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EDITOR'S PAGE

Editor-in-Chief: Prof. (Dr.) S.K. Verma

I am happy that the **Volume 9, No. 1 issue** of the **Journal of Exercise Science and Physiotherapy** ***(JESP)*** is ready for the readers and circulation. This issue of JESP contains twelve research reports on different important aspects of exercise science. **Kumar, Ashok from Patiala, Punjab** studied the prevalence of glycemic status, obesity and waist circumference in Punjabi male Type 2 Diabetics and concluded that prevalence of poor glycemic control and obesity exist but obesity and overweight were more prevalent in Punjabi Type 2 diabetics and recommended that efforts should be made to control this in type 2 diabetics for their well being and possibly to avoid the risk of disease like cardiovascular later in life. **Jaywant from** Mumbai, Maharashtra evaluated the effect of Dance Aerobics on cardiovascular endurance and body fat percentage in middle aged women. She concluded that if a person is aiming for just weight loss, then the dance aerobics is an ideal choice, however, if the person is aiming for improved cardiovascular status, other physical exertional activities should be considered. **Thakur et al from Punjab** investigated the efficacy of myofascial release on patients with fibromyalgia and its influence on pain and concluded that myofascial release is effective in reducing pain. **Goyal et al** from Mullana, Haryana evaluated the effect of manipulation of wrist technique and Cyriax physiotherapy training in reducing pain and improving grip strength in lateral epicondylitis. They concluded that the patients of lateral epicondylitis procured more substantial benefits from wrist manipulation as compared to Cyriax physiotherapy after three weeks. **Saini & Multani from Patiala, Punjab** compared the structural changes in the knee between age-matched sportspersons and non sportspersons and concluded that sportspersons have less worsened structural knee changes, better knee joint range of motion, muscle strength, physical activity levels and a better quality of life as compared to the age-matched non sportsperson peers. **Mazumder & Ghosh from Kalyani, West Bengal** carried a comparison on imagery and self-esteem of various levels of footballers and reported significant differences in the mean value of imagery and self-esteem between the district and state level footballers. **Goyal and associates from Mullana, Haryana studied** the effect of combination of a Taping and Iontophoresis or Taping alone in the treatment of Plantar Fasciitis pain.. They concluded that the use of Iontophoresis along with the Taping, revealed a better management for pain and stiffness as compared to Taping alone. **Doley and coworkers from Dehradun, Uttarakhand** compared the effectiveness of Positional Release Therapy & Deep Transverse Friction Massage On Gluteus Medius Trigger Point and report that Deep transverse friction massage is a better choice of treatment in improving pain threshold in subjects with gluteus medius trigger point. **Singh & Kumar, Ashok from Patiala, Punjab** studied the impact of chronicity of type 2 diabetes on lipid profile in type 2 diabetics and concluded from their results that the chronicity of Type 2 Diabetes mellitus disturb the normal levels of lipid profile that is dyslipidemia if unchecked this may lead to atherosclerosis and ultimately Cardio-Vascular Disease (CVD) and it is the commonest cause of death in type 2 diabetics. **Khan et al from Delhi,** compared the stretching induced strength changes between the proximal and distal groups of muscles and concluded that Shorter stretching (2 minute) increases maximum isometric voluntary contraction force in both muscles but relatively more in the calf. **Leo Aseer & Subramaniam from Tamilnadu** analyzed the effectiveness of integrated soft tissue mobilization on the pain, lumbar spine mobility and the outcome on functions in chronic low back pain (CLBP) and concluded that integrated soft tissue mobilization offered relatively moderate improvement in the functional outcome than that observed in the control group. In the end A Case study of a Rare Case of Turner's Hypoplasia and Unilaterally Fused Deciduous and Permanent Lateral Incisor Caused by Trauma is presented by **Leena Verma from Chandigarh**.

S.K. Verma

Prevalence of Glycemic Status, Obesity & Waist Circumference in Punjabi Type 2 Diabetics

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Abstract

Aim-To observe the prevalence of glycemic status, obesity and waist circumference in Punjabi male Type 2 Diabetics. **Materials** & **Methods-**Two hundred forty type 2 diabetics Punjabi males with age ranging from 30 to 70 years volunteered to participate in this study as subjects. The glycemic status (fasting blood sugar & glycated haemoglobin, HbA1c), obesity (BMI) & waist circumference (WC) were recorded with standard procedures. WHO criteria determined BMI and WC categories. The statistical analysis was done by using SPSS version 16.0 and the level of significance was <.05. **Results-**The mean age, height, weight, fasting blood sugar (FBS), glycated haemoglobin (HbA1c), body mass index (BMI) and waist circumference (WC) of studied type 2 diabetics were 50.75±11.4 years, 166.69±7.6cm, 75.88±11.8Kg, 146.37±28.6 (mg/dl), 7.34±1.2 (%), 27.29±3.6 and 102.82±8.0 (cm) respectively. Based on fasting blood sugar, 10.4% studied type 2 diabetics had normoglycemia (FBS≤120mg/dl), 89.6% were hyperglycemia (FBS≥120mg/dl). Based on glycated haemoglobin (HbA1c), 25.4% studied type 2 diabetics had good control of blood sugar (HbA1c≤6.5), 30.4% were average control (HbA1c 6.5-7.5), 26.7% were poor control (HbA1c 7.5-8.5) and 17.5% were morbid control. Based on BMI, 26.7%, study type 2 diabetics were normal, 55% wer overweight, 14.5% was obese Class I, 3% were Obese Class II and 1.8% were Obese Class III. Based on waist circumference of the sample population of type 2 diabetics 10.9% were obese, 24.1% had increased risk for metabolic syndrome [action level I (WC ≥ 94cm)] and 61.7% had substantially increased risk [action level II (WC ≥102cm)]. **Conclusion-**it was concluded that prevalence of poor glycemic control and obesity exist but obesity and overweight were more prevalent in Punjabi Type 2 diabetics.

Keywords: FBS, HbA1c, BMI.

Introduction

Diabetes mellitus is a chronic metabolic condition characterised by persistent hyperglycaemia with resultant morbidity and mortality related primarily to its associated complications. Despite the association of obesity with poorer glycemic control and cardiovascular morbidity and mortality less attention has been given to its management relative to the attainment of glycemic targets. The diabetes mellitus is becoming more and more prevalent in Indian society. In India, it is estimated that approximately 2% of the population, 15 million people have diabetes *(Swami, 1984)*. The number of cases is said to be rising by 5%-6% each year and an estimated 300,000 people die from diabetes and its related complications *(Herman et al., 1984)*. There are about 3.5 crore diabetics in India and the figure will rise to about 5.2 crores by 2025. Every 5th patient visiting a consulting physician is a diabetic, and, every 7th patient visiting a family physician is a diabetic. Keeping in view the alarming increase in the incidence and prevalence of diabetics in India, WHO has declared

India as the "Diabetic Capital of the World" *(Vijay, 2002)*. Thus the management of diabetes is a big challenge for health professionals. The quality of life of diabetics decrease, resulting in a decline in one's ability to give best to the society and also increase in health-care cost. The aim of the present research work was to observe the prevalence of glycemic status, obesity & waist circumference of Punjabi type 2 diabetics.

Materials and Methods

Two hundred forty type 2 diabetics Punjabi male with an age ranging from 30 to 70 years volunteered to participate in this study as subjects. The glycemic status (fasting blood sugar & glycated haemoglobin, HbA1c), obesity (BMI) & waist circumference (WC) were recorded with standard procedure. WHO criteria determined BMI and WC categories. The statistical analysis was done by using SPSS version 16.0 and the level of significance was <.05.

Results

The mean age, height, weight, fasting blood sugar (FBS), glycated haemoglobin (HbA_1c), body mass index (BMI) and waist circumference (WC) of studied type 2 diabetics were 50.75±11.4 years, 166.69±7.6cm, 75.88±11.8Kg, 146.37±28.6 (mg/dl), 7.34±1.2 (%), 27.29±3.6 and 102.82±8.0 (cm) respectively (Table 1).

Table 1: Descriptive Statistics of Punjabi Type 2 Diabetics

Variables	
Age (years)	**50.75±11.4**
Height (cm)	**166.69±7.6**
Weight(kg)	**75.88±11.8**
FBS (mg/dl)	**146.37±28.6**
HbA1C (%)	**7.34±1.2**
Body Mass index, BMI	**27.29±3.6**
Waist Circumference (cm)	**102.82±8.0**

Based on fasting blood sugar, 10.4% studied type 2 diabetics had normoglycemia (FBS≤120mg/dl), 89.6% were having hyperglycemia (FBS≥120mg/dl) (Table 2).

Table 2: Percentage Distribution of Type 2 Diabetics on the basis of Fasting Blood Sugar

Fasting Blood Sugar category	
Up to 120 (mg/dl)	**10.4% (25)**
120 to 150 (mg/dl)	**55% (132)**
151 to 180 (mg/dl)	**27.1% (65)**
Above 180 (mg/dl)	**7.5% (18)**

Based on glycated haemoglobin (HbA1c), 25.4% studied type 2 diabetics had good control of blood sugar (HbA1c≤6.5), 30.4% were having average control (HbA1c 6.5-7.5), 26.7% were having poor control (HbA1c 7.5-8.5) and 17.5% demonstrated morbid control (Table 3).

Table 3: Percentage Distribution of Type 2 Diabetics on the basis of HbA1c

HbA1c category	
<6.5	**25.4% (61)**
6.5-7.5	**30.4%(73)**
7.5-8.5	**26.7%(64)**
>8.5	**17.5%(42)**

Based on BMI, 26.7%, study type 2 diabetics were normal, 55% were overweight, 14.5% were obese Class I, 3% were Obese Class II and 1.8% were Obese Class III (Table 4).

Table 4: Percentage Distribution of Type 2 Diabetics on the basis of BMI

BMI Category	BMI range,kg/ m^2	
Normal	**18.5 to 24.9**	**26.7% (66)**
Overweight	**25 to 29.9**	**55%(130)**
Obese Class I	**30 to 34.9**	**14.5%(35)**
Obese Class II	**35 to 39.9**	**3%(7)**
Obese Class III	**over 40**	**1.8%(2)**

Based on waist circumference of the sample population of type 2 diabetics 10.9% were obese, 24.1% had increased risk for metabolic syndrome [action level I (WC≥94cm)] and 61.7% had substantially

increased risk [action level II (WC ≥102cm)] (Table 5).

Table 5: Percentage Distribution of Type 2 Diabetics on the basis of Waist Circumference

Waist circumference category	
<90cm	3.3% (8)
≥90cm	10.9% (26)
≥94cm (action level I)	24.1% (58)
≥102cm (action level II)	61.7% (148)

The glycated haemoglobin (HbA_1c) was highly significantly and positively related with fasting blood sugar (r=0.70 p<.01) of type 2 diabetics in the studied sample. Similarly, the waist circumference was also significantly positively related with body weight (r=0.62 p<.01) and body mass index (r=0.46 p<.01) (Table 6).

Table 6: Correlation (Pearson's) among Glycemic and Obesity variables

Variables	FBS	HbA1c	BMI	Waist Circumference
Weight	-.04	-.01	.80**	.62**
FBS	-	.70**	-.05	-.10
HbA1c		-	-.01	-.10
BMI			-	.46**

** significant at 0.05 level; **significant at 0.01 level*

The high prevalence of obesity in this population of diabetes suggests that structured weight reduction should be an integral part of attainment of glycemic targets.

