A Preliminary Study to Evaluate Postural Improvement in Subjects With Scoliosis: Active Therapeutic Movement Version 2 Device and Home Exercises Using the Mulligan's Mobilization-With-Movement Concept

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Abstract

Objective: The purpose of this preliminary study was to determine if the use of Active Therapeutic Movement Version 2 (ATM2) device and home exercises using the Mulligan's mobilization-with-movement concept by subjects with scoliosis would result in postural improvement and to document any changes in trunk range of motion and quality of life.

Methods: Forty-three subjects between the ages of 12 to 75 years were recruited for the study. Each subject underwent a low back evaluation along with specific measurements for their scoliosis. Subjects participated in a 4-week intervention, 2 times a week consisting of treatment utilizing the ATM2 and were also given a home exercise program to mimic the specific movement(s) they performed on the ATM2. Photographic assessment of posture was taken before and after the intervention. Subjects were surveyed during the initial assessment and again at the final intervention using the following outcome measures: Fear Avoidance Belief Questionnaire, Short-Form Health Survey-36, Oswestry Disability Index, and a Numeric Pain Rating Scale.

Results: Results were significant for most of the variables measured. Subjects gained improvement in spinal ranges of motion for all directions except for flexion and extension (most subjects had reference range of flexion and extension at the beginning of the study). Most subjects had improved pelvic alignment after the intervention. Before and after photographs demonstrated improved posture. Subjective measurements of pain, disability, and quality of life improved.

Conclusions: Results of this preliminary study showed improvement for selected variables. The use of ATM2 and home exercises using the Mulligan's mobilization-with-movement concept by subjects with scoliosis appears to be a potentially viable conservative treatment alternative to address various findings associated with scoliosis, including posture improvement. (J Manipulative Physiol Ther 2014;37:502-509)

Key Indexing Terms: *Scoliosis; Body Image; Posture; Therapeutics*

Idiopathic scoliosis is a disputed subject in orthopedic surgery because of its several varieties, unknown cause, and unpredictable course.[1] *Scoliosis* is defined as a lateral deviation of the spine, having a minimum Cobb angle of 10° with concordant vertebral rotation.[2,3] Adolescent idiopathic scoliosis, the commonest variety, has been shown to have a greater frequency in girls.[1] The prevalence of scoliosis in the adolescent population has an incidence of 2% to 4%. Of those diagnosed, only 10% progress and require medical intervention. Unfortunately, nonsurgical treatment interventions including medications, exercise, physical therapy, and chiropractic treatments have not yielded significant benefits in health quality-of-life measures.[4-7]

The effects of scoliosis are 2-fold: when advanced, the deformity can be disfiguring, which may cause psychosocial disability,[8] and second, the thoracic distortion can cause mechanical pulmonary restriction resulting in symptoms if the curve is severe enough.[6] Mild-to-moderate scoliosis (defined as Cobb angle <40° at the end of growth) usually has a benign prognosis in adult life.[9] Although there are reports of increased incidence and/or severity of back pain in adult life, this cannot be reliably predicted or prevented.[10]

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Deformities present at skeletal maturity persist for life and can continue to progress over time. The mechanism for progression of scoliosis in adults is not well defined but presumably involves remodeling of tissues by "wear-and-tear" effects of continuous loading because growth potential is absent. Adult curvatures repeatedly have been found to progress in proportion to curvature magnitude. This observation is consistent with the possibility that, in adults as well as in children, progression results from biomechanical loading imbalance, and therefore, increased loading fosters increased progression.[11] In one study of 187 patients followed up for more than 15 years after skeletal maturity, 20° to 29° curvatures progressed 10°, on average; 30° to 39° degree curvatures progressed 12°; 40° to 49° curvatures progressed 15°; and 50° to 59° curvatures progressed 20 degrees.[12] Variation in progression among adult patients with similar curvatures may be predicted to result from different muscle activation strategies that alter the loading imbalance. Curvatures of less than 20° are less likely to progress than more severe curves, perhaps because they produce mechanical loads below the threshold required to induce cellular changes leading to degenerative changes in spinal elements. However, even mild curves that remain stable become increasingly rigid with age presumably, from secondary effects of altered mechanical loading.[11,13]

A body of research has demonstrated that, whatever the initial trigger that induces a spinal curvature, asymmetric loading of the spinal axis produces biomechanical forces that can account for most if not all progression of the spinal deformity.[13] Structural damage to bone and disc can occur very early in the development of even minor curves.[14]

With a mild spinal deformity (barely visible when the patient is undressed), in a postpubertal child, the curve is unlikely to progress and does not require any treatment.[1] If the deformity is mild but it is believed that the curve will progress or deteriorate, then there is dispute among experts on what the final curve status might be.[15,16] An increase of 5° or more in the Cobb angle is taken as noteworthy progression.[2] Where there is severe deformity that is unacceptable to the patient, causing distress and psychologic damage, surgical correction is recommended; only the timing and methodology may give rise to discussion. Evidence to support nonoperative treatment has not been demonstrated in the literature and has not reduced the incidence of surgical intervention.[1]

Traditional treatment for idiopathic scoliosis has consisted of different procedures including casting, bracing, electrical stimulation, exercises, and surgery.[17-19] Some of these treatments have fallen out of favor due to lack of efficacy, and others have evolved as technology and medical advances have offered better clinical outcomes.[20] Although advances in surgical methods have been noteworthy, (eg, minimally invasive surgery, which is best suited for thoracic curves,[21]) many of the physical and emotional problems associated with living with scoliosis have not been well addressed by conventional therapies. Until the physical and emotional problems associated with living with scoliosis are resolved, conclusions on management must be provisional.

Fig 1. *The device used in this study.*

The Active Therapeutic Movement Version 2 (ATM2) (Back Project Corporation, Sunnyvale, CA) (Fig 1) is a device that was designed originally to treat spinal pain and has been used for neck, pelvis, hip, knee, and shoulder conditions. The manufacturers theorize that the machine trains the patient, through repetition and repositioning, to move ways that are pain free and to activate and strengthen core stabilization muscles. In a case study,[22] it was reported that the ATM2 showed some benefit in kyphoscoliosis posture in a patient with scoliosis. It was theorized that the mechanism responsible for the changes may have been from stabilizing the pelvis during the treatments, which could have allowed more isolated spinal motion. However, without larger studies with more patients, the conclusions could not be conclusive.

Therefore, the purpose of this preliminary study was to determine if the use of ATM2 and home exercises using the Mulligan's mobilization-with-movement concept by subjects with scoliosis would result in postural improvement and to document any changes in trunk range of motion and quality of life.