A window into the behavioural strategies used in visuomotor adaptation

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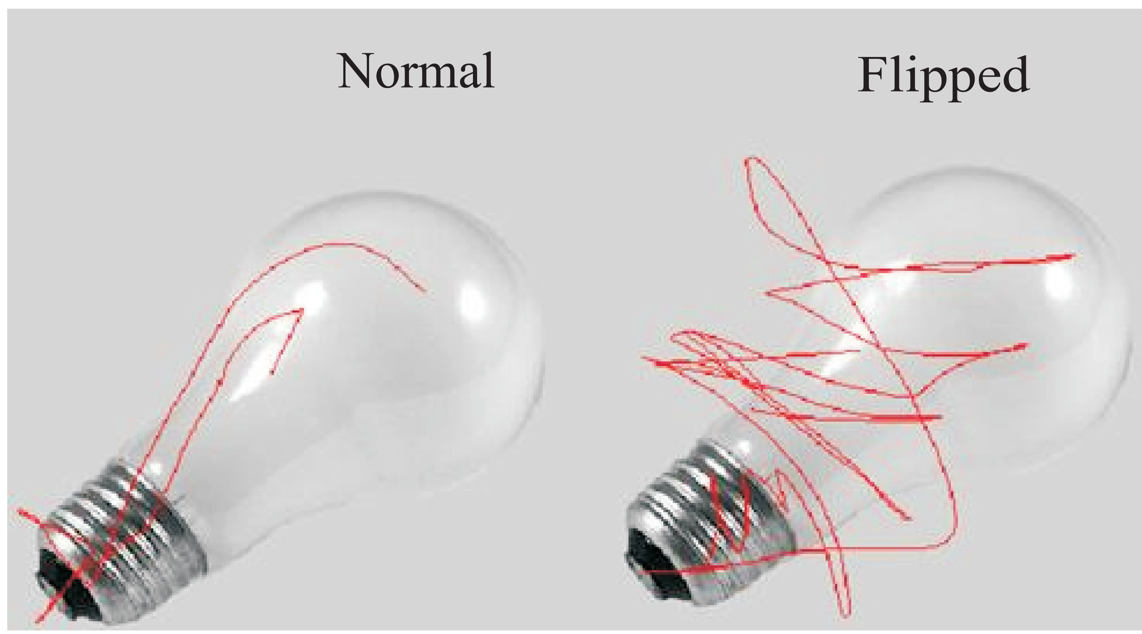
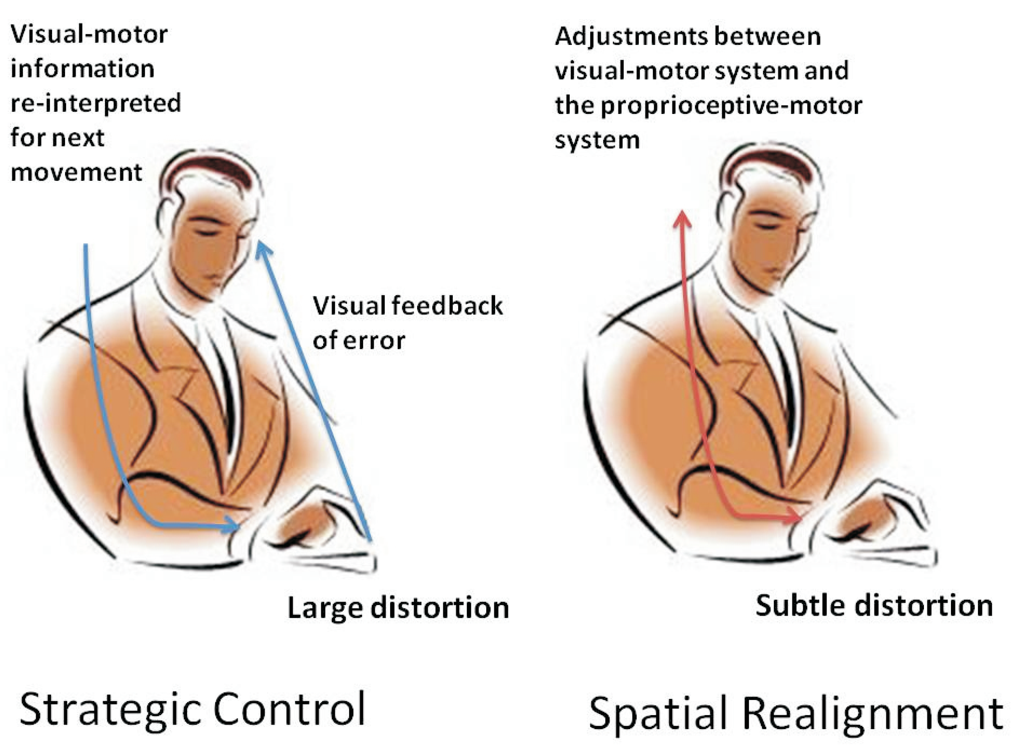
Introduction