Discussion

The results shows that overweight and obesity is common in the Punjabi type 2 diabetes patients. Obesity is a major potentially modifiable risk factor for type 2 diabetes *(Pinkney, 2002)*. This is similar to the association between obesity and diabetes shown in other studies *(Kumar et al., 2008 and Daoust et al., 2006)*. The percentage of patients with central obesity (abdomen) was higher than those with general obesity indicating that early detection and control of central obesity might be more important in Asian population. There is an indication of waist circumference being an important indicator of progression to diabetes *(Gautier et al., 2010)*. It is associated with poorer control of blood glucose levels, blood pressure and cholesterol, placing persons with diabetes at higher risk for both cardiovascular and microvascular disease. While studies have well established the strong epidemiological association between obesity and development of diabetes *(UKPDS, 1988)*, little attention has been paid to the significance of obesity in Punjabi population with diabetes. This is important because of the fact that obesity is an independent risk factor for cardiovascular disease *(Rimm et al., 1995)*, an effect likely to be mediated, at least in part through its known associations with the metabolic syndrome. Clinical evidence suggests that the association of diabetes with central obesity is stronger than the association with general fat *(Vazquez et al., 2007)*. Waist circumference has been used as measures of central obesity and body mass index has been used as a measure of general obesity. Studies have indicated that central obesity might be more important in the Indian population *(Kumar et al., 2008 and Daoust et al., 2006)*. Central obesity has been associated with decreased glucose tolerance, alterations in glucose insulin homeostasis, reduced metabolic clearance of insulin, and decreased insulin-stimulated glucose disposal *(Vazquez et al., 2007)*. About 55% of the patients in our sample are overweight as per the revised guidelines for the measurement of obesity (by using

BMI) for Asian population *(WHO Expert Consultation 2004)*. Also, increased waist circumference was more common. To conclude, our study showed that obesity is common in type 2 diabetics. Central obesity is significantly more common in our population. Both general and central obesity is more common. It is known that weight loss in overweight patients with type 2 diabetes rapidly reverses the state of insulin resistance and can restore normal blood glucose concentrations *(Henry et al., 2004)*. A variety of intervention studies show that patients with type 2 diabetes who succeed in losing weight often enjoy modest improvements in glycemic control and cardiovascular risk profiles, as long as the weight loss is maintained *(Williamson et al., 2000)*.

Conclusion: The results of this study revealed that prevalence of poor glycemic control and obesity exist but obesity (abdominal) and overweight were more prevalent in Punjabi Type 2 diabetics. Therefore, efforts should be made to control this in type 2 diabetics for their well being and possibly to avoid the risk of disease like cardiovascular later in life.

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Effect of Aerobic Dance on the Body Fat Distribution and Cardiovascular Endurance in Middle Aged Women

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Abstract

Dance aerobics is a popular means of exercise in the urban population. This study evaluates effect of Dance Aerobics on cardiovascular endurance and body fat percentage in middle aged women. To ensure uniformity in the findings, *Cooper Protocol***,** a standardised protocol for dance aerobics was followed, ensuring optimal exercise intensity and minimal musculotendinous damage.

120 middle aged women divided in two groups were examined for VO_{2max} and body fat percentage .Group I comprised 60 women engaged in regular aerobic dance sessions, since 6 months. Group II did not engage in any exertional physical activity. Unpaired t test was used. p= 0.001 considered significant. Aerobic dancers exhibited i) no significant difference in VO_{2max} (p=0.00201) ii) lower fat percentage (p= 0.01462), indicating aerobics is highly effective in weightloss, but effects on cardiovascular endurance are not pronounced. Increasing intensity of existing protocol to achieve increased VO_{2max} may hasten musculotendinous damage. This should be considered before an individual selects aerobic dancing as fitness activity.

Keywords: Cooper Protocol, VO_{2max}, Callipers

Introduction

The aerobic dancing is a popular means of exercise regimen, especially in the urban population.Exercising to music, non requirement of costly equipments or space especially have made dance aerobics very popular in urban areas. Numerous studies carried out on aerobic dance and its effect on body. These have yielded mixed results of the aerobic dancing on various physiological parameters of the population *(Kathleen & Rockefeller, 1979; Patricia, 1987; Williford et al, 1989; Garber et al 1992; Grant et al, 2002; Lehri, and Mokha, 2006; Pantelić et al, 2007; Jakubec et al, 2008; Schiffer et al, 2008; Angioi et al, 2009; Keogh et al 2009; Leelarungrayub et al, 2011; Hopkins et al, 1990*). The difference may be due to difference in the cadence and impact of the various dance schedules *(Uchechukwu, 2009)*. The following study considers the effect of dance aerobics on the VO_{2max} and body fat content on middle aged women. The dance schedule followed in the study was based on Cooper Protocol *(Bull, 1996)*.

Materials and Methods:

The study was carried out after obtaining the Institutional Ethical Committee Approval. The study was carried out in two groups. Group I consisted of 60 middle aged women who practiced aerobic dance since atleast 6 months..Each session of aerobic dance

lasted for one hour, thrice a week. Group II consisted of 60 middle aged women not engaged in any exertional physical activity. Prior to testing, required pre-test instructions were given to all volunteers and the tests were properly explained and demonstrated. The total body fat percentage *(Grzonkowski et al, 1989)* and VO_{2max} (*McArdle et al, 2010*) respectively was calculated in the two groups. The skin fold thickness was measured by skin fold calipers *(Gause & Dey, 2005)* at triceps, subscapular region, suprailiac region, abdomen and thighs. The following precautions were followed while taking the measurements by the skin fold callipers:

The volunteers were asked not to eat or drink anything two hours prior to measurement of body fat. The callipers were placed on the exact site marked before. The readings taken in the first 5 seconds only were considered. The callipers were placed perpendicular to the site measured. The sum of skin folds reflected absolute or percentage changes in body fat (*McArdle et al, 2010*). Measurement sites for the callipers were as follows

1. Triceps: Vertical fold in the posterior midline of right upper arm, half way between the tip of shoulder and the tip of elbow; the elbow remains in an extended, relaxed position.
2. Subscapular: Oblique fold just below the bottom tip of of right scapula.
3. Iliac : Slightly oblique fold just above the iliac crest
4. Abdominal : vertical fold 1 inch to right of umbilicus
5. Thigh: vertical fold at the midpoint of right thigh.
6. Biceps : vertical fold at the midline of the right upper arm

Formula for prediction of fat from skin fold:

% body fat = 8.997+ 0.24658 (3SKF) - 6.343 (gender) – 1.998 (race)

Where SKF = sum of skin folds

Gender = 0, female 1, male

Race = 0, white 1, black

The equation was age adjusted for specific ages as the % body fat increases with age.

The sum of skin folds reflects absolute or percentage changes in body fat *(Bandyapadhyay, 2005)*.

Classification	Men	Women
Essential fat	2-4	10-12
Athletes	6-13	14-20
Fit	14-17	21-24
Acceptable	18-35	25-31
Obese	35 plus	31 pLus

The VO_{2max} is the measure of cardiovascular endurance of an individual (*McArdle et al, 2010*). This was measured using the Queens Step Test *(Chatterjee et al, 2005)* - a three-minute step test (each step 16.25 inches). The post exercise recovery heart rate was calculated post each stepping cycle to a four step cadence, 'up up down down'. The women performed 22 step ups per minute, regulated by a metronome set at 88 beats per minute. The step test began after a brief demonstration and practice. At the completion of 3 minutes, pulse rate was measured for 15 seconds, after 5 to 20 secs of recovery *(Uchechukwu, 2009)*. (ST_{PULSE})

Recovery Heart Rate was converted to beats per minute and calculated as.

VO_{2max} = 65.81 – (0.1847 x ST_{PULSE}) for women

Results & Discussion

The results were tabulated and analysed by SPSS software. The unpaired t test was applied. p = 0.001 was considered significant.

Table 1: Comparison of aerobic dancers & working women

Variables	Aerobic dancer		Working woman				Mann-Whitney Test applied
	Mean	SD	Mean	SD	z-value	p-value	Difference is-
Age (yrs)	**38.07**	**5.22**	**37.92**	**3.80**	**-0.146**	**0.884**	Not significant
Queens step test	**38.88**	**5.33**	**35.19**	**5.48**	**-3.089**	**0.00201**	**Not Significant**
SFT (%)	**27.29**	**4.06**	**29.13**	**3.81**	**-2.442**	**0.01462**	**Significant**

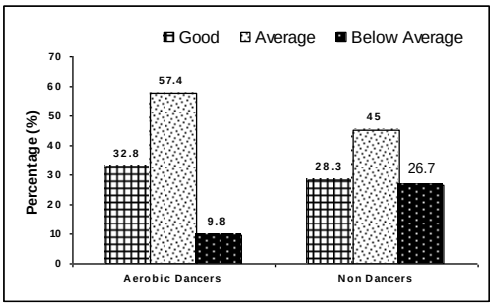

Figure 1: Comparison of Queen's Step Test of Dancers & Non-dancers

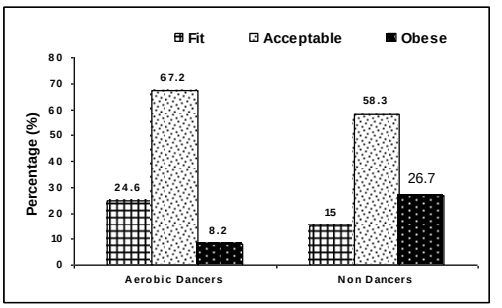

Figure 2: Comparison of Body Fat % of Dancers & Non-dancers

The results show that though the VO_{2max} values are higher in the dancers than the non dancers, the result is not statistically significant (p=0.00201) [Fig. I]. The values for the total body fat percentage however are statistically significant (p=0.01462) [Fig. 2].

The vigorous dance activity increases the resting metabolism in the body cells. There is facilitation of lipid mobilisation and oxidation especially from the visceral adipose tissue *(Guyton and Hall, 1996)*. There is probably an increase in estimated daily energy expenditure in aerobic dancers compared to working women that creates a slightly negative energy balance in aerobic dancers, causing calorie expenditure, resulting in the weight loss. This may be the cause of reduced body fat in aerobic dancers.

VO_{2max} is the measure of the cardiorespiratory endurance of the individual (*McArdle et al, 2010*). The slightly increased values of VO_{2max} in the aerobic dancers may be due to decreased peripheral resistance, increased cross sectional diameter of the coronary arteries, and improved tone of the ventilatory musculature (*McArdle et al, 2010*). Nitrous oxide released due to the shear stress may be the reason for these effects. However, for the significant change to occur in VO_{2max} the *Critical Training Threshold (Astrand et al, 2003, McArdle et al, 2010*). needs to be achieved. This may not be achieved during a standard Cooper Protocol Aerobic Dance session *(Bull, 1996)*.

Conclusion: This is a very important fact which needs to be considered before an individual considers aerobic dance as a fitness activity. If a person is aiming for just weight loss, then the dance aerobics is an ideal choice, however, if the person is aiming for improved cardiovascular status, other physical exertional activities may be considered.

