

## Spinal stability is improved by inducing a lumbar lordosis in boys with Duchenne Muscular Dystrophy: A pilot study

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### Abstract

The development of scoliosis in boys with Duchenne Muscular Dystrophy (DMD) is a significant, morbid event in the progression of the disease caused by progressive spinal musculature weakness. As an alternative to muscle activity, the spine can also be stabilised by locking the articular facet joints, which is achieved when the body is supported on a seat tilted anteriorly using a ‘wedge’, of the kind commonly recommended for low back pain. We tested spinal stability when using a seat tilted 158 anteriorly in eight boys with DMD, without significant scoliosis, by measuring the ability to support a lateral load applied to the thorax through a sling and hawser. All eight boys tolerated lateral loading better with wedged seating and were able to support an average additional load of 95 g per kilogram of body weight compared to normal seating. Lateral load bearing was improved in 10 normal control boys by an average of 40 g per kilogram of body weight. These encouraging pilot findings indicate that there is a need for further studies on the effectiveness of passive mechanical factors in spinal stabilisation to delay the development of scoliosis in boys with DMD.

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### 1. Introduction

Between 70% and 90% of boys with Duchenne Muscular Dystrophy (DMD) develop progressive scoliosis [1]. Surgery is currently the treatment of choice to arrest the development of scoliosis. However, a recent study of 123 patients suggested that a substantial number of boys require conservative management because of a milder scoliosis, patient choice or cardiorespiratory compromise precluding surgery [1]. This finding supports the potential significance of other techniques of spinal stabilisation in DMD boys, one of which we address in this study. Previous longitudinal studies in DMD boys have emphasised a long-term benefit of lumbar lordotic posture, suggesting that it may prevent, or at least delay the progress of spinal deformity [2,3]. An earlier

study of DMD subjects [4] examined the possible protective effect of inserting a lumbar pad in the supine position against lateral spinal traction, using spinal radiographs. No benefit was found, but as the subjects were supine, this study did not reflect the forces at work in normal sitting posture.

The spine with intact ligaments but reduced muscle support is an unstable structure [5], as can be seen in DMD. The psoas, erector spinae and abdominal muscles provide the majority of support to the vertebral column, maintaining its upright stability, in a manner similar to guy wires supporting a flexible pole, whereas local stability of sections of the spine is maintained by the intrinsic muscles spanning one or two vertebral joints [6]. However, the posterior vertebral articular facet joints also play a crucial role in the lateral stability of the lumbar spine, since they partially lock together in certain postures. More specifically, the lumbar spine is more stable in lordosis, when the articular facet joints are locked. In kyphosis the lumbar facet joints unlock

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