Examining the Relationship between Sleep Posture and Morning Spinal Symptoms in the Habitual Environment Using Infrared Cameras

Abstract

Introduction: Sleeping is generally considered a period for rest and recovery, however some people wake with spinal symptoms not present on going to sleep and seek treatment. It has been clinically postulated that some sleeping postures, especially those involving sustained end range rotation or extension, can provoke pain sensitive spinal tissues. While sleep research generally has blossomed, little attention has been paid to the physical effects of nocturnal posture on waking spinal symptoms. Furthermore, sleep research is generally conducted in high technology sleep laboratories that are expensive to operate and usually only accessible in metropolitan centers limiting availability to a broader population. We aimed to develop a recording protocol that was low cost, unobtrusive and portable, enabling sleep posture assessment to occur in a person's habitual environment.

Method: Fifteen participants were recruited by word of mouth. Participants completed a Pre-Sleep Questionnaire. Two infrared cameras (placed overhead and foot end of bed) plus associated recording equipment were installed in their habitual sleeping area. One camera recorded continuously, the other camera was activated by motion detection. Recordings occurred over two consecutive nights, commencing automatically at 2000hrs and stopping at 0800hrs. Four sleeping postures were defined; supine, prone, supported sidelying, where the spine is neutral and ¾ sidelying, where the spine is rotated and extended. Recordings were viewed, posture classified and the time spent in each posture calculated. Time spent in each posture for night one and night two was analyzed to determine the presence of a first night effect.

Results: The protocol was effective in capturing good quality video data. Utilising motion detection reduced analysis time by 50%. The classification system had high intra-rater reliability for all four postures (ICC > 0.91). No first night effect was detected. Participants' self-report was accurate for the proportion of the night spent in supine (ICC = 0.7 95% CI 0.32 to 0.89) but not for the other three postures (ICC < 0.32 p $\leq$ 0.17). However when combining the two sidelying postures, self-report was accurate (ICC = 0.57; 95%CI 0.10 to 0.83; p = 0.01). There were no significant relationships found between the four postures and morning spinal symptoms.

Conclusion: The protocol tested provided a low cost, reliable, unobtrusive and portable method to assess sleep posture in the habitual environment that should be suitable for clinical and research purposes.