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Efficacy of Myofascial Release in Fibromyalgia

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Abstract

Fibromyalgia is a syndrome of widespread pain, decreased pain threshold and other characteristic symptoms. These other symptoms include undue fatigue, insomnia, joint pain, headache, chest pain, irritable bowel syndrome, jerky leg movements, numbness and tingling in various body parts. For the management of these symptoms many medical and physiotherapeutic interventions are used. Myofascial release is an important technique which is used to reduce these symptoms. Previous studies have been done to find out the effect of myofascial release in fibromyalgia. But there are not much studies which elucidate how myofascial release is effective in reducing these symptoms. The present study made an effort to find out the efficacy of myofascial release on patients with fibromyalgia and how its influence on VAS scale, Epworth Sleepiness Scale (ESS), Self Trait Anxiety Inventory (STAI) and Fibromyalgia Impact Questionnaire. (FIQ). The mean, standard deviation, t value and t test for all the variables were calculated. It was concluded that myofascial release has a significant effect on VAS scale however there is reduction in ESS, STAI, FIQ but not upto significant level.

Keywords: Fibromyalgia, Fatigue, Myofascial Release.

Introduction

Fibromyalgia is defined as "non articular rheumatism characterized by musculoskeletal pain, spasm, stiffness, fatigue and severe sleep disturbances". It is a syndrome of widespread pain, decrease pain threshold and other characteristic symptoms *(Wolfe, 1996)*. These other symptoms include chronic soft tissue neck and back muscle pain that is aching, throbbing or burning in nature usually accompanied by neck, shoulder, spine, shoulder or hip stiffness *(Gray et al., 1997)*. Fibromyalgia patients may also experience undue fatigue, insomnia, joint pain, headache, chest pain, irritable bowel syndrome, jerky leg movements, numbness and tingling in various body parts *(Gray et al., 1997)*. It is estimated to affect approximately 3 to 6 million people and is the third most prevalent rheumatologic disorder. The majority of the affected patients are women in the age range of 30 to 60 years *(Goldenburg, 1998)*. It affects women (3.4%) more frequently than men *(Wolfe et al., 1995)*. The cause of fibromyalgia is unknown.

No evidence of an underlying cause or pathophysiologic basis for fibromyalgia currently exists although myriad of mechanisms have been proposed. Among the list of proposed mechanisms include lack of physical

fitness, sleep deprivation, chronic muscle spasm with ischemia, adenosine monophosphate and creatine level imbalances, neurohormonal imbalances *(Goldenberg, 1989)*. Genetic abnormalities in the serotonin transporter promoter gene have also been noted *(Neumann et al., 2002)*. There is an increased association of catecholamine-o-methyltransferase deficiency in fibromyalgia *(Gursoy et al., 2003)*.

Infectious agents have also been linked to the development of fibromyalgia as well as to that of the closely related Chronic Fatigue Syndrome (CFS). Viral agents, including hepatitis C *(Buskila et al., 1997)*, HIV *(Simms et al., 1992)* and hepatitis B *(Adak et al., 2005)* have been associated with fibromyalgia on epidemiological and clinical grounds. Besides this the etiology is also linked to the levels of both serotonin and norepinephrine. These were found to be decreased in levels in the CerebroSpinal Fluid (CSF) of fibromyalgia patients *(Russell et al., 1992)*. The cerebrospinal fluid levels of the excitatory amino acid neurotransmitters aspartate and glutamate, which are involved in pain transmission through the spinal cord, have been shown to correlate with levels of pain in patients with fibromyalgia, although absolute levels were normal *(Larson et al., 2000)*. These etiological reasons produce various symptoms of pain, sleep disturbances and anxiety in the fibromyalgia patients. Optimal management of these symptoms is thus required to manage these.

Management can be done by conventional treatment ae well. It consists of use of heat and cold, TENS, Ultrasound, breathing exercises, aerobic exercises in the form of cycling, walking. Electrotherapy, including transcutaneous electrical stimulation (TENS), electro-acupuncture, functional electrical stimulation, iontophoresis, laser interferential therapy and ultrasound, has been used in musculoskeletal pain conditions. Interferential electrotherapy with amplitude modulated at low frequencies reaches deep muscles and nerves, stimulates voluntary muscles, promotes an increase in peripheral blood flow, accelerate bone healing and reduces pain. Besides different sites of action, the combination of electrical therapy and ultrasound is more effective than each of them separately because it provides localized analgesia on previous detected painful areas *(Almeida et al., 2003)*. Among other techniques of management includes the use of myofascial release.

Myofascial release is defined as 'the facilitation of mechanical, neural and psychopysiological adaptive potential as interfaced via the myofascial system'. It is a highly interactive stretching technique that requires feedback from the patient's body to determine the direction, force and duration of stretch and to facilitate maximum relaxation of tight tissues. The benefits of massage-myofascial release therapy on pain, anxiety, quality of sleep, depression and quality of life in patients with fibromyalgia were studied by *Castro et al. (2010)*. Their study demonstrated that myofascial release therapy reduces the sensitivity to pain at tender points in patients with fibromyalgia, improving their pain perception. Release of fascial restrictions in these patients also reduce anxiety levels and improves sleep quality,

physical function and physical role. Myofascial programme can be considered as an alternative and complimentary therapy that can achieve transient improvements in the symptoms of these patients. This study has used myofascial release for achieving reduction in various symptoms of pain, sleep disturbances and anxiety in patients of fibromyalgia.

The interest in chronic pain has increased considerably in the past decade. Evaluation of the prevalence of pain in populations has clinical and economic relevance. Pain often is associated with disability and is a major factor affecting quality of life. Chronic musculoskeletal pain is common in the general population, with a prevalence of 35% to 50% according to several studies from the United States and Western Europe *(Brattberb et al*., 1989). Chronic Widespread Pain (CWP) is the cardinal symptom of fibromyalgia (FM) syndrome. It was given a standard definition by the American College of Rheumatology (ACR) committee. This definition emphasized that axial pain was a constant feature and that pain had to be present in the upper and lower quadrants and the right and left sides of the body *(Croft et al*. *1993)*.

A constellation of ancillary symptoms may be present, including headache, fatigue, sleep disturbances, Irritable Bowel Syndrome (IBS), paresthesias, fluctuation of symptoms in response to changes in weather or stress level, and other manifestations *(White and Harth 2001)*. Various treatment approaches have evolved so far for the effective management of the patients with fibromyalgia. These approaches aim at managing the different aspects of the condition.

Because of the chronic and multi-symptom character of FMS, the recommended treatment for its patients is based on the interdisciplinary approach, with physical, pharmacologic, cognitive-behavioral and educational interventions. In the sphere of physical intervention, physical therapy offers a great variety of therapeutic modalities (i.e. kinesiotherapy, hydrotherapy, electrothermal and phototherapy, relaxation techniques, massage therapy, and acupuncture) that can be used to control FMS.

Materials & Methods

The present study is a randomized control trial (RCT). The variables for the study were the questionnaires including Epworth Sleepiness Scale, Self Trait Anxiety Inventory, Fibromyalgia Impact Questionnaire and VAS scale. In this RCT 52 patients were randomly selected between the age group of 25- 65 years and were randomly divided into two groups. Group 1 was designated as the conventional group and received conventional treatment, group 2 was named as the experimental group as it was administered the myofascial treatment prgram. The study was performed in the Out Patient Department (OPD) Of Punjabi University, Patiala and various hospitals of Patiala and Ludhiana. The patients of the conventional group were given hot packs, Interferential therapy, Ultrasound, kneading free active exercises of neck, shoulder and arm, breathing exercises. Patients were asked to do 30 minutes walk daily and were also asked to do cycling.

The treatment was continued for 2 weeks. The patients of the experimental group were given myofascial release techniques including that for the posterior cervical musculature, sternocleidomastoid, upper trapezius, cranial base release, cross hand release for back (erector spinae) and J stroke. The same treatment was continued for 2 weeks and the questionnaires were got filled on 0 day, day 7 and day 14 of the program. The data was analyzed using t test. The results of the study have been projected in the form of tables and graphs.

Results & Discussion

Significant changes were seen in the VAS in the mean difference between 0-14th days in the experimental group. However no significant changes were seen in Epworth Sleepiness Scale, Self Trait Anxiety Inventory and Fibromyalgia Impact Questionnaire when the conventional group was compared with the experimental group. The changes in the values of VAS, ESS, STAI, and FIQ have been shown in the graphs

Table 1.1: Mean and Standard deviation of age for the subjects of the group A and group B

DEMOGRAPHIC	GROUP A		GROUP B	
	Mean	SD	Mean	SD
AGE	38.91	9.78	40.36	13.40

Table 1.2: Comparison of mean value for VAS at 0 day, 7th day, 14th day and MD (0 – 14th) day between Group A and Group B

VAS	GROUP A Vs GROUP B	
	t value	P value
0 day	-0.366	> 0.05
7th day	0.964	> 0.05
14th day	2.362	< 0.05
MD (0 – 14th) day	-2.823	< 0.05

Table 1.3 Mean and SD of ESS at 0 day, 7th day, 14th day and MD (0 – 14th) day for the subjects of Group A and Group B and Comparison of mean value for ESS at 0 day, 7th day, 14th day and MD (0 – 14th) day between Group A and Group B

ESS	Group A		Group B		Group A vs Group B	
	Mean	SD	Mean	SD	t	P
0 Day	12.36	0.67	11.73	0.65	2.26	0.05
7 Day	11.91	0.30	10.82	0.60	5.37	0.05
14 Day	11.18	0.60	10.18	0.40	4.57	0.05
MD (0-14)	1.18	0.60	1.55	0.69	-1.32	0.05

Table 1.4 Mean and SD of STAI at 0 day, 7th day, 14th day and MD (0 – 14th) day for the subjects of Group A and Group B and Comparison of mean value for STAI at 0 day, 7th day, 14th day and MD (0 – 14th) day between Group A and Group B

STAI	Group A		Group B		Group A vs Group B	
	Mean	SD	Mean	SD	t	P
0 Day	52.55	1.97	52.09	2.17	0.515	0.05
7 Day	51.91	2.39	51.36	2.38	0.537	0.05
14 Day	50.91	2.43	49.91	3.11	0.840	0.05
MD (0-14)	1.64	1.03	2.18	2.36	-0.703	0.05

Table 1.5 Mean and SD of STAI(y-2) at 0 day, 7th day, 14th day and MD (0 – 14th) day for the subjects of Group A and Group B and Comparison of mean value for STAI(y-2) at 0 day, 7th day, 14th day and MD (0 – 14th) day between Group A and Group B

STAI (Y-2)	Group A		Group B		Group A vs Group B	
	Mean	SD	Mean	SD	t	P
0 Day	48.27	6.10	48.27	6.21	0.00	0.05
7 Day	47.36	6.55	47.36	6.68	0.00	0.05
Day 14	46.27	6.66	45.73	6.62	0.19	0.05
MD (0-14)	2.00	1.00	2.55	1.29	-1.11	0.05

Table 1.6 Mean and SD of FIQ (y-2) at 0 day, 7th day, 14th day and MD (0 – 14th) day for the subjects of Group A and Group B and Comparison of mean value for STAI(y-2) at 0 day, 7th day, 14th day and MD (0 – 14th) day between Group A and Group B

FIQ	Group A		Group B		Group A vs Group B	
	Mean	SD	Mean	SD	t	P
0 Day	77.91	10.96	77.82	13.41	0.02	0.05
7 Day	74.55	10.61	68.18	10.42	1.42	0.05
14 Day	68.91	13.06	62.64	12.48	1.15	0.05
Mean Dev. (0-14)	9.00	9.54	15.18	7.82	-1.71	0.05

In the present study myofascial release was given at the sites of tender points including posterior cervical musculature, trapezius, pectoral region, sternocleidomastoid, cranial base release, gluteal fascia including J stroke as explained by *Castro et al. (2011)*. Various questionnaires including Fibromyalgia Impact Questionnaire, Epworth Sleepiness Scale, Self Trait Anxiety Trait and Visual Analogue scale were used. In order to find out effect of myofascial release on these scales an experiment was conducted on 22 subjects of age group 25-65 years. *Lofgren and Norrbrink (2009)* in their study included the women of 18-60 years in his study. The present study took the age group upto 65 years of age.

