

The effect of visual feedback via mirror on immediate performance of an upper limb positioning task

N. Tuff^{1,2}, M.J. Watson².

¹Neurorehabilitation, Colchester General Hospital, Colchester. ²School of Allied Health Professions (AHP), University of East Anglia, Norwich.

Introduction. Augmented visual feedback is recognized as a means of enhancing movement retraining for subjects who have sustained brain lesions such as stroke or head injury¹. The rationale is that it increases the information available to the learner, thus enhancing learning and performance^{1,2}. There is anecdotal evidence supporting the use of mirrors as an augmented visual feedback strategy. There is however a dearth of published literature evaluating the effectiveness of this method. The current study was designed to investigate the immediate effects of mirror image feedback on the accuracy of an upper limb positioning task in normal subjects.

Method. A convenience sample of 18 subjects (16 female, 2 male), all healthy undergraduate students without musculoskeletal or sensory problems, was recruited. Subjects' ages ranged from 18-29 years (mode 20 years). All subjects were tested on accuracy to actively reproduce 3 predetermined angles of shoulder abduction (50°, 110°, 140°) with the dominant upper limb. Each subject carried the task out under 3 conditions: 1) visual feedback via mirror; 2) visual feedback via direct sight of arm; 3) visual feedback via both mirror and direct sight of arm. To control for carry-over effects, a counterbalancing procedure was used, varying order of joint angle and test condition across subjects. A reliable and practical method of joint angle measurement, utilising a plurimeter, was devised. Data were recorded as accuracy of joint angle reproduction (+/- degrees of movement, 0° = perfect reproducibility). Ethical approval was obtained.

Results. A one-factor within subjects ANOVA test gave a result of $F(1.496,25.437) = 0.444$; $p=0.590$. Therefore differences between the 3 conditions did not reach statistical significance. However 95% confidence intervals for reproducibility across subjects suggested that condition 1 showed best results (-8.63°-9.19°), followed by condition 3 (-13.49°-13.93°), then condition 2 (-17.71°-14.59°). Condition 2, which might be regarded as the normal situation, showed the poorest reproducibility.

Conclusion. Despite lacking statistical significance (probably due to type II error), this investigation indicated that mirrors may nonetheless have a small effect on joint position sense in normal subjects. The extent to which these results are applicable to a patient population, particularly those relearning postural control following a brain lesion, needs to be established, though warrants further investigation.

References

¹Carr J., Shepherd R. (1998) Training motor control, increasing strength and fitness and promoting skill acquisition. In: Neurological Rehabilitation: Optimising Motor Performance. p.23-46. Oxford: Butterworth Heinemann.

²Janzen Ezekiel H. et al. (2001) Application of motor learning principles: the physiotherapy client as a problem solver. III. Augmented feedback. Physiotherapy Canada. 53(1): 33-39.

