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Efficacy of Sensory Motor Training on Pain, Disability and Function in Patients with Chronic Non-Specific Low Back Pain -An Experimental Study-

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Abstract:

The objective of the study was to check whether Sensory Motor Training is equally or more effective than traditionally used core stability exercises in patients with chronic non-specific low back pain. It is an Experimental (Efficacy) Study. A total of 28 subjects were recruited for the study on the basis of inclusion and exclusion criteria after obtaining informed consent. The subjects were divided into two Groups A (Sensory Motor Training) and Group B (Core Stability Exercises).Numeric Pain Scale for Pain (NRS), Oswestry Disability Questionnaire for Disability (ODQ) and Back Pain Functional Scale Function (BPFS) were taken as the outcome measures for this study. The result of this present study indicates the analysis of Pain, Disability and Function showed both the methods proved to be effective in decreasing the pain, disability and increasing functional level independently. When results were compared between the groups, Group A showed better improvement than Group B. However the results were

statistically insignificant. The conclusion this study depicted that both Sensory motor training and Core Stability exercises are equally effective in reducing Pain, Disability and increasing Function in subject with Chronic Non-specific Low Back Pain. However, Sensory motor training was found to be better impact when means were considered.

Key words: Pain, Disability, Function, Sensory Motor Training, Core Stability Exercise, Chronic Non-Specific Low Back Pain.

Introduction

Low back pain (LBP) is a common and costly problem, often associated with high recurrence rate and equivocal management efficacy. Low back pain remains the primary cause of absenteeism and disability in every industrialized society. [Vesa Lehtola et.al.2012]. About 80% of the population experiences low back pain more than once throughout their lives. Those experiencing acute low back pain, 90% recover within two months, but chronic low back pain triggers physical atrophy and psychological problems. Low back pain sustained for more than 12 weeks is called chronic low back pain (CLBP).[Jin Ah Hwang 2013]. CLBP patients experience trunk muscular atrophy, muscle response delays, and decreased postural adjustment ability and in particular undergo changes in APAs (Anticipatory Postural Adjustments). [Jin Ah Hwang 2013],[Paul W. Hodges1999].

Bilge Kara et al depicted that patient with LBA present with both altered motor control and impaired spinal reposition sense. Impaired motor control findings with LBA include balance impairment, longer reaction times and decreased psychomotor speed, changes in trunk feed-forward control (transverses abdominus) and loss of muscular stabilization (cross sectional area loss of the multifidus).[Stratford PW Binkley JM et al.2000].Many authors have demonstrated that

sensory motor deficits are present in LBP patients.[Martin Descarreaux et.al.2005] These deficits can affect segmental spinal stability and eventually lead to articular damage and subsequent chronic pain. Sensorimotor dysfunction associated with LBP may include disturbances in a wide range of control mechanisms, the patho-physiological mechanisms.[Ehab E et.al 2001].

Patient with low back pain present with impaired spine reposition sense and altered motor control [Apeksha O Yadav et.al.2013].

Poor reposition sense has been shown to be related to risk musculoskeletal injury in several joints, including ankle and knee. Low back disorders have also been associated with changes in trunk position sense.[Sara E. Wilson et.al.2003]. Reconditioning of proprioceptive senses and Sensorimotor training that increases one's muscle adjustment ability maximizes the sensory input in different parts of the body and aids in improving one's motor adjustment ability. [Jin Ah Hwang 2013]

Sensorimotor training has recently been found to be quite helpful in increasing motor performance and coordination when compared with previous methods.[Jin Ah Hwang 2013],[Heitkamp HC et.al.2001].

Jin AH Hwang concluded that sensory motor training makes patients capable of learning how to adjust muscles, thereby alleviating pain and improving muscle performance. [Jin Ah Hwang 2013].Literature regarding impact of Sensory motor training in patients with LBP was less so the present study aims to analyses its impact and examine whether it should be considered as a treatment option for LBP. It was hypothesized that Sensory Motor Training will be equally or more effective than traditionally used core stability exercises in patients with chronic non-specific low back pain.

Methodology

An experimental study was conducted on total of 28 subjects who were enrolled from various hospitals and health centers in Dehradun on the basis of inclusion and exclusion criteria. This study was approuved by ethical commity of Dolphin (PG) Institute of Biomedical and Natural Sciences, Dehradun. Subjects were divided into 2 groups after informed consent was informed. Group A (Sensory Motor Training n=13), and Group B (Core Stability Exercises n=15).

Pre intervention readings of pain using Numeric Rating Scale, disability using Oswestry Disability Questionnaire and function using Back Pain Functional Scale were carried out for each patient. For both the group interventions was given five times in a week for 4 weeks. Post intervention reading was calculated in the same manner as pre intervention after the end of 4 weeks.