Conclusion

The present study concludes that both the conventional and myofascial treatments are helpful in reducing the symptoms of pain, sleep disturbances and anxiety in case of fibromyalgia. However significant effects of myofascial release were seen on pain and hence it is also a reliable method for reducing pain in case of fibromyalgia.

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Effect of Wrist Manipulation & Cyriax Physiotherapy Training on Pain & Grip Strength in Lateral Epicondylitis Patients

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Abstract

The purpose of the study was to evaluate the effect of manipulation of wrist technique and Cyriax physiotherapy training in reducing pain and improving grip strength in lateral epicondylitis. A total of 30 patients (male =16; female=14) were selected as subjects and they were further divided into 2 groups. Each group comprising of 15 subjects (male=8; female=7). Results of this study suggest that there was an improvement in the mean values of Numeric Pain Rating Scale and Grip Strength after treatment in both groups. But the improvement was statistically more significant in wrist manipulation group than the Cyriax physiotherapy training receiving group. It was concluded that the patients of lateral epicondylitis procured more substantial benefits from wrist manipulation as compared to Cyriax physiotherapy after three weeks.

Keywords: Lateral Epicondylitis, Manipulation, Cyriax, Strength, Pain

Introduction

Lateral epicondylitis (LE) is the second most frequently diagnosed musculoskeletal upper extremity disorder in a primary care setting *(Harr & Andersen, 2003)*. The most commonly affected structure is the Extensor Carpi Radialis Brevis (ECRB) tendon that is characterized by the increased presence of fibroblasts, vascular hyperplasia and disorganized collagen and the average duration of a typical episode of LE is 6 months – 2 years *(Stasinopoulos & Johnson, 2004)*. Lateral epicondylitis occurs 7 to 20 times more frequently than medial epicondylitis *(Brotzman & Wilk, 1996)*. The dominant arm is commonly affected with the prevalence of 1-3% in general population, but this increase to 19% at 30-60 years of age *(Allender, 1974)*.The condition is not differing between men and women *(Vicenzino, 1996)*. There has been a well defined clinical presentation, the main complaints being pain and decreased grip strength. Diagnosis is simple and can be confirmed by the tests that reproduce pain such as palpation over the facet of the lateral epicondyle, resisted wrist extension, resisted middle finger extension and passive wrist flexion *(Kamein, 1990)*. Traditional treatment program for people with lateral epicondylitis have focused primarily on the pain control by ultrasound, anti-inflammatory medication, iontophoresis or phonophoresis followed by rehabilitation program which ranges from flexibility to strengthening and endurance training. Numerous treatments

have been tried for lateral epicondylitis including drug therapies, corticosteroid injection, electrical stimulation, laser, acupuncture, counterforce bracing, ergonomics, splintage etc. However no one treatment has been reported to be universally efficacious. Surgical treatment is needed in 5-10% of patients who do not respond after many months of conservative treatment *(Manchanda & Grover, 2008)*. Manipulation has been frequently used for the management of back and neck complaints and is thought to be free motion segment that have undergone disproportionate displacement or are felt to be hypo-mobile and causes muscle relaxation. These mechanisms are thought to be associated with distribution of abnormal stresses within the joint, resulting in pain, restriction of motion and potential inflammation *(Cooprestein, 2001; Shekelle et al., 1992)* Manipulation of wrist is capable of relieving symptoms in lateral epicondylitis patients *(Struijis et al., 2003)*. *Cyriax and Cyriax (1983)* suggested the use of deep transverse friction massage in combination with Mill's manipulation for the treatment of LE. For it to be considered a Cyriax intervention, the two components must be used together in the order mentioned. There are 40 different treatment methods reported in literature to treat the LE. All the treatment options have one aim of reducing pain and improving function. It suggests that the optimal treatment strategy is not known. However to build the evidence base for the physiotherapy management of LE; the purpose of the present study is to evaluate the effect of Cyriax physiotherapy and manipulation of wrist technique in reducing pain and improving grip strength.

Materials & Methods:

Thirty patients of lateral epicondylitis both males & females in the age range of 25 to 55 years were selected as subjects after obtaining their consent based on inclusion and exclusion criteria of the study. The subjects were further divided into two groups: Group-A (n=15) and Group-B (n =15) respectively and received the treatment for 3 times a week for 3 weeks.

Treatment Protocol: The subjects of Group - A underwent the Cyriax Physiotherapy in addition to pulsed ultrasonic therapy at 20% duty cycle, frequency 3MHz and an intensity of 1.2 W/cm^2 for 5 min, given at the tenoperiosteal junction of the ECRB. Cyriax physiotherapy consisted of 10 minutes of deep transverse friction massage (DTF) followed by a single application of Mill's manipulation. For DTF, the patient was positioned comfortably with the elbow fully supinated and in 90 degree of flexion. The anterolateral aspect of the lateral epicondyle was located (where the ECRB originates and is the most common site of pain in patients with lateral epicondylitis) and the area of tenderness was identified. DTF was applied with the side of the thumb tip applying the pressure in a posterior direction on the teno-osseous junction. This pressure was maintained while imparting DTF in a direction towards the therapist's fingers, which were positioned on the other side of the elbow for counter pressure. DTF was applied for 10 minutes. After the numbing effect was achieved, the tendon was prepared for

Mill's manipulation *(Cyriax & Cyriax, 1983)*. For Mill's manipulation; patients were positioned comfortably in the seating position with the affected extremity in 90^0 of abduction with the medial rotation enough so that the olecranon faced up. The therapist stabilized the patient's wrist in full flexion and pronation with one hand, while other hand was placed over the olecranon. While assuming full wrist flexion and pronation position, the therapist applied high – velocity low – amplitude thrust at the end range of elbow extension.

The subjects of Group – B underwent Manipulation of wrist in addition to pulsed ultrasonic therapy at 20% duty cycle, frequency 3MHz and an intensity of 1.2 W/cm^2 for 5 min given at the tenoperiosteal junction of the ECRB. Thrust technique was performed as follows – Each subject rested the forearm of his or her affected side on a table with the palmar side of the hand facing down. The therapist sat at a right angle to the subject's affected side and gripped the subject's scaphoid bone between his thumb and index finger reinforced by placing the thumb and index finger of the other hand. The therapist then extended the subject's wrist dorsally at the same time the scaphoid bone was manipulated ventrally. This part of the maneuver was repeated approximately 15 times. This procedure was repeated about 20 times, alternated by either forced passive extension of the wrist or extension against resistance. The duration of an intervention session was 15 to 20 minutes. No restrictions in use of the arm were imposed *(Struijis et al., 2003)*. Both the groups also received graduated exercise therapy regimen including stretching exercises and progressive resisted exercises.

Statistics

The data was analyzed using statistical computer software 'SPSS 13 software package (version 13, SPSS Inc. Chicago, USA)'.The paired t – test and unpaired t – test were used. The level of significance was $p<0.05$.

Results & Discussion

The mean age and BMI of the subjects of Group -A and Group-B were 45.87±9.086 years, 46.93±7.324 years, 27.041 ± 1.842 Kg/m^2 and 27.21 ± 2.352 Kg/m^2 respectively. It was found that the difference in the mean values of age and BMI between Group -A and Group-B were not statistical significant (Table 1).

Table 1: Comparison of Age & BMI

	Group A (Mean±SD)	Group B (Mean±SD)	t-value
Age(years)	45.87 ±9.086	46.93±7.324	0.354*
BMI(Kg/m^2)	27.04± 1.842	27.21±2.352	0.229*

*p<0.05

Table 2: Comparison of Scores (Unpaired t - test) of NPRS & Grip Strength between two groups

		Group A	Group B	t-value
NPRS (cm) (Mean±SD)	before	8.20±0.775	7.93±0.961	
	after 3 wks	6.00±0.845	4.20±0.862	5.78*
Grip Strength (kg) (Mean±SD)	before	5.13±0.99	15.00±1.195	
	after 3 wks	17.13±1.13	19.80±1.082	6.61*

*significant p<0.05; NPRS- Numeric Pain Rating Scale

Table 2 shows the comparison of scores of Numeric Pain Rating Scale (NPRS), Grip Strength between Group-A and Group-B before and after three weeks of treatment. It was found that before the start of three week treatment programme

to the subjects of Group-A and Group-B there was no statistical difference in the scores of NPRS and Grip Strength. After three weeks there was statistically significant difference in the scores of NPRS and Grip Strength in both the groups but a greater improvement was observed in Group-B as compared to Group-A (Table 2). Further, it was found that in Group-A there was a statistical significant improvement in the scores of NPRS & Grip Strength after three weeks (Table 3).

Table 3 Paired t-test of NPRS & Grip Strength of Group A

	before	after three week	t-value
NPRS (Mean±SD)	**8.20±0.775**	**6.00±0.845**	**20.58***
Grip Strength (Mean±SD)	**15.13±0.990**	**17.13±1.125**	**14.49***

significant p<0.05

Similarly, it was found that in Group-B there was a statistically significant improvement in the scores of NPRS & Grip Strength after three weeks (Table 4).

Table 4 Paired t-test of NPRS & Grip Strength of Group B

	before	after one week	t-value
NPRS (Mean±SD)	**7.93±0.961**	**4.20±0.826**	**31.59***
Grip Strength (Mean±SD)	**15.00±1.195**	**19.80±1.082**	**27. 50***

significant p<0.05

The results of the present study shows that subjects in both the groups had significant decrease in pain and increase in grip strength. However, out of the two groups, the Group-B receiving wrist manipulation had a higher percentage of change in both grip strength and reduction in pain as compared to Group- A (Cyriax physiotherapy). Therefore the null hypothesis is rejected. The results of this clinical trial are novel as no other studies comparing Cyriax physiotherapy and manipulation of wrist have been identified. Both the groups in the present study had equal number of subjects and there was no significant difference found with respect to their gender distribution, age and body mass index. The reported success of manipulation of wrist in the present study is bolstered by the previously published trials *(Struijis et al., 2003; Manchanda and Grover, 2008)*. Despite its broad application, the mechanism by which manipulation may work is poorly understood. Manual therapy is used quite often for spine and peripheral joints despite of the inability of clinicians to accurately diagnose the pathway at which manipulation is targeted. In people with low back pain and neck pain, spinal manipulation is thought to free motion segments that have undergone disproportionate displacement and to relax muscles by sudden stretching. Unwanted muscle activity in people with low back pain, in theory can cause a limited range of motion to protect against sudden movements. The advantages of the manipulation of wrist are the potential effectiveness over the short term and the ability for patient to maintain his/her daily activities without restrictions. The clinical efficacy of manipulation therapy has been demonstrated in randomized clinical trials which report benefits in term of pain relief and rapid restoration of function. This may be due to direct effects on articular structures, modulation of nociceptive afferent transmission within the CNS and psychological influences *(Struijis et al., 2003)*. The reported success of Cyriax