The Viewing Window task has previously been used to study visuomotor adaptation in young and elderly participants[1, 2]. These studies have shown the Viewing Window to be a useful tool for observing adaptation to large distortions in the form of flips in window movement.



Adapting to large distortions uses *strategic control*[2]. However, we also make adaptations to subtle distortions without being aware of it. These adaptaions use *spatial realignment*[3].



Purpose

Can the Viewing Window be used to study adaptation during the use of spatial alignment ?

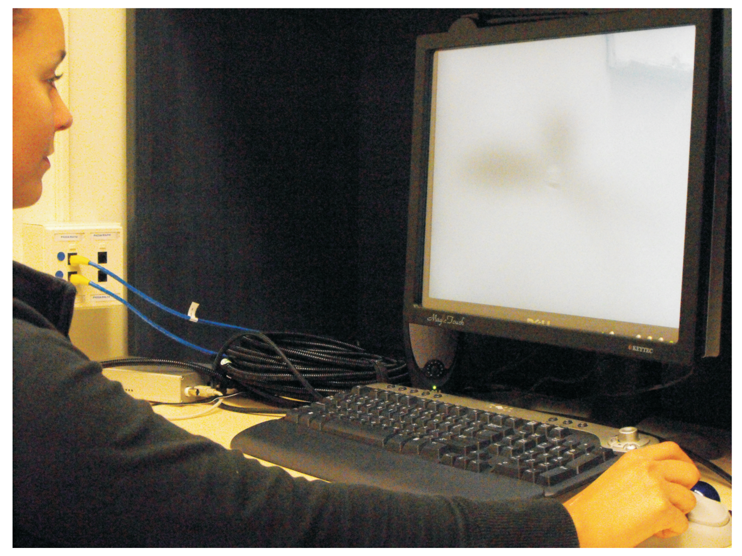
Method

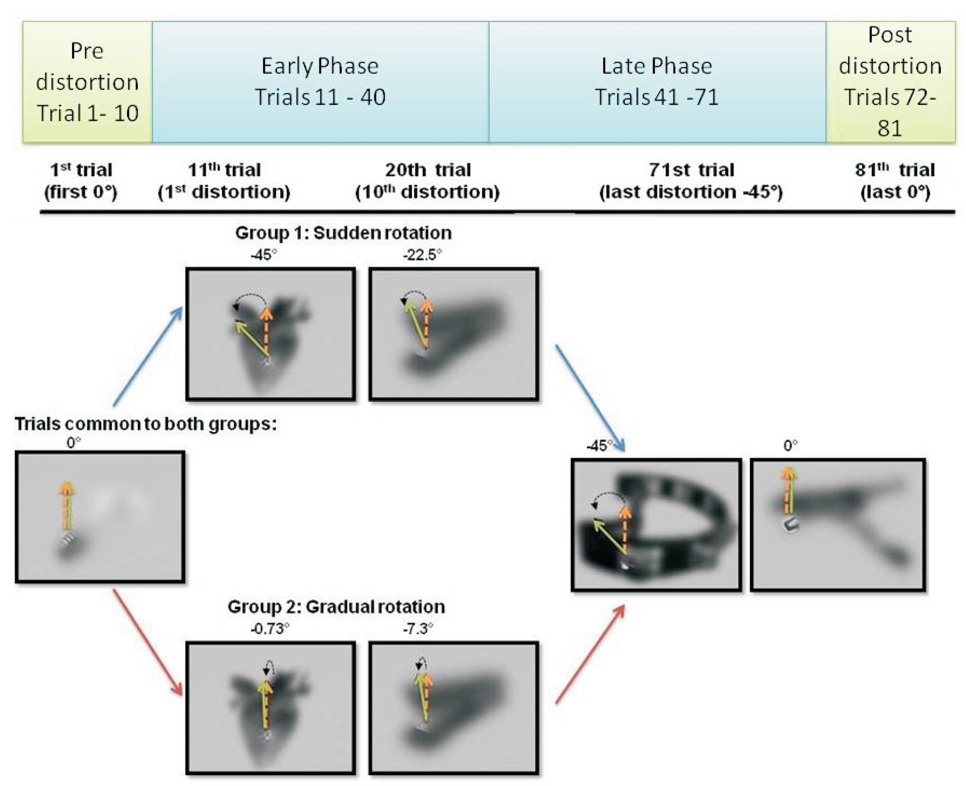
Participants

34 right-handed first year psychology students (12 male, mean age = 21) with normal or corrected-to-normal vision participated.

