A Pilot Study of the ATM®2 in the Treatment of LBP

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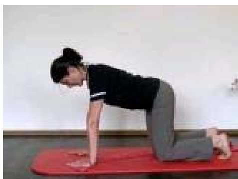
Introduction

Low back pain (LBP) is a major public health problem (Cassidy J, Carroll L, Cote P. 1998). LBP affects 80% of the general United States population at some point in life with sufficient severity to cause absence from work (Frank et al.1998). It is the second most common reason for visits to primary care doctors, and is estimated to cost the American economy $75 billion every year (Frymoyer J, Cats-Baril W.,1991). Lifetime incidence of LBP ranges from 60-90% with a 5% annual incidence (Hills, 2005). One of the problems in treating LBP has been in trying to empirically prove the effectiveness of intervention. The idea for the ATM2 was discovered by a physical therapist trained in "Mulligan's" (Mobilization with Movement) concept while he was treating a very difficult patient. Clinical evidence has been documented for the effectiveness of the ATM2 when used with patients (pts) who have LBP, however; no published studies have been done. The purpose of this study was to 1. Determine if the ATM2 (Active Therapeutic Movement) intervention was more effective than a mat exercise for decreasing low back pain (LBP) and increasing lumbar range of motion (ROM) and 2. To determine if the ATM2 impacts reprogramming of the central nervous system (CNS) firing pattern (involving the Transverse Abdominis muscle; TrA) by allowing previously painful movements to be done pain free (due to re-positioning of the pelvis within the unit) in subjects with LBP.



Abdominal Hollowing Exercise

Methods & Materials

Sixteen subjects (eight female, eight male) eight with LBP and eight without LBP were recruited. Inclusion criteria for those with LBP was

- pain had been present for 6 weeks to 1 year (sub-acute and chronic)
- experiencing LBP at the start of the study that could be provoked by either lumbar flexion or lumbar extension movements
- between the ages of 18-45
- non-smoker (for at least one year)
- taking no prescription drugs for pain

Exclusion criteria were

- pregnant women
- currently receiving treatment for low back pain
- history of spinal surgery
- known LB congenital abnormalities
- above normal body fat for their age (to optimize the EMG signal)
- known claustrophobia
- tape allergies
- any previous trauma to the low back

Subjects were randomly assigned to the ATM2 intervention first or the mat exercise first. Pain provoking lumbar movement was determined and ROM and pain level was documented. A measuring tape was used to measure the amount of lumbar extension and flexion and the Visual Analogue Scale (VAS) was used to document pain level. Surface electrodes measured trunk muscle activity and anterior and middle deltoid of the subjects dominant arm for the purpose of recording the response of the Internal Oblique; I.O. (the IO have been shown to reflect the activity of the deeper TrA, per the protocol suggested by Ng et al.), External Oblique and Erector Spinae muscles to quick dynamic movements of glenohumeral (GH) flexion and GH abduction before and after intervention. Once properly adjusted in the ATM2, the subject completed 10 pain free movements into the previously painful direction. EMG recordings were taken throughout ATM2 and abdominal hollowing interventions. After each intervention pain level and ROM was assessed.

ATM2 Set Up for Lumbar Extension

Subject# (subjects with pain)	Pre-exercise EROM VAS	Post-exercise EROM VAS	Pre-ATM2 EROM VAS	Post-ATM2 EROM VAS	Change in VAS post exercise	Change in VAS post ATM2
2	2	3	5	2	↑1	↓3
3	3	3	3	3	No change	No change
4	4	4	4	4	No change	No change
5	1	2	2	1	↑1	↓1
6	0	1	3.5	0	↑1	↓3.5
7	4	3	3	4	↓1	↑1
9	7	5	5	2	↓2	↓3
16	1	1	1	1	No change	No change

Actual Pain Values for Subjects with Pain

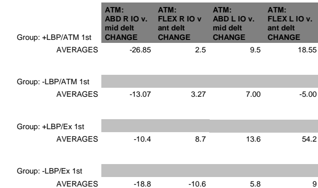
Results

2-way ANOVA at a level of .82 determined (ATM2 intervention versus exercise intervention) pain status (having LBP versus not having LBP) was not a factor in ROM. Change in ROM was found to be significant (p=.001). The ATM2 group gained an average of .25 cm. The mat exercise group lost an average of .13 cm. Pain level between the two interventions was significant at T=.12. EMG recordings did not show the TrA as contracting before the other trunk muscles at a significant level

Level of pain at rest ATM vs. exercise	p =.67 (Mann-Whitney)
Level of pain at end range ATM vs. exercise	p =.32 (Mann-Whitney)

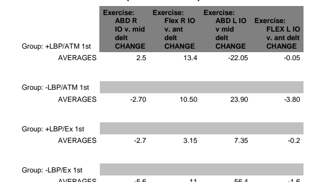
Change in Pain for LBP subjects ATM vs. Exercise

Timing (ms) of Muscle Firing (ATM)



	ATM: ABD R IO v. mid delt CHANGE	ATM: FLEX R IO v ant delt CHANGE	ATM: ABD L IO v. mid delt CHANGE	ATM: FLEX L IO v. ant delt CHANGE
Group: +LBP/ATM 1st				
AVERAGES	-26.85	2.5	9.5	18.55
Group: -LBP/ATM 1st				
AVERAGES	-13.07	3.27	7.00	-5.00
Group: +LBP/Ex 1st				
AVERAGES	-10.4	8.7	13.6	54.2
Group: -LBP/Ex 1st				
AVERAGES	-18.8	-10.6	5.8	9

Timing (ms) of Muscle Firing (Exercise)



	Exercise: ABD R IO v. mid delt CHANGE	Exercise: Flex R IO v. ant delt CHANGE	Exercise: ABD L IO v mid delt CHANGE	Exercise: FLEX L IO v. ant delt CHANGE
Group: +LBP/ATM 1st				
AVERAGES	2.5	13.4	-22.05	-0.05
Group: -LBP/ATM 1st				
AVERAGES	-2.70	10.50	23.90	-3.80
Group: +LBP/Ex 1st				
AVERAGES	-2.7	3.15	7.35	-0.2
Group: -LBP/Ex 1st				
AVERAGES	-5.6	11	56.4	-1.6

Key: abd=subject performs rapid arm abduction while recording timing of onset of (right) internal obliques contraction compared to middle deltoid, "-" number means (average timing) obliques came on before deltoid, "+" means deltoid contracted first

Discussion and Conclusions

The ATM2 was studied to determine if it can decrease LBP, increase ROM and what the mechanism may be that is responsible for any decrease in pain. The ATM2 was shown to be effective in reducing LBP complaints although not significantly better than the abdominal hollowing exercise. Our subjects were all students in their 20's and the overall presenting pain levels were low to start. The fact that the ATM2 did not significantly decrease LBP more than the mat exercise is not surprising as abdominal hollowing exercises are often prescribed for patients with LBP. The ATM2 was shown to be effective in increasing lumbar ROM whereas the mat exercise was not. The ATM2 did not appear to impact CNS reprogramming of the TrA muscle based on our procedure. However, studies that have looked at TrA timing have utilized needle EMG and our study used surface EMG which only can pick up the reflection of TrA activity. In addition, the software program we used was difficult to read the extremely short time values necessary to accurately measure timing of the trunk muscles. Based on the results of this pilot study the ATM2 has potential for helping patients with LBP and warrants further study.