physiotherapy in the present study conflicts with previously published trials *(Stasinopoulos & Johnson 2004; Verhaar et al., 1996)*. The authors did not offer any description or reference regarding technique; therefore, it is not clear if their application of Cyriax physiotherapy differed from aid physical therapists in making clinical decisions as injections are not delivered as part of physical therapy treatment. Patients included in this study were those clinically identified as having the tenoperiosteal variety of lateral epicondylalgia as it is hypothesized that this form is best managed with Mill's manipulation. The proposed mechanism of Mill's manipulation is the lengthening of scar tissue following the rupture of adhesions due to the manipulation. This increased length decreases tension on the scar leading to less pain, effectively converting a tear shaped like a "V" into one resembling a "U". The resulting gap is filled with fibrous tissue, resulting in permanent lengthening and abolition of pain. The application of friction massage is said to provide the patient with analgesia prior to the manipulation as well as softening the scar. It has been hypothesized that the mechanism of pain relief secondary to friction massage may be due to modulation of nociceptive impulses at the spinal cord level, also known as the gate control theory. Currently, no published evidence exists to prove the proposed mechanism as to what actually occurs during and following manual treatment with Cyriax physiotherapy. Despite the considerable evidence supporting the use of manual therapy techniques in treating musculoskeletal pain, there still exists no consensus as to the exact mechanisms of action there either *(Cyriax & Cyriax, 1983)*. Recent evidence has indicated that the central nervous system may play a role in pain inhibition following joint manipulation. *Vicenzino (1996)* investigated the effects of a non-thrust cervical lateral glide in patients with chronic lateral epicondylalgia. This technique was shown to result in increased pain-free grip, pressure pain threshold, as well as a sympathetic nervous system response as indicated with measures of skin conductance and blood flux. More recently, *Paungmali et al., (2003)* found similar results with improved pain-free grip, pressure pain threshold, and sympatho-excitation following mobilization with movement directed at the elbow. It should be noted that the above studies captured outcomes only immediately following treatment; therefore, no generalization can be made regarding long-term effects. Given the results of these trials, the potential exists for a similar sympathetic nervous system response following the application of Cyriax physiotherapy, which may explain the technique's superiority in decreasing pain and improving pain-free grip strength. The comparisons between present study results and those of previous trials should be made with caution, as it is not possible to determine which intervention made the greatest contribution to the treatment effect. The present study did not assign patients to receive ultrasound, graduated exercise regimen, Cyriax physiotherapy and manipulation of wrist as an isolation treatment. The absence of a true, no treatment control group makes it difficult to differentiate between treatment effect

and the natural course of the disorder, thus threatening the internal validity of the study. No long term follow- up data was collected past 3 weeks; therefore the long-term effects of the interventions in the present study remain unknown. Future research is needed that will determine the long term effects of the interventions used in the present study.

Conclusion

It was concluded that the patients of lateral epicondylitis procured more substantial benefits from wrist manipulation as compared to Cyriax physiotherapy.

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Comparative Study of the Age Related Structural Changes in the Knee between Sportspersons and Non Sportspersons

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Abstract

Knee joint degeneration is the major cause of disability among the Indian population. The structural changes subject to differ among the sportspersons and non sportspersons. The aim of the study was to compare the structural changes in the knee between age-matched sportspersons and non sportspersons. Thirty sportspersons and thirty non sportspersons aged ≥50 years were randomly selected on the basis of selection criteria. Physical examination that included effusion, tenderness, atrophy, knee joint range, lower extremity muscle strength, physical activity levels and knee injury and osteoarthritis status was done in all the sixty subjects. Digital X ray examination was then carried out for measurement of joint space width and Kellgren Lawrence grading. Statistically significant difference was found in the joint space width and Kellgren Lawrence grades between the sportspersons and non sportspersons. Also significant difference was found in effusion, tenderness, atrophy, knee joint range, lower extremity muscle strength, physical activity levels and knee injury and osteoarthritis status between the sportspersons and non sportspersons. The study concluded that sportspersons have less worsened structural knee changes, better knee joint range of motion, muscle strength, physical activity levels and a better quality of life as compared to the age-matched non sportsperson peers.

Key words: Structural changes, joint space width, sportspersons, non sportspersons.

Introduction

The most consistent knee structural changes with increasing age are increase in cartilage defect severity and prevalence, cartilage thinning and increase in bone size with inconsistent change in cartilage volume *(Ding et al, 2005)*. High-impact and torsional loads may increase the risk of degeneration of normal joints, and individuals who have an abnormal joint anatomy, joint instability, disturbances of joint or muscle innervation, or inadequate muscle strength or endurance probably have a greater risk of degenerative joint disease.

It is reported that exercise contributes to cartilage healing and reduces risk for injury, and that moderate exercise can even decrease the number of cases requiring arthroplasty. Conversely, excessive (harsh) exercise may be associated with increased cartilage damage or degenerative changes. Despite the presence of osteophytic changes in joint cartilage of athletes performing mild sports activities, these may not result in osteoarthritis due to the adaptive feature of joint cartilage. In contrast, the risk for osteoarthritis is increased in professional sportsmen exposed to acute repetitive impact and torsional loading *(Ozkan et al, 2007)*.

Therefore it is important to assess the athlete's risk of physical exercise and determine whether it is beneficial or detrimental to the joint structure. Consequently, the present study was conducted to evaluate the age related structural changes that occur in articular cartilage particularly of weight-bearing joints such as knee joint with special reference to sporting activities.

An age-related increase in calcification of the articular cartilage and the menisci in the knee has been demonstrated radiographically *(Loeser, 2009)*. Accordingly, the age related structural changes in the knee joint were evaluated in the present study largely with the help of radiographs. The measurement of joint space width (JSW) on radiographs is currently the best available surrogate for evaluation of the progression of cartilage destruction *(Vignon et al, 2003)* and the Kellgren-Lawrence radiographic grading scale is commonly used in epidemiologic and clinical studies to define the presence of and to estimate the severity of osteoarthritis of the tibiofemoral joint *(Kizoksi et al, 2006)*. Therefore, the present study compares the age related structural changes in knee, between sportspersons and non sportspersons, on the basis of the measurement of joint space width and the Kellgren-Lawrence radiographic grading scale.

Participants: A comparative study was conducted on a sample of 60 subjects. They were divided into two groups: Group A having non-sportspersons and Group B having sportspersons. The sample was collected from Patiala and Chandigarh. Thirty intervarsity or national level sportspersons aged ≥50 years, both men and women from different sports volunteered to participate in the group of sportspersons. The criteri for the selection of sportspersons were that most of them had played for over a decade and were still recreationally active. The non-sportspersons group containing thirty age matched subjects was drawn from a random sample of the population. All subjects signed the consent form prior to participation in the study. Exclusion criteria for both groups, included subjects with history of neurological problem, systemic illness, major reconstructive surgery of the lower extremities or involvement of multiple major joints, subjects with unilateral or bilateral TKR or any inflammatory arthropathy, subjects in whom radiographs are harmful or contraindicated.

Materials & Methods:

All subjects recruited for the study were assessed through clinical examination and pre-participation screening which included detailed medical, social, personal and family history and examination of the vital signs. Anthropometric measurements, namely, height and weight were carried out by using anthropometric rod and weighting scale. The scale for effusion (*Mckeag and Moeller, 2007)* and scale for tenderness *(Hubbard and Berkoff, 1993)* were used to assess the severity of effusion and tenderness respectively. Both active and passive range of

motion of the knee joint was assessed with the goniometer. The strength of the lower extremity muscles were assessed with a cable Tensiometer *(McArdle et al, 2001).* The knee injury and osteoarthritis outcome (KOOS) score was used which covers 5 patient-relevant dimensions: pain, other symptoms, activities of daily living (ADL), function in sports and recreation (Sports/Rec), and knee-related quality of life (QOL). KOOS is a self-administered instrument that can be used for short-term and long-term follow-up of several types of knee injuries including osteoarthritis. *(Lohmander et al, 2004)* The General Practice Physical Activity Questionnaire was used to assess the level of physical activity in the subjects *(Bull and Milton, 2010).* Then the subjects were made to undergo the digital X-ray examination for measurement of joint space width and Kellgren Lawrence grading. This technique is based on the MTP (metatarsophalangeal) view which measures the joint space width that can be readily used to track longitudinal changes in cartilage thickness *(Oksendahl et al, 2009).* Digitalized films of radiographs were read for narrowing, sclerosis and osteophytes in the medial compartment of each right knee using the standard Kellgren and Lawrence method for assessing progression of radiographic OA: joint space narrowing, sclerosis and osteophytes were each graded on the scale of 0 to 3 (normal, mild, moderate and severe). Joint space width (JSW) was determined as the joint width in millimetres of the medial knee compartment. The lower the JSW, the more severe is the radiographic progression of knee OA; knee OA is the severe most when JSW = 0.

Results & Discussion:

Unpaired t test was applied to compare the age related structural changes in knee joint between nonsportspersons and sportspersons. Karl Pearson correlation was used to find the correlation between joint space width and the study variables.

Table 1: Demographic details of the participants in the two groups

Study Variables	Group A (Non sportsperson)	Group B (Sportsperson)	t-value
	Mean±SD	Mean±SD	
Age (yrs)	56.43±6.39	54±6.6	1.44
Height, mtrs	1.67±0.08	1.70±0.10	1.37
Weight (kg)	67.36±8.81	75.16±12.35	2.81
BMI(kg/m^2)	24.36±2.57	25.95±3.77	1.91

*p<0.05

Table 1 compares the demographic details such as age, height, weight and body mass index (BMI) between the non sportspersons and sportspersons. Mean and standard deviation were calculated and statistically non-significant difference was found for age and BMI, suggesting that the two groups were homogenous.

Table 2 shows the comparison of various parameters between the non sportspersons and sportspersons. Unpaired t-test was applied between the group A and B. Statistically significant difference was found in

tenderness, atrophy, effusion, knee joint range of motion, knee muscle strength, K/L grading, joint space width, GPPAQ scores and KOOS parameters.

Table 2: Comparison of the mean values of study variables between non sportspersons (group A) and sportspersons (group B).

Study Variables	Group A (Non sportspersons)			Group B (Sportspersons)			
	Mean	SD	SEM	Mean	SD	SEM	t-value
Tenderness	0.73	0.78	0.14	0.27	0.52	0.10	2.71*
Atrophy	1.46	0.64	0.11	1.03	0.57	0.10	2.69*
Effusion	0.63	0.89	0.16	0.13	0.57	0.10	2.58*
AROM flexion	114.0	10.70	1.95	122.17	8.68	1.58	3.24*
AROM extension	2.53	4.09	0.75	0	0	0	3.39*
PROM flexion	119.00	10.37	1.89	126.0	6.49	1.18	3.13*
PROM extension	0.50	1.53	0.28	0	0	0	1.79
Quadriceps strength	9.66	3.47	0.63	16.10	3.63	0.66	7.01*
Hamstrings strength	10.80	3.77	0.69	17.73	4.56	0.83	6.42*
K/L Grades	2.47	0.94	0.17	1.63	0.81	0.15	3.68*
Joint space width	1.18	0.51	0.09	2.24	1.09	0.20	4.80*
GPPAQ scores	2.50	0.86	0.16	3.0	0	0	3.18*
KOOS symptoms	78.29	18.38	3.35	90.71	9.21	1.68	3.30*
KOOS pain	80.46	17.19	3.13	93.97	6.96	1.27	3.99*
KOOS ADLs	78.18	19.67	3.59	94.16	8.96	1.63	4.04*
KOOS sports	55.50	36.33	6.63	81.33	19.30	3.52	3.44*
KOOS Qol	65.41	24.49	4.47	85.28	15.32	2.79	3.76*

*p<0.05

Table 3: Correlation of JSW with study variables with reference to knee joint

Parameters	Correlation (r)
JSW Vs Quadriceps strength	0.3700*
JSW Vs Hamstrings strength	0.3238*
Active knee flexion	0.3544*
Active knee extension	-0.3715*
GPPAQ Scores	0.3490*
KOOS Symptoms	0.3788*
KOOS Pain	0.4002*
KOOS ADLs	0.3799*
KOOS Sports and recreation	0.4083*
KOOS QoL	0.4194*

*p<0.05

Table 3 depicts the statistically significant relationship of JSW with all variables studied with reference to knee joint.

