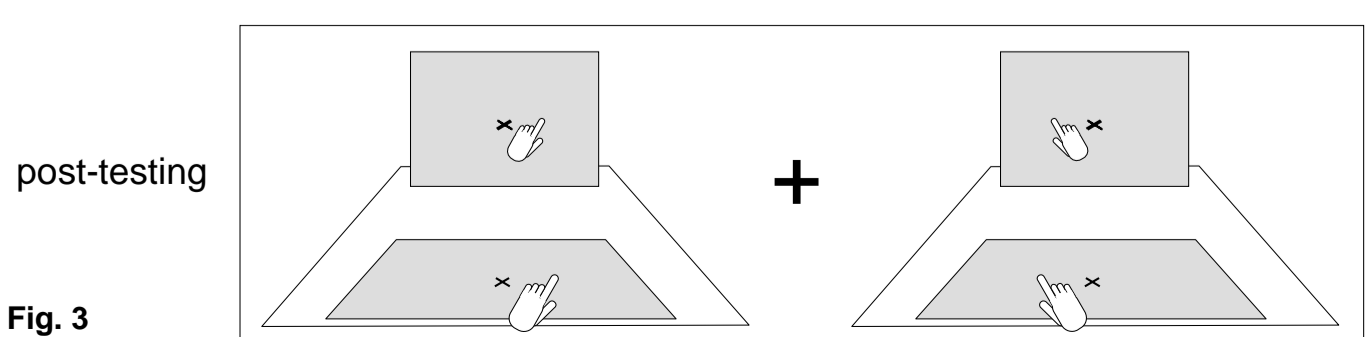
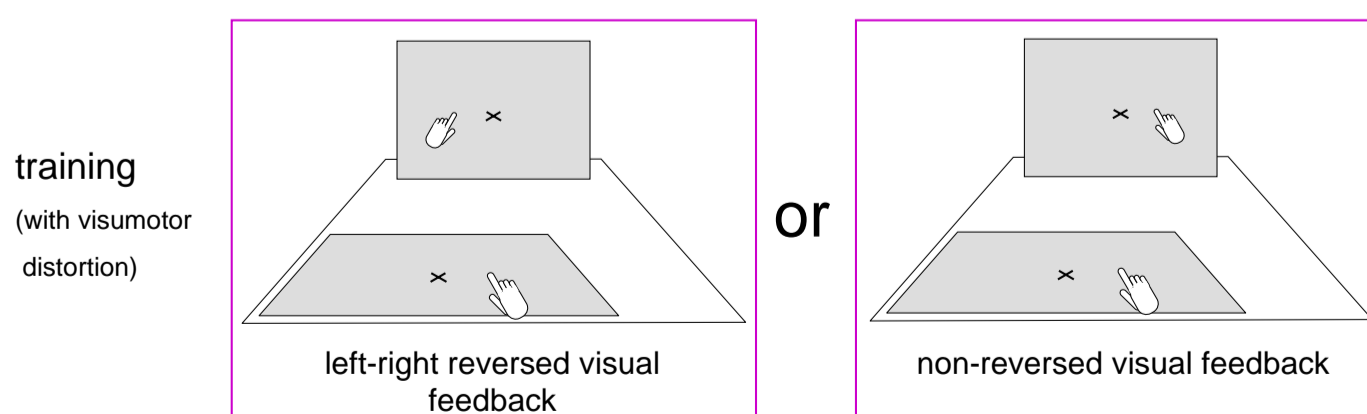
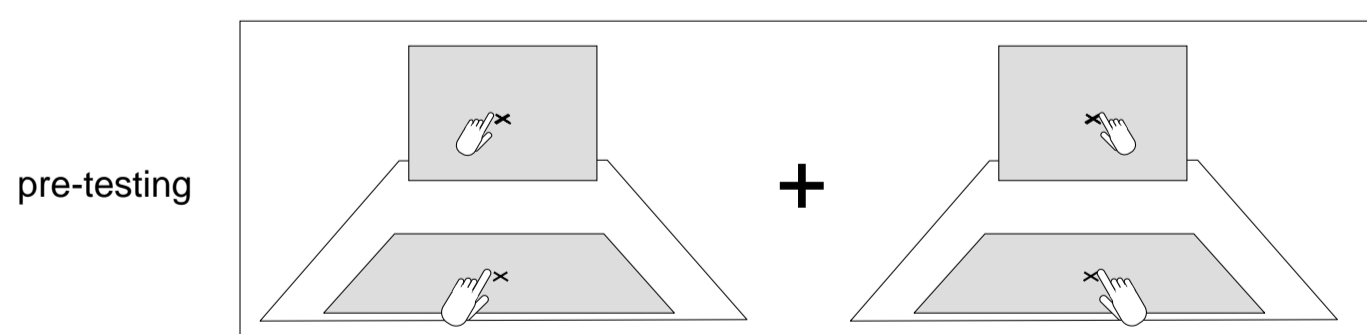