Protocol for Group A (Sensory motor training): All the patients in this group received sensory motor training. In this training wobble board with very small contact surface with the ground was used. A total of 6 kinds of exercises were conducted, five times per week, for four weeks. [Jin Ah Hwang 2013]

Protocol for Group B (Core stability exercises): All the patients in this group received core stability exercises on mat. In these exercises patients performed back extension and curl-up exercise on mat. The programs consisted of training of 5 days per week. During the first week each participant performed 3 sets of 15 repetitions of each exercise, alternating the sit up with the back repetitions of each exercise. During the third and fourth weeks, the training routines included 4 sets of 20 repetitions of each exercise. No rest periods was given between all the sets of repetitions.[Gauri Shankar et.al.2012].

Data Analysis

Data analysis was done using SPSS 16.0 version. Descriptive analysis was done to calculate the mean for age, weight, and height of subjects. Paired t-test was applied to compare the pre and post intervention readings within the group. Independent t-test was done to compare the pre and post intervention readings between the groups. The statistical significance was set as 95% confidence interval with p value <0.05 considered to be significant.

Results

Data were analyzed for 28 participants: 13 in Group A and 15 in Group B. Analysis of Pain, Disability and Function showed that both the group proved to be effective in decreasing the pain, disability and increasing functional level independently. When results were compared between the groups, Group A showed better improvement than Group B. However the results were statistically insignificant.

Discussion

Pain, disability and function were evaluated in the present study. The objective of both the exercises was to foster tissue repair while avoiding further excessive loading, improved postural response of the trunk muscles, improved strength and coordination thereby having positive impact on pain. **Gerold R Ebenbichler** depicted that decreased pain and disability is due to biochemical changes in blood including increase in endorphin levels having demonstrated as a consequence of exercise. [Gerold R et.al.2001] **Benedict M Wand** added that, with sensory motor training reduction in pain intensity, pain interference and disability were 78%, 81% and 89%

respectively. [Benedict M et.al.2011] In support to our results proving both the techniques statistically effective.

The result showed positive effect of both the treatment techniques, however within the group difference was not statistically significant for both the outcome measures. Both the techniques are presumable restoring the coordination between the trunk muscles which thereby is improving their function and decreasing disability. In support of our results, **Amal F Ahmed** [Amal F Ahmad 2011] depicted that sensory motor training increases coordination between muscle groups and improves the response to sensorial information.

They added that progression is made through alteration indifferent postures, base of support and challenges to their center of gravity.[Ferraz MB1990] So we can depict that these exercises elicit automatic and reflexive muscular stabilization demanding a patient to maintain postural control under a variety of situations, which may have a psychological impact on their performance. **Kelly P. Westlake** and **Elsi G. Culham** concluded that sensory specific exercise had a training effect on proprioceptive re-integration. [Kelly P. Westlake et.al.2007].Thus we could add that these exercises have a positive impact on balance thereby increasing the functional performance. **Jin AH Huang et al** added that reconditioning of proprioceptive sensors and sensory motor training that increases ones muscle adjustment ability maximizes the sensory input in different parts of body and adds in improving ones motor adjustment ability [Jin Ah Hwang 2013].Generally speaking we could add that Sensory motor training increases inter-muscular control, improving ones response to sensory information which could be a major reason of improving function and decreasing disability. In support of our study **Ahmed** depicted that the anticipation of pain causes the patient to guard their physical activities. This may explain the role of SMT (Sensory motor training) on decreasing pain,

decreased disability and increased function in present study. [Amal F Ahmad 2011].

The purpose of this study was to adopt shorter treatment duration with sensory motor training (4 weeks) rather than traditional core stability exercises (6 weeks). Also, Sensory motor training supposed to improve the anticipatory postural control rather than only strengthening the superficial and deep muscle groups as in core stability exercises. [Jin Ah Hwang 2013]. One of our aims was also to add literature on Sensory motor training as there is abundant literature on the cores stability exercises but literature on sensory motor training is scarce. Our results were clinically significant but statistically insignificant.

The reason behind this may be that Sensory motor training is a fairly new technique and not most of the patients were familiar with the training and some of the patients also reported difficulty in performing exercise on the balance board. While on the other hand patients performing Core Stability were convinced to perform the exercises although sufficient precautions were taken to prevent fall and same was conveyed to the patients but some of the subjects could have been still apprehensive thus not able to perform exercises to their full potential. This may explain the statistical insignificant results. Our study proved that indeed SMT could be a choice of treatment for LBP patients as it is effective in decreasing Pain, Disability and increasing Function.

For future research EMG could be used to exactly evaluate the alteration in muscle activity of TrA after Sensory motor training. In addition effect of SMT on Repositioning Error could be checked in Low Back Pain patients.