The present study compared the age related structural knee changes between sportspersons and non sportspersons. It was found that participation in sports is not associated with accelerated incidence or severity of structural knee changes.

Rather it is interesting to note that the non sportspersons exhibited the worse structural changes in their knees leading towards the development of osteoarthritis. These results are consistent with the other studies of long distance running and vigorous activity in independent cohort of aging subjects *(Panush et al, 1986; Lane et al, 1986; Hannan et al, 2000; Chakravarty et al, 2008)*. Even at the elite-athlete level, data suggest that running may not be an independent risk factor of knee osteoarthritis *(Kujala et al, 1995)*. Several other studies have also suggested that participation in low to moderate level recreational activities is associated with decreased risk of knee osteoarthritis *(Manninen et al, 2001)*.

In contrast, a number of studies have shown that participation in specific sports at elite level does increase the risk of knee OA. Associations are more pronounced for premature symptomatic and radiographic OA among participants in professional ballet dancing, soccer and weight lifting *(Kujala et al, 1994; Teitz et al, 1998; Spector et al, 1996)*.

Thus, it is important to critically analyze the effects of sporting activities on structure of knee joint, particularly age related changes in articular cartilage that could lead to the development of osteoarthritis. The above mentioned studies were mainly the case control studies in which only symptomatic athletes were included *(Kujala et al, 1994)*. Other studies had taken only high impact sports and found high percentage of injuries *(Teitz et al, 1998)*. Conversely, in the present study the sportspersons were randomly selected who reported lower than the expected number of injuries suggesting less worsening of the age related structural changes in the knee.

In addition to this, the radiological findings of the present study have suggested that the sportspersons have preserved knee structure as compared to the non sportspersons. These findings are well in line with those of *Chakravarty et al (2008)* who found that there were no significant differences in the K/L grades and JSW in the long distance runners after two years of longitudinal study suggesting that sporting activity is not associated with increased structural changes in the knee. Nonetheless, *Spector et al (1996)* concluded that long term weight bearing sports are associated with radiological presence of hip and knee OA as measured via Kellgren Lawrence grades.

Accordingly, the data collected in present investigation, was analysed further and the local factors with regard to knee joint were compared between sportspersons and non sportspersons, demonstrating that sportspersons had lesser tenderness, effusion grades and atrophy of thigh muscles, and higher range of active and passive knee joint motion, stronger quadriceps & hamstirngs, better physical activity levels (GPPAQ scores) and lower incidence of knee injuries (KOOS scores). All these factors might have contributed to preserve the structure of knee joint in sportspersons, signifying that the sportspersons have less worsened structural knee changes. For example, the weaker quadriceps muscle of non sportspersons as compared to the sportspersons suggest the possibility that the age-related quadriceps-dominant muscle atrophy may play a role in the

pathogenesis of structural knee changes. *Ikeda et al (2005)* holds the similar view. The strength of the quadriceps is believed to be important in stabilizing the knee joint and protecting articular surfaces from high loads *(Urquhart et al, 2008)*. Another important factor was physical activity level. The sportspersons were fully active with better joint space width (JSW) in knee joint. *Manninen et al (2001)* examined the association between physical activity and risk of severe knee OA requiring arthroplasty and found that the risk decreased with increase in cumulative hours of recreational physical exercise.

More importantly, the present study has established a strong relationship of structural changes (JSW) in knee joint with Lower extremity muscle strength, knee joint range of motion, physical activity levels and KOOS scores suggesting that the larger JSW or better said, less worsened structural knee changes are strongly related with stronger quadriceps &hamstrings, greater knee joint range of motion, higher physical activity levels and a lower knee injury profile. These findings are supported by numerous studies. *Holla et al (2011)* in their study concluded that features of articular degeneration are associated with lower knee ROM in patients with early OA. *Ersoz and Erqun (2003)* found statistically significant negative correlations between range of motion and radiographic scores and suggested that reduced ROM is associated with reduced JSW. Various studies have been conducted which suggest that atrophy or muscle weakness is an important clinical factor in determining the structural knee changes *(Slemenda et al, 1997; Valderrabano and Steiger, 2011)*. Strong association between pain and structural knee changes were reported by *Hart et al (1991); Duncan et al, (2007) and Neogi et al (2009). Foley et al (2007)* measured the physical activity level and physical work capacity and assessed the structural knee changes by MRI and suggested that knee cartilage volume and tibial plateau area are dynamic structures that can respond to physical stimuli.

Thus, findings of the present study have demonstrated that the sportspersons have less worsened structural degenerative changes in the knees as compared to the age-matched non sportspersons. The muscle strength, knee joint range of motion and physical activity levels are notably higher in the sportspersons than the non sports sportspersons. Also the better scores of KOOS among the sportspersons suggest that the sportspersons enjoy a better quality of life as compared to the non sportspersons. Therefore the participation in sports should be encouraged in order to minimize the risk of progression of structural degeneration in knee joint.

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Comparison on Imagery and Self-Esteem of Various Level Footballers

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Abstract

The present study was conducted for the comparison on imagery and self-esteem of various levels of footballers. Twenty five district level footballers (N_1=25) and twenty five state levels footballers (N_2=25) of West Bengal were taken as the subjects for the present study. Thus total no of subjects were (N=50) fifty only. The age group of the subjects ware ranged from 15 to 19 years. Imagery and Self-Esteem were the variables for the present study. Imagery was measured by the Sports Imagery Questionnaire *(Cumming, 2002*) and Self-Esteem was measured by the *Rosenberg Self Esteem Scale (1965).* Mean and standard deviation of each variable were calculated. The means of respective variables between two games were compared by using t-test. Statistical significance was tested at 0.05 level of confidence. The results of the present study showed that there was statistically significant difference in the mean value of imagery and self-esteem between the district and state level footballers.

Keywords: Imagery, Self-esteem, Sports Imagery Questionnaire, Rosenberg Self-esteem (RSE) scale.

Introduction

In sports, imagery and self-esteem are well-known factors that may enhance or improve sports skills. Most sporting programs consist of mental practice, which has been found to help the basic development of athletes at lower skill levels. The use of imagery for success is not a clearly understood method because its processes, including effective techniques, are not defined. Athletes need to mentally practice both imagery and self-esteem. Imagery is influenced by many factors including somatic anxiety, motivation, emotions, and confidence. It has been found that a factor like self-esteem is one that athletes and coaches consider as relevant for good performance.

Some studies found that many people and athletes use imagery to increase exercise and physical fitness as the imagery helps the success of their exercise *(Hall, 2001).* An athlete's enactment of performance imagery is the normal procedure in training programs. This method is used more heavily by elite athletes with higher self- esteem than non-athletes. Studies suggest that imagery may help athletes to build more self-confidence in relation to performance. *Kendall et al (1990)* demonstrated that imagery, in combination with relaxation and selftalk, increases the utilization of specific defensive skills. Moreover, athletes who displayed high selfconfidence and low anxiety were able to perform under more relaxing conditions to thereby enhance their performances *(Covassin, 2004).*

Self- esteem is one of the most frequently cited psychological factors considered by many to be a key factor for a successful performance stated that in

social cognitive theory, an individual's degree of self- esteem influences performance both directly and indirectly. In earlier studies, it was found that successful athletes exhibit higher self-esteem than unsuccessful athletes *(Treasure et al, 1996)*. This study noted that athletes who have higher self- esteem during competitions are more likely to be successful. It is also important to note that confident athletes believe in their ability to perform well and win *(Covassin & Pero, 2004)*. Performance may be determined by an individual's belief that he or she has the ability to execute skills, which are required by the situation and the responsiveness of the environment. Therefore, the ability of personal self- esteem strongly contributes to success or failure. The present study has been conducted to find out the differences in the use of imagery and self-esteem of various levels of footballers.

Materials & Methods

Twenty five district level male footballers (N_1=25) and twenty five state level male footballers (N_2=25) of West Bengal were taken as the subjects for the present study. The age group of the subjects ranged from 15 to 19 years. For the present project random group design was adopted. Imagery and Self-Esteem were the variables for the present study. Imagery was measured by the Sports Imagery Questionnaire and Self-Esteem was measured by the *Rosenberg Self Esteem Scale (1965)*. The questionnaire was separated into two parts: a simple demographic part and a questionnaire for imagery and Self-Esteem as detailed below: *Imagery Ability:* The Sports Imagery Questionnaire *(Cumming, 2002)* is a questionnaire designed to assess an athlete's imagery. The Sports Imagery Questionnaire consisted of 30 items. The responder was required to rate the questions on a scale of 1 to 7, where 1=rare use of imagery and 7=extensive use of imagery. An average frequency score was calculated for each athlete. *Self-Esteem:* The Rosenberg Self-esteem (RSE) scale developed by *Rosenberg (1965)* is a widely used self-esteem measurement developed by Rosenberg. The scale measures self-esteem, which is a positive evaluation of one's attributes and sense of self-worthiness. It consisted of 10 items. Participants indicate their agreement-disagreement level for each item along a four point Liker type scale, ranging from "strongly agree" to "strongly disagree". Higher score in the scale indicate higher self-esteem. The maximum possible score of the scale is 3 and the minimum is 0. Total scores were calculated for each athlete. Mean and standard deviation were the descriptive statistics and 'T' test was used as comparative statistics in the present study. The level of significant difference was set at $p<0.05$ level of confidence.

Results & Discussion

Table 1: **Mean and Standard deviation of district and state level footballers on imagery**

Name Of The Group	Mean ± S.D.
District	**4.75 ± 0 .70**
State	**5.55 ± 0 .78**

Comparison of the mean and standard deviation of obtained data on Imagery as measured by the Sports Imagery Questionnaire *(Cumming, 2002)* of district and state level footballers is presented in Table-1. The mean and standard deviation

of Imagery of the district and state level footballers were 4.75 ± 0.70 and 5.55 ± 0.78 respectively. Table-2 compares the mean and standard deviation values of self-esteem as measured by the Rosenberg Self-esteem (RSE) scale of district and state level footballers. The mean and standard deviation on self-esteem of the district and state level footballers were 20.69 ± 4.21 and 23.18 ± 4.17 respectively indicating higher self esteem of state footballers.

