



LETTER

Effect of posture on levels of arousal and awareness in vegetative and minimally conscious state patients: a preliminary investigationL Elliott¹, M Coleman², A Shiel³, B A Wilson⁴, D Badwan⁵,
D Menon⁶ and J Pickard⁷¹ Department of Physiotherapy, Addenbrooke's NHS Trust, Cambridge, UK² Wolfson Brain Imaging Centre, University of Cambridge, Cambridge, UK³ Faculty of Medicine, National University of Ireland, Galway, Ireland⁴ MRC Cognition and Brain Sciences Unit, Cambridge, UK⁵ Royal Leamington Spa Rehabilitation Hospital, Warwick, UK⁶ Wolfson Brain Imaging Centre, University of Cambridge, Cambridge, UK⁷ Wolfson Brain Imaging Centre, Cambridge, UK

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L Elliott

Senior Physiotherapist, Physiotherapy Department, Box 185, Addenbrooke's Hospital, Cambridge, CB2 2QQ, UK; louise.elliott@addenbrookes.nhs.uk**Keywords:** minimally conscious state; vegetative state; Wessex Head Injury Matrix

Moderate to severe brain injury is estimated to occur in 25 individuals per 100 000 population every year. Of these, 10–20% never fully regain consciousness but remain in a vegetative or minimally conscious state.¹ Patients in the vegetative state may appear at times to be wakeful, with cycles of eye closure and eye opening resembling those of sleep and waking, but show no sign of awareness or of a functioning mind.² In contrast, patients considered to be in a minimally conscious state are said to show inconsistent but definite evidence of awareness despite profound cognitive impairment.³

At present, the pathophysiology underlying the vegetative and minimally conscious states is unclear, a standard treatment approach is lacking, and very little has been discovered to advance rehabilitation techniques. It is widely acknowledged that active rehabilitation should begin early in the intensive care setting, and should be applied to all patients (including those who remain mechanically ventilated). However, this is not yet routine practice. Several reports have highlighted the generic benefits of early rehabilitation,⁴ however, the benefits of specific interventions remain to be demonstrated. Over the last year, our group has investigated the effects of postural change on levels of arousal and awareness.

A total of 12 patients (eight men, four women; mean age 49 years, range 19–71) classified as either vegetative

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(n = 5) or minimally conscious (n = 7) according to international guidelines^{2,3} were assessed using the Wessex Head Injury Matrix (WHIM), a 62 point score, which records the recovery of behaviours in brain injured patients.⁵ Patients were assessed lying in bed, during a 20 minute period of standing using a tilt table at 85°, and again while lying in bed. During the observations blood pressure was measured using an oscillometric cuff. The observations were repeated over a one week period, and the median highest ranked behaviour and median total number of behaviours observed were recorded. The local research ethics committee approved all investigations. Informed assent was obtained from the next of kin.

We found that eight patients (three vegetative and five minimally conscious) showed consistent improvements in the highest ranked behaviours (table 1[†]; p = 0.008) and total number of behaviours (p = 0.013) observed in the standing position (fig 1[†]). Three patients (two vegetative and one minimally conscious) showed no change and one minimally conscious patient showed only an increase in the highest ranked behaviour observed. Although WHIM scores in three vegetative patients increased during standing, the behaviours observed did not reach a level suggesting awareness of self and/or environment. After standing the WHIM scores in the supine position were equal to or below those acquired before standing. No change in blood pressure was observed (p = 0.3).

View this table: **Table 1** Highest ranked behaviours recorded in the supine and standing positions for [\[in this window\]](#) each patient [\[in a new window\]](#)

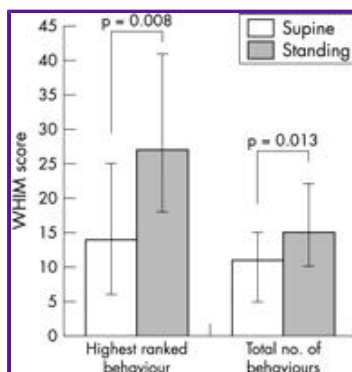


Figure 1 The median highest ranked behaviour and total number of behaviours observed in the lying and standing positions for both vegetative and minimally conscious patients. The highest rank (p = 0.008) and total number of behaviours (p = 0.0013) observed increased significantly in the standing position. Error bars indicate the interquartile range. WHIM, Wessex Head Injury Matrix.

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Our preliminary results suggest that positional changes may have a significant impact on behaviours in vegetative and minimally conscious patients. Although the benefit of this phenomenon in rehabilitation remains unproved, these findings have clear implications for the assessment and categorisation of patients. Neurological assessments used to classify patients according to international guidelines relating to the vegetative and minimally conscious states typically take place with the patient lying in bed. Where physical constraints permit, it may be important to also observe patients in the standing position.

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FOOTNOTES

All authors are members of the Cambridge Coma Study Group

Authors' contributions:

L Elliott—Principal investigator (data acquisition and patient recruitment).

A Shiel—Data acquisition and patient recruitment.

M Coleman—Data analysis and manuscript preparation

B Wilson—Project supervision.

D Badwan—Patient recruitment and data analysis.

D Menon—Project supervision.

J Pickard—Project supervision.

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Competing interests: none declared

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