Conclusion

This study depicted that both Sensory motor training and Core Stability exercises are equally effective in reducing Pain,

Disability and increasing Function in subject with Chronic Non-specific Low Back Pain. However Sensory motor training was found to be better impact when means were considered. So we could conclude that SMT is indeed a choice of treatment for patients with CNSLBP.

Clinical Significance

Previous literatures says that Sensorimotor training if effective in reducing pain in osteoarthritis and Anticipatory Postural Adjustments in chronic back pain but our literature proves that Sensory Motor training is effective in reducing Pain, Disability and improving Function in patients with CNLBP.

Tables and Graphs

TABLE 1.1:- Training for Sensory Motor Training

Sr. no.	Position	Exercise method
1	Hallowing exercise	Contact the abdominal muscles, raising the center of movement toward the naval in quadruped position.
2	Single leg raising in quadruped position	Raise one leg maintain it in a quadruped position and apply the same movement to the opposite leg.
3	Contralateral arm and leg raising in quadruped position	Raise the opposite arm and leg simultaneously in a quadruped position and maintain them in that position, apply same movement to the opposite side
4	Abdominal bracing	Flex the hip and knee joint at 90^{o} in a supine position push out the lower abdomen in inhalation and contact the lower abdomen during exhalation.
5	Holding a bridging position	Apply so that the leg do not spread apart in the bridging positioning
6	Single leg raising in the bridging position(Rt/Lt)	Extend one leg in bridging position and raise and maintain it. Apply the same movement to the opposite side.

TABLE 1.2:- Training for Core Stability Exercises

	Monday Set/reps	Tuesday Set/reps	Thursday Set/reps	Friday Set/reps	Saturday Set/reps
Week 1 Curl-up	3/15	3/15	3/15	3/15	3/15

Back extension	3/15	3/15	3/15	3/15	3/15
Week 2					
Curl-up	4/15	4/15	4/15	4/15	4/15
Back extension	4/15	4/15	4/15	4/15	4/15
Week 3					
Curl-up	4/20	4/20	4/20	4/20	4/20
Back extension	4/20	4/20	4/20	4/20	4/20
Week 4					
Curl-up	4/20	4/20	4/20	4/20	4/20
Back extension	4/20	4/20	4/20	4/20	4/20

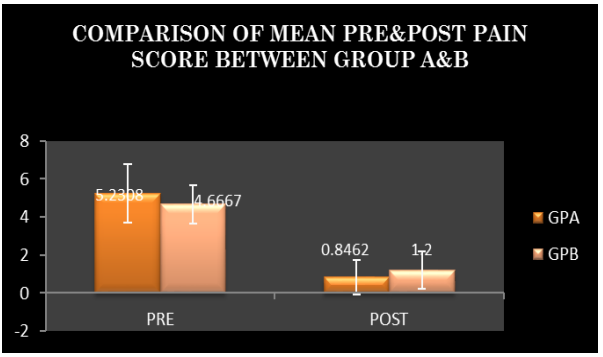

Fig 1.1: Between Group Analysis of Pain

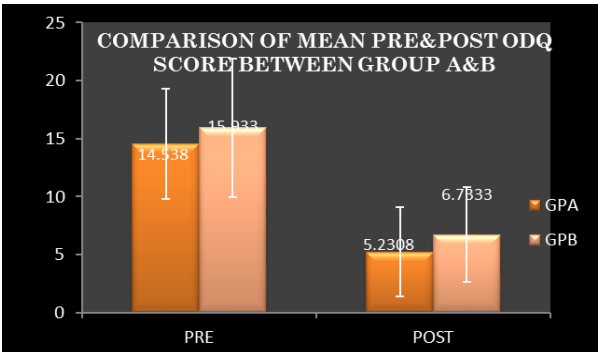

Fig 1.2: Between Group Analysis of ODQ Score

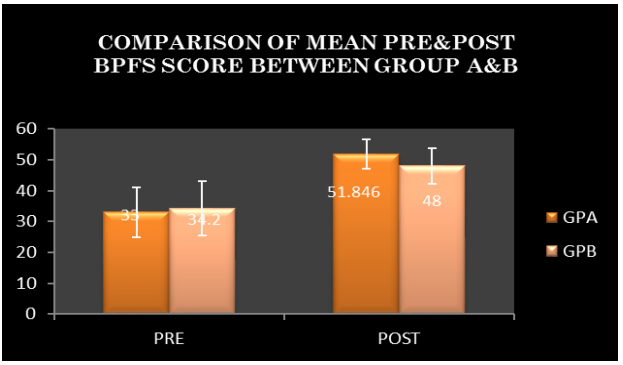

Fig 1.3: Between Group Analysis of BPFS Score

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