Table 2: **Mean and Standard deviation of district and state level footballers on self-esteem**

Name Of The Group	Mean ± S.D.
District	20.69 ± 4.21
State	23.18 ± 4.17

TABLE 3: **Significance of the differences between district and state level footballers on imagery**

Group	Imagery Mean±S.D.	Mean Difference	Standard Error	T-Value
District	4.75±0.70	0.8	0.21	3.82*
State	5.55±0 .78			

****Significant at 0.05 level of confidence*: t (48) = * 2.009**

TABLE 4: **Significance of the differences between district and state level footballers on self-esteem**

GROUP	Self-Esteem Mean±SD	Mean Difference	Standard Error	t-value
District	20.69±4.21	2.49	1.185	* 2.10
State	23.18±4.17			

****Significant at 0.05 level of confidence*: t (48) = *2.009**

Statistical comparison of state and district level footballers reveals the existence of statistically significant difference in imagery and self esteem (tables 3 & 4). The results in general indicate higher imagery and self esteem status in case of state level footballers than the district level footballers. This differences may occurs due to the fact that the state level footballers were more experienced and had higher levels of physical fitness and thus used imagery during sports situations more so than district level footballers. Again the significant difference in self esteem may be observed due to the fact that the state level footballers had higher level of participation experience, higher level of game specific fitness and practices more than the district level footballers.

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Treatment of Plantar Fasciitis by Taping vs. Iontophoresis: A Randomized Clinical Trial

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Abstract

The purpose of the study was to observe the effect of combination of a Taping and Iontophoresis or Taping alone in the treatment of Plantar Fasciitis pain. A total of 30 patients (male =16; female=14) were selected as subjects and they were further divided into two groups. Each group comprising of 15 subjects (male=8; female=7). The results of the present study show an improvement in the mean values of Visual Analog Scale, and Foot Functional Index scores after treatment in both groups. But it was found that an improvement was statistical significant more in Taping and Iontophoresis group than Taping group alone. It was concluded that if the patients of plantar fasciitis were treated with combination therapy (Taping & Iontophoresis) then there was noticed significant recovery from pain and disability in them.

Keywords: Plantar Fasciitis, Iontophoresis, Taping, Pain

Introduction

Plantar fasciitis (PF) has been reported across a wide sample of the community that includes both the athletic and non – athletic population *(Schepsis et al., 1991)*. Plantar fasciitis represents the fourth most common injury to the lower limb *(Ambrosius and Kondrachi 1992)*. In the non- athletic population, it is most frequently seen in weight bearing occupations with unilateral involvement most common in 70% of cases. In the athletic population, 10% of all running athletes involved in basketball, tennis, football, long distance runner and dancers' have all noted high frequency of plantar fasciitis. Obesity and pronated foot posture are associated with chronic plantar heel pain and may be risk factor of the condition. 10% of the population at some point in their lifetime experience plantar heel pain *(Riddle and Schappert 2004)*. In 2000 the foot and ankle special Interest Group of the Orthopedic Section, APTA, surveyed over 500 members and received responses from 117 therapist. Of those responding, 100% indicated that plantar fasciitis was most common foot condition seen their clinic *(Delitto et al., 2008)*.There is a little knowledge about the clinical course of the condition and is unknown approximately in 85% of the cases *(Roxas 2005)*. The commonly prescribed treatment options are conservative and surgical interventions *(Weil et al., 1994)*. Various treatment strategies, including orthoses, stretching, taping, extracorporeal shock wave therapy, laser therapy and drug therapy in the form of systemic medication, and topical application, have been investigated and have shown variable clinical benefit. Studies have shown clinically relevant

improvements in PF symptoms using Iontophoresis of Dexamethasone *(Gudeman et al., 1997)* and acetic acid *(Japour et al., 1999*). Non- steroidal anti- inflammatory drugs have been trialed, but did not show clinically significant effects *(Osborne and Allison 2006)*. Low Dye taping supports the longitudinal arch of the foot. It has been shown to significantly reduce peak plantar pressures of normal feet during gait, especially the peak plantar pressure in the medial midfoot, Low-Dye taping is applied below the ankle and is hypothesized to generate a supinating force that controls the amount of pronation occurring at the subtalar joint *(Russo & Chipchase, 2001)*, so it might be expected to play a role in the management of PF. No studies have examined how taping interacts with drug therapy during treatment of PF. The purpose of the present study is to test the combination therapy of Taping & Iontophoresis on pain and disability in plantar fasciitis patients.

Materials & Methods

The 30 patients of plantar fasciitis both males & females in the age range of 24 to 58 years were selected as subjects after obtaining their consent based on inclusion and exclusion criteria of the study. The subjects were further divided into two groups: Group- A (n=15) and Group-B (n =15).

Treatment Protocol: The subjects of Group - A underwent the taping and Iontophoresis. The Iontophoresis comprises of an electric impulses from a low-voltage galvanic current stimulation unit to drive ions (0.9% NaCl) into soft tissue structures. (Figure 1). Saline water is made by 0.9% NaCl solution. Then the solution is poured into a water bath. Electrodes are fixed, red positive electrode is placed under the metatarsals heads and the black negative electrode is placed under the calcaneal bone. Current is applied using Uniphy Guidance -C machine. A current up to 4 mA for 10 minutes and a total dose of 40mA is delivered over a period of time determined by the patient's sensitivity.

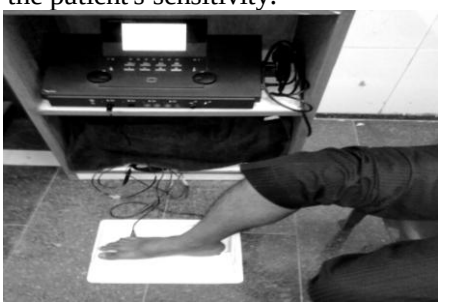

Figure 1.Showing Iontophoresis to the Patient

The taping procedure comprised of

LAYER1 - Patient lie in the prone position, (1" or 2" sports/cloth tape spray with tape adhesive prior to taping) Starting behind small toe, coursing around back of heel and adhere to inside of arch right behind great toe. Before adhering to great toe, slightly push down on joint behind great toe to increase bowing of arch as shown in figure 2.1

LAYER 2 - Apply 2" sport tape (cloth) to bottom of foot with pressure up into the arch. Tape should adhere to 1st layer of tape on both sides of the foot. Can leave heel open if choose. Repeat this 3-4 times with each layer offset from the previous about 1/2 the width of the tape until arch is covered as shown in figure 2.2

LAYER 3 - Apply another strip of tape as you did in the first layer (one strip only). This will cover the ends of the 2" tape of

the second layer on each side of foot to prevent peeling up (Figure 2.3).

The foot should be in 'neutral position' i.e. foot in line with the ankle which is in line with the knee.

Figure 2.1

Figur 2.2

Figur: 2.3

The training frequency of the treatment session for both the groups and for each treatment if for 1 week for one time in a day. The Group B underwent the taping treatment alone. The scores of VAS (Visual Analog Scale) and stiffness (Foot Functional Index) of each subject of Group- A and Group- B were recorded before and after 1-week.

Statistics

The data was analyzed using statistical computer software 'SPSS 13 software package (version 13, SPSS Inc. Chicago, USA)'.The paired t – test and unpaired t – test was used. The level of significance was $p<0.05$.

Results

The mean age and BMI of the subjects of Group -A and Group-B was 41.33 ±12.11 years, 43.93±8.860 years, 30.05 Kg/m^2 and 28.36 Kg/m^2 respectively. It was found that the difference in the mean values of age and BMI between Group -A and Group-B was not statistical significant (Table 1).

Table 1: Comparison of Age & BMI

	Group A	Group B	t-value
Age(years)	41.33±12.11	43.93±8.860	0.700
BMI(Kg/m^2)	30.05	28.36	0.681

*significant p<0.05

Table 2: Comparison of Scores (Unpaired t - test) of VAS & FFI between two groups

		Group A	Group B	t-value
VAS(Mean±SD)	before	6.27±0.799	6.40±0.737	2.05*
	after 1 week	3.87±0.834	4.93±0.884	
FFI(Mean±SD)	before	41.91±3.85	41.91±1.94	2.05*
	after 1 week	23.44±3.63	32.70±2.20	

*significant p<0.05

Table 2 shows the comparison of scores of Visual Analog Scale (VAS) and FFI between Group- A and Group- B before and after one week. It was found that before the start of one week treatment programme to the subjects of Group- A and Group- B there was no statistical difference in the scores of VAS and FFI. After one week there was statistical significant difference in the scores of VAS and FFI in both the groups but a greater

improvement was observed in Group- A as compared to Group- B (Table 2).

Further, it was found that in Group-A there was a statistical significant improvement in the scores of VAS & FFI after one week (Table 3).

Table 3. Paired t-test of VAS & FFI of Group A

	before	after one week	t-value
VAS(Mean±SD)	6.27±0.79	3.87±0.83	2.14*
FFI(Mean±SD)	41.92±3.85	23.45±3.63	2.14*

*significant p<0.05

Similarly, it was found that in Group-B there was a statistical significant improvement in the scores of VAS & FFI after one week (Table 4).

Table 4. Paired t-test of VAS & FFI of Group B

	before	after one week	t-value
VAS(Mean±SD)	6.53±0.64	4.93±0.88	2.14*
FFI(Mean±SD)	41.92±1.94	32.70±2.20	2.14*

*significant p<0.05

Discussion

The result of present study shows that subjects in both the groups had significant decrease in pain and improvement in FFI. However, out of the two groups, the Group-A receiving Iontophoresis along with Taping had a higher percentage of change in both pain and stiffness as compared to Taping alone. Therefore the null hypothesis is rejected and thus alternate hypothesis is accepted. As Plantar Fasciitis is one of the conditions which can be treated by a wide variety of physiotherapy methods, it is still difficult to formulate all proof guidelines for the management of Plantar Fasciitis. Various methods of treatment exist with own claims of success without any attempts of comparing the maximal effective methods. Both the groups in present study had equal number of subjects and there was no significant difference found with respect to their gender distribution, age and body mass index. Radford et al., (2006) found a short term effectiveness of low - dye taping compared to sham ultrasound (placebo) at reducing pain. The benefits of taping found in this study are consistent with research with mechanical adaptations. And this change in mechanics reduces the strain on plantar fascia by supportive tape during standing and ambulation. So the use of taping provides the mechanical stability and support for the strained plantar fascia. In the clinical setting taping results in almost immediate changes in symptoms. It is proposed that, during this short term alleviation of symptoms, the adjunct management options have time to reach therapeutic thresholds. Taping can be applied in either the acute or chronic condition (Vicenzino et al., 1997). It may be more cost - effective for acute cases of plantar fasciitis *(Young et al., 2001)*. Both taping strategies (Low – dye taping and calcaneal taping) were associated with a reduction in pain for 1 week after plantar fasciitis. *Holmes et al., (2002) & Vicenzino et al., (2000)* demonstrated the effectiveness of low - dye taping in reducing pain in plantar heel pain patients. The result of the present study is bolstered by the study of *Osborne and Allison (2006)* that showed the reduction in the symptoms of plantar fasciitis patients. *Drooga et al., (2004)* determines with his study that Iontophoresis benefits with vasodilatation due to attenuated addition of molar concentrations of NaCl to the iontophoresis solutions. Chorine is applied as NaCl solution and has a sclerolytic effect that reduces redundant scar tissue, which increases extensibility of scar tissue and connective tissue and used in contracture indications. *Drooga &*

Sjoberga (2003) study the effect of ionic strength of the vehicle on the nonspecific vasodilatation during iontophoresis of sodium chloride and deionized water. They found that anodal and cathodal iontophoresis induced a voltage over the skin that was dependent on the ionic strength of the test solution. The nonspecific vasodilatation during anodal iontophoresis was less pronounced than during cathodal iontophoresis, and was independent of the voltage over the skin. The nonspecific vasodilatation in cathodal iontophoresis was related to the voltage over the skin, and was possibly mediated by depolarization of local sensory nerves. The result of the NaCl Iontophoresis along with Taping group shows significantly greater improvements in morning pain where as such results could not be found out when seen in taping alone. So this study adds that drug delivered (NaCl) when delivered via Iontophoresis in combination with Low Dye taping, give good short tern relief. The benefits of taping are reduced when it is stopped, however when it is combined with Iontophoresis, treatment effects are maintained. Future research is needed using a control group to evaluate the treatment approach used in the study and also the long term benefits of the intervention used.