Materials and Procedure

Viewing window movement was controlled using a trackball.





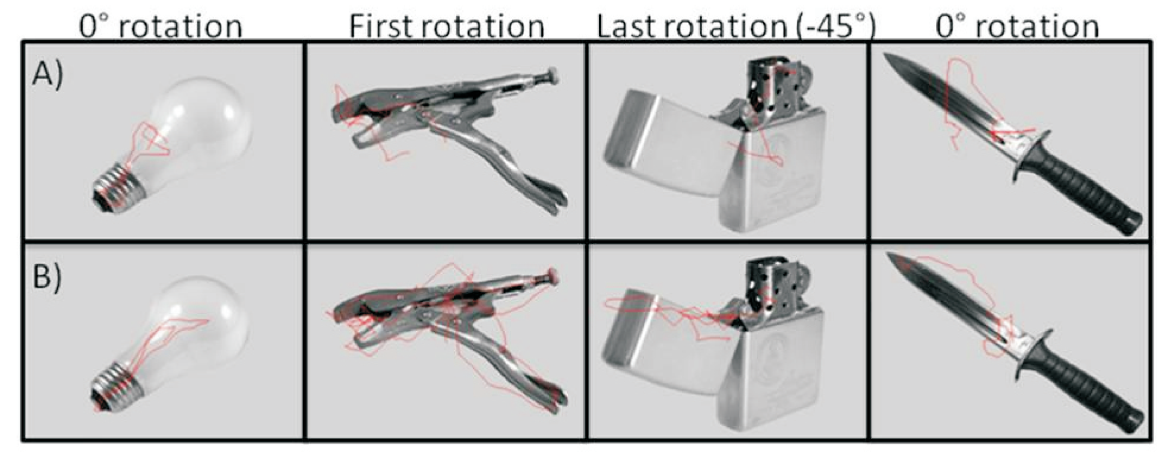
Data Analysis

The first 5 trials were removed as practice trials. Correct trials were analysed and scan paths visually inspected.

