Posture & Mobility Group - Small Research Study Funding Scheme

Short Report (August 2007)

Wheelchair mobility for people following stroke with perceptual problems

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Unilateral neglect is a relatively common perceptual disorder that affects patients following stroke and refers to an inability or difficulty in attending to space on the side opposite brain damage. It is associated with poor recovery and many affected patients do not relearn to walk again and therefore might benefit from powered mobility. However, the nature of the disorder makes the safe navigation of a power chair problematic and patients are often unable to take advantage of powered mobility resulting in a corresponding reduction in independent mobility.

This study aimed to provide some preliminary data to document the nature of navigational difficulties. Seven participants with unilateral neglect undertook two carefully designed tests of power chair navigation. The tests were:

1. Wheelchair Assessment Course (WAC) – this involved steering a powered chair around a short 'obstacle course' where the number and side of collisions were counted.
2. Doorway Accuracy Test (DAT) – a finer-grained measure where participants were asked to navigate a central course though a series of openings. 3D motion capture was used to measure deviations away from midline.

Six participants each completed 10 trials of the WAC. All had left-sided unilateral neglect though varied in terms of severity. As predicted, participants made more errors on their affected side (F (1,5) = 4.8, $p < 0.05$). Figure 1 below shows the means (standard errors) for each participant.

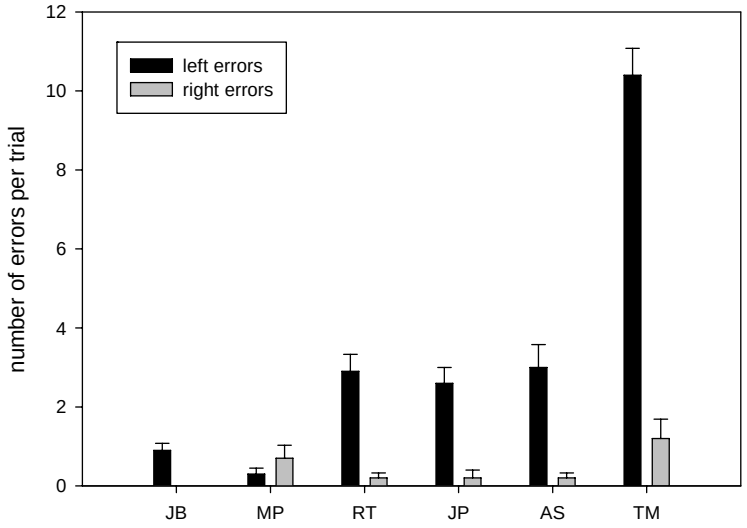

Figure 1. Individual means (and standard error) errors for each participant on the WAC.

Six participants also completed the DAT. However, RT was unable to complete this assessment. A participant with mild 'right' neglect (RH) completed the DAT along with the other 5 participants. Each participant completed 24 trials, 8 for the 3 different sized gaps. Participants demonstrated a reliable 'crossover' effect (F (2,10) = 6.48, $p < 0.05$), deviating to their 'unaffected' side for larger gaps but to the 'affected' side as the gaps became smaller (see Figure 2).

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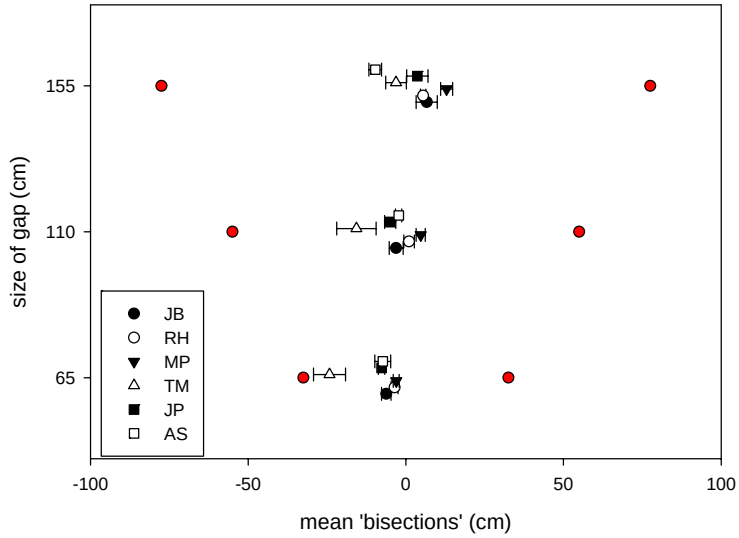

Figure 2. Individual means (and standard errors) for performance on the DAT

This 'crossover' behaviour is reminiscent of behaviour demonstrated by patients with unilateral neglect on pen and paper line bisection tasks.

This assessment work provided the basis for a number of single case studies that investigated the ability of participants to improve their performance using simple rehabilitation strategies. Strategies tested involved spatial cueing which was achieved by asking participants to steer the chair by using a joystick positioned on the affected side. In some cases (those with hemiplegia), this involved reaching across their body whereas others were able to use their other limb. To date, 3 of the 4 cases investigated were able to significantly improve their performance.

Further information

I would like to thank the Posture & Mobility Group for supporting this work. The research is part of ongoing work in collaboration with colleagues at The Universities of Hull (Johan Hulleman) and Birmingham (Keiko Kitadono, Glyn Humphreys, Jane Riddoch)

If you would like more detailed information, the P&MG have a full report (available on request) or you may contact David Punt (d.punt@leedsmet.ac.uk). Aspects of the work have been submitted to an international peer-reviewed journal.