Fig. 3

Setup 2 (fig. 4):

The experiments done in setup 1 were duplicated using computer graphics. S's routed a virtual hand on a screen by moving a computer mouse with their right hands. Vision of S's hands was prevented. They were instructed to move the virtual hand to the target in the middle of the screen with a rapid movement and there click a mouse button. To produce a visuomotor distortion the ratio of mouse movements to virtual hand movements was laterally increased (by factor 1,5) or decreased (by factor 0,75) with respect to a standard ratio (1cm mouse movement = 2,7cm virtual hand movement).

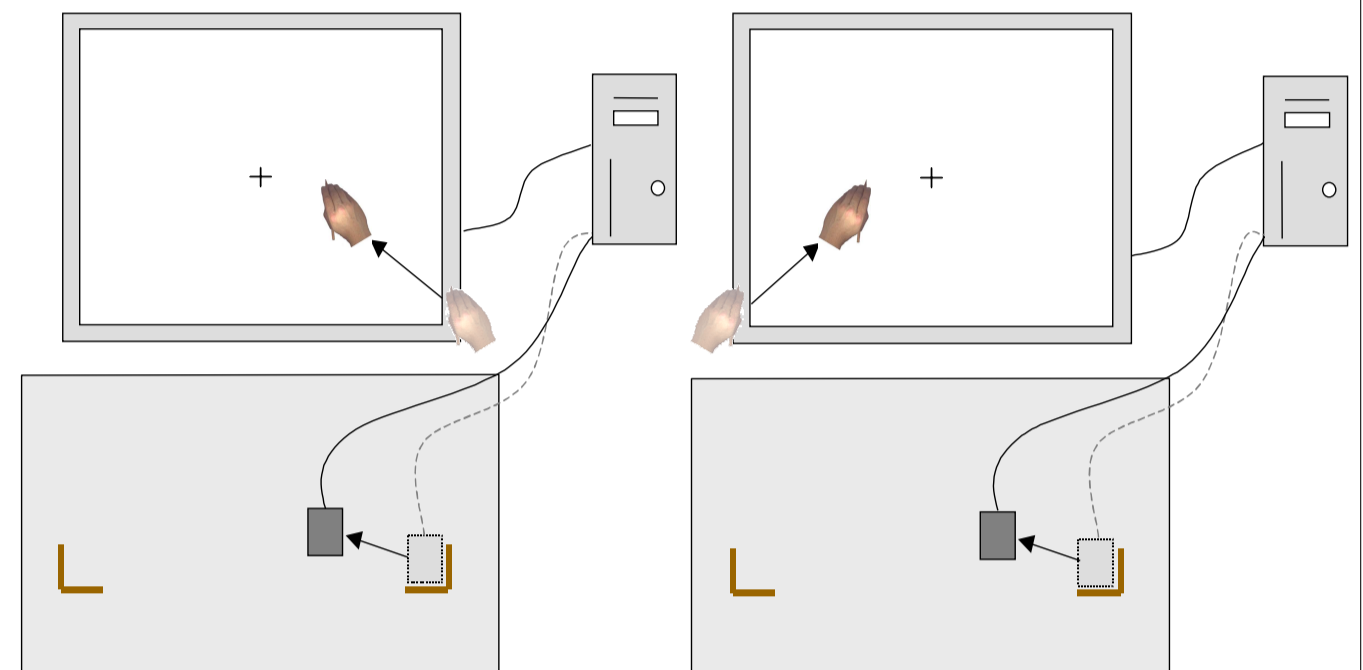


Fig. 4

non-reversed

left-right reversed

3. Results

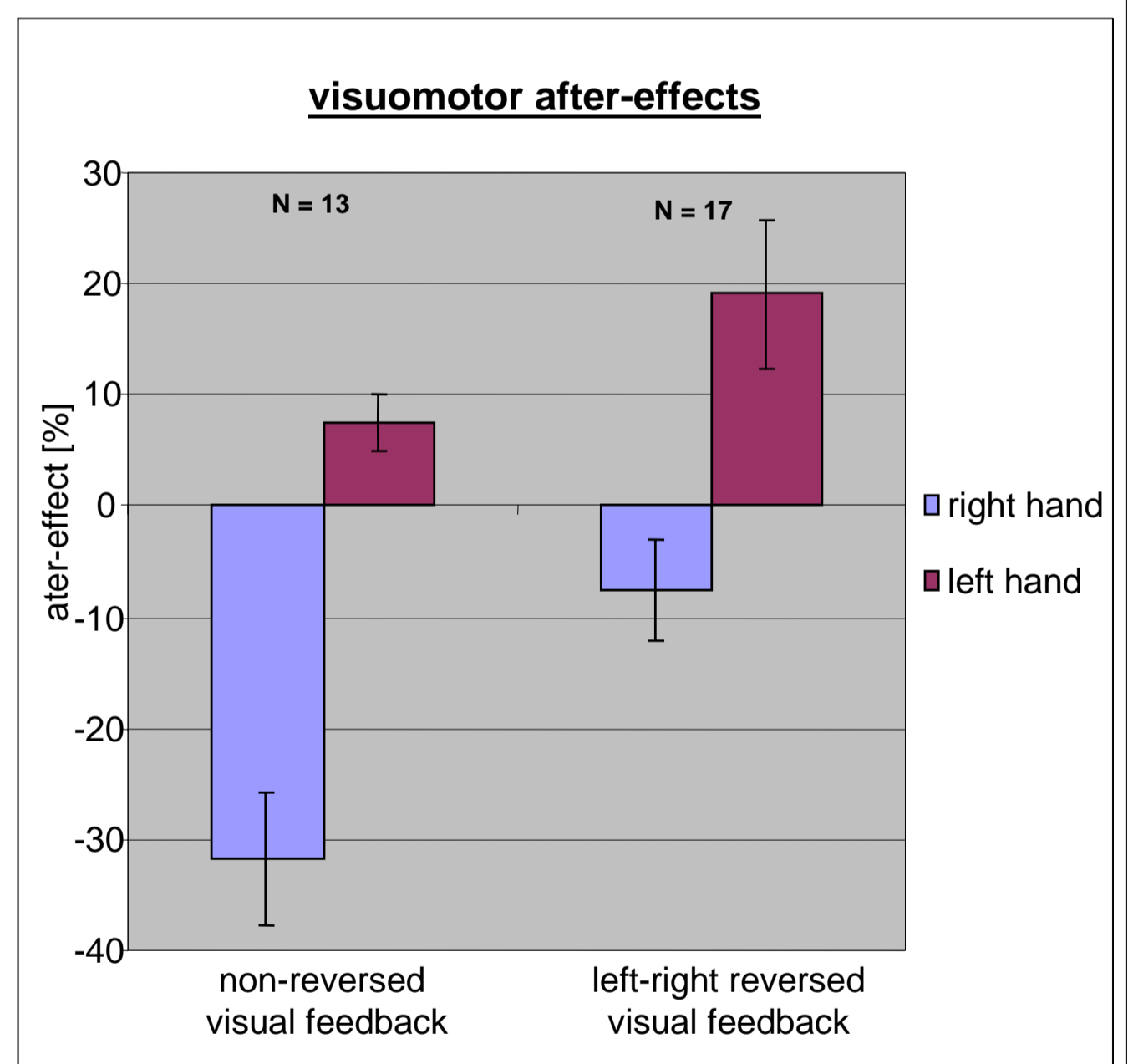


Fig. 5

With non-reversed visual feedback adaptation occurred for the actively moved right hand while after-effects were absent or very small for the left hand. With left-right reversed visual feedback the results were the opposite: 1. After-effects for the right hand decreased remarkably while after-effects for the left hand were manifestly larger than with non-reversed visual feedback. 2. Left hand after-effects were even larger than those for the actively moved right hand.

Combined mean visuomotor after-effects are depicted in fig. 5. Errors are SEM. Data are depicted as % of a standardised value.

4. Conclusions

➔ Visual feedback apparently induces a stronger after-effect than active movement of the hand:

With left-right reversed visual feedback the visuomotor after-effect is transferred from the actively moved right hand to the non-used left hand. With non-reversed visual feedback this is not the case.