Results

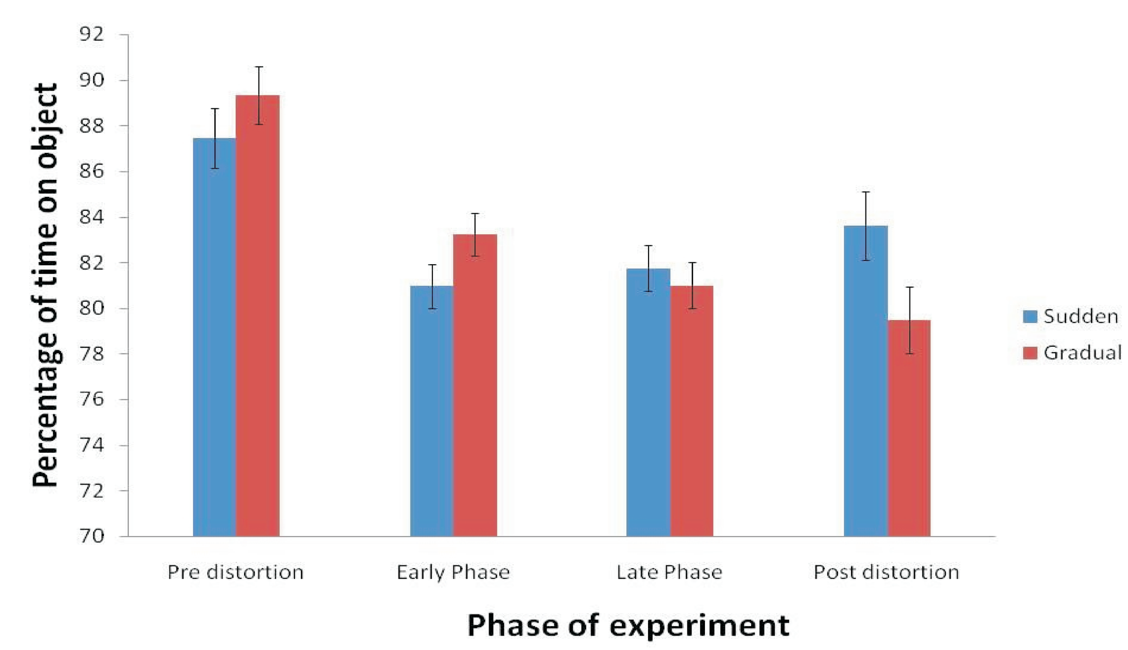
After-effects

More complex scan paths were observed when distortions were introduced in the sudden condition (B). Later in the phase of the distortion trials, participants showed signs of adaptation. Once Viewing Window control returned to normal, subjects in gradual distortion group (A) showed greater after effects reflected by increased time off the object.



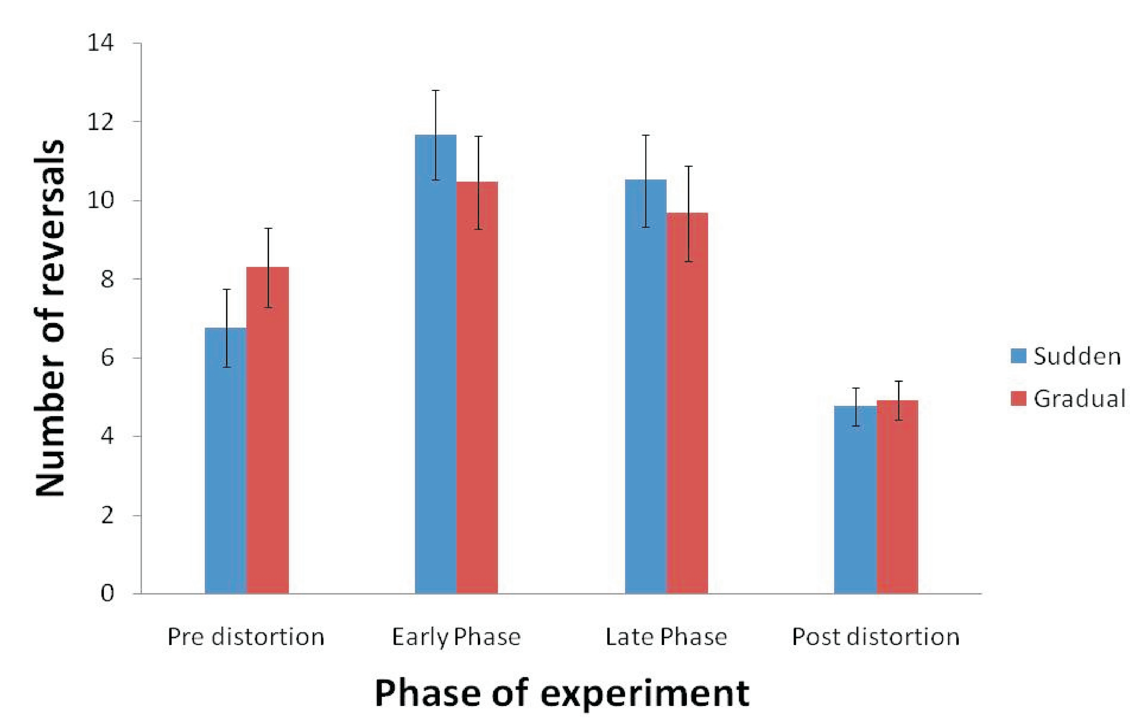
A) Gradual-rotation B) Sudden-rotation

During the pre-distortion and distortion trials there were no significant differences between groups in the time spent on the object. However, during the post-distortion trials the gradual-distortion group spent significantly less time on the object than the sudden-rotation group.



Scanning behaviour

During adaptations to smaller distortions, minor corrections in scan paths rather than large reversals in viewing window movement are expected. We did not observe significant differences in the number of reversals between experimental groups.



Conclusions

Subjects in the gradual-rotation group demonstrated greater after-effects than those in the sudden-rotation group. This demonstrates that the Viewing Window task can be used to investigate spatial realignment in addition to strategic control.

Implications

Strategic control and spatial realignment are known to recruit different sets of neural correlates. Strategic control recruits multiple regions primarily in the parietal cortex[4]. Whereas, spatial realignment is believed to primarily rely on cerebellum activity[5]. As the Viewing Window can be used to study both strategies, in the future we can use this tool to investigate the neural networks that underlie both strategies of visuomotor adaptation.

References

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