Conclusion

It was concluded that if the patients is given Iontophoresis along with the Taping, a better management is seen for pain and stiffness to those patients treated with Taping alone.

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Effect of Positional Release Therapy and Deep Transverse Friction Massage on Gluteus Medius Trigger Point - A Comparative Study

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Abstract

Study Objectives: To compare the effectiveness of Positional Release Therapy & Deep Transverse Friction Massage On Gluteus Medius Trigger Point. *Methods:* 30 subjects were randomly recruited from various hospitals and community center in Dehradun and Guwahati based on the inclusion and exclusion criteria. The subjects were divided into two Groups (PRT (Group A) & DTFM (Group B). *Outcome Measure***:** Pressure pain threshold. *Results***:** Both Groups A and B shown significant improvement in pressure pain threshold when comparison is made within the group. However Group B shown significant improvement in pressure pain threshold (p= 0.001) post intervention between the group. *Conclusion***:** Deep transverse friction massage is better choice of treatment in improving pain threshold in subjects with gluteus medius trigger point.

Key Words: Myofascial Trigger Point, Myofascial Pain Syndrome, Strain Counter Strain, Pressure Pain Threshold.

Introduction

Myofascial trigger points are extremely common and become a painful part of nearly everyone's life at one time or other. Myofascial trigger point is described as a hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band. Myofascial trigger points are the hallmark characteristics of Myofascial pain syndrome and feature motor, sensory, and autonomic components. Motor aspects of active and latent trigger points may include disturbed motor function, muscle weakness as a result of motor inhibition, muscle stiffness, and restricted range of motion. Sensory aspects may include local tenderness, referral of pain to a distant site (*Dommerholt et al., 2006; Travell, 1999*).

The formation of a myofascial trigger point may result from a variety of factors such as a severe trauma, overuse, overstress, psychological stress and joint dysfunction. Recent studies have hypothesized that the pathophysiology of Myofascial pain syndrome and the formation of Myofascial trigger point result from injured or overloaded muscle fibres leading to involuntary shortening and loss of oxygen and nutrient supply with increased metabolic demand on local tissues (*Dommerholt et al., 2006; Fernandez C et al., 2005 and Malanga, 2010*). Simons and Travell suggested that trigger points in the muscle quadratus lumborum and gluteus medius are frequently found in low back pain. Trigger points in the gluteus medius muscle refer pain and tenderness along the posterior

crest of the ilium, to the gluteal (posterior and lateral aspect) and sacral regions which is commonly identified as low back pain or lumbago (*Simons, 1983; Travell, 1999*).

Positional release technique or strain counterstrain technique (PRT or SCS) is a passive intervention aimed at relieving musculoskeletal pain and related dysfunction (*Atienza Meseguer et al., 2006; Chaitow, 2002; Ambrogio, 1997*). The classical description of this technique was made by Jones in 1981 who recommended the adoption of a position of comfort of dysfunctional tissue exhibiting tender points (*Atienza et al., 2006*). Dardzinski et al (2006) found that the strain counterstrain technique was effective in reducing pain and improving function in patients with localized myofascial pain syndrome. Wong et al (1994) reported that strain counter strain reduced sensitivity to palpation and increased strength in subjects exhibiting tender points in the hip musculature. Deep transverse friction massage (DTFM) is a technique used by James Cyriax and Gillean Russell to affect musculoskeletal structures of ligament, tendon and muscle to provide therapeutic movement over a small area (*Prentice, 2002*). The technique is applied at right angles to the fibres comprising the tissue containing the lesion in a relaxed and shortened position (*Boyling, 1994; Prentice, 2002*). Hong et al (1993) hypothesized that deep massage can offer effective stretching and mobilization of taut bands also reducing pain and tenderness of myofascial trigger point (*Fernandez et al, 2006*). Both PRT and DTFM found separately to be effective on reducing tenderness and pain evoked by trigger points. Thus we set out to examine which amongst these techniques is most effective in treating gluteus medius trigger point. Therefore the purpose of the present study was to compare the effects of Positional Release Therapy and Deep Transverse Friction Massage on Gluteus Medius Trigger Point.

Materials & Methods

Thirty subjects were included from various hospitals and community in Dehradun and Guwahati based on the inclusion and exclusion criteria and divided into 2 groups Group A (n=15), and Group B (n=15). Subjects presenting with at least one area trigger point at gluteus medius muscle between the ages of 20 -40 years were included. Before participating, the subjects read and signed informed consent form that was approved by the Institutional review board. Pre intervention measurements of pressure pain threshold using algometer were carried out for each patient. All the subjects received interventions in alternate days for 3 days. The PPT value was measured on 3rd day and 5th day prior to treatment and the final reading was taken on 7th day. Subjects were excluded from the participation like any sensory disturbances in the gluteus medius region, Diagnosed disc prolapse, History of any trauma or surgery of the lower back or hip region, Diagnosed fibromyalgia syndrome, If the subjects is undergoing any myofascial pain therapy in the past one month before the study, and Sacroiliac joint dysfunction.

*Procedure***:** Positional release technique subjects were asked to lie prone

with the therapist standing on the same side of the trigger point. Once the trigger point was palpated on the gluteus medius the therapist extend and abducts the hip and supports the patient's leg on the therapist thigh until reported pain reduces by 70%. The hip is positioned in marked external rotation for trigger points located posterior to the mid axillary line and in internal rotation for those located anterior to mid axillary line. The position of comfort was held for 90 sec. After the release the subject was put back slowly and passively to the neutral position (*Ambrogio, 1997; Chaitow, 2002*).The same procedure was repeated for 5 times.

Deep Transverse Friction Massage subjects were asked to lie prone with pillow placed under the thigh of the involved side. The treatment area was cleaned and dried before applying the technique. The treatment was applied by the therapist standing at the side of the patient. Treatment was given by thumb after the involved trigger point was palpated on the gluteus medius with the muscle in relaxed and shortened position (hip extension and abduction). The thumb was used by the therapist to apply friction across the fibre of the muscle. Transverse friction was applied with as much pressure as the patient tolerated and the therapist's thumb and the patient's skin was moved together as one. The treatment was applied for 10 minutes (*Boyling and Palastanga, 1994*).

Data was analysed by using SPSS software (version-13). Paired t-test was applied to compare the PPT within the groups. Independent t-test was applied to compare the PPT between the groups. The p value was set at ($\leq$0.05).

Results & Discussion

Table 1.1: Mean and SD of Age for the subjects of Group A and Group B

Demographic	Group A		Group B	
	Mean	SD	Mean	SD
AGE	26.47	3.31	28.07	5.90

Table 1.2: Comparison of mean value for PPT at 1st, 3rd, 5th and 7th day within Group A and Group B

	Group A		Group B	
PPT	t	p	t	p
1st v 3rd	-9.260	0.000	-16.84	0.00
1st v 5th	-12.36	0.000	-9.136	0.00
1st v 7th	-12.91	0.000	-17.62	0.00

Table 1.3: Comparison of mean value for PPT at 1st, 3rd, 5th and 7th day between Group A and Group B

PPT	GROUP A Vs GROUP B	
	t	P
1st day	-1.280	0.211
3rd day	-2.813	0.009
5th day	-2.981	0.006
7th day	-3.890	0.001

The study showed that there is improvement in the pressure pain threshold after the intervention in both the groups as shown in Table 1.2 and Fig.1.1. This improvement in pressure threshold was found to be statistically significant with p=.001. When comparison is made between the group, Group B (Deep Transverse Friction Massage) showed more improvement in pressure pain threshold as compared to Group A. Table 1.3 shows the mean value of the data collected at 1st (pre) day had been found statistically insignificant (p-value = .211) and the data of 3rd, 5th and 7th day which had been found statistically significant (p-value= .009, .006, .001) when compared between the group. Fig.1.2 and fig.1.3

shows the improvement in the pressure pain threshold after the intervention between the Group A and Group B, which clearly indicate that there is significant improvement in Group B.

Discussion: Myofascial trigger points are extremely common and become a painful part of nearly everyone's life at one time or other (*Dommerholt et al., 2006*). Trigger point in gluteus medius muscle cause referred pain that is commonly identified as low back pain or lumbago. Its three trigger point regions together refer pain and tenderness primarily along the posterior crest of the ilium, to the sacrum and to the posterior and lateral aspect of the buttock. Pain and tenderness may extend to the upper thigh also (*Prentice, 2002; Travell, 1999*). After comparison Group B (Deep transverse friction massage (DTFM)) showed significant effect on improving the pain threshold in subjects with gluteus medius trigger point. We compared transverse friction massage with Positional release technique as some therapist claims that transverse friction technique places considerable strain on their hand. However, DTFM was found to be significantly effective than PRT.

Transverse friction massage involves the application of friction and pressure at depth to the offending lesion which is considered to be the cause of pain or reduced function (*Cyriax, 1978*). Force is applied perpendicular to the fibres in an attempt to separate each fibres, mechanically, promotes local hyperemia, analgesia, and reduction of adherent scar tissue to ligament, tendon and muscle structure. Deep transverse frictions cause the stimulation of nociceptive endings connected to Aδ fibres and mechanoreceptors found in soft tissues which are connected to large diameter Aβ fibres. These large diameter fibres have an effect on cells in the posterior horn of the cord tending to inhibit forward transmission of the small-diameter nociceptive information, i.e. the 'pain gate' is closed. Hence it is suggested that presynaptic inhibition at cord level will modulate peripheral pain and reduce its perception (*Watson, 1986; Bowsher, 1988*). There may also be inhibition of neurotransmission exerted from higher centers, as the arrival of nociceptive stimuli at certain central inhibitory nuclei in the CNS (Raphe nuclei and periaqueductal area of grey matter in the midbrain) causes release of chemicals from neurons at cord level which block the action of nociceptive neurotransmitters (encephalin, endorphin). Consequently, in terms of modulation of pain, transverse frictions can be justified on both counts as they will cause presynaptic inhibition at the cord level and inhibit pain by the central production of encephalins (*Boyling and Palastanga, 1994*). Massage increases the blood circulation in the soft tissue, thus enhances the excretion of lactate or inflammatory substances and facilitate secretion of endogenous opiates (*Yoon et al., 2012*). This mechanism explains the reason for the results in our study where the pain threshold improved significantly in the DTFM group.

Macgregor et al (2012) suggested that massage resets sarcomere lengths. Deep cross-friction massage facilitates the proliferation of fibroblasts and results in the facilitation of soft tissue healing and realignment as pressure applied to the muscle is increased (*Yoon et al., 2012*). It

is also reported that deep cross-friction massage was effective on subacute non-specific low back pain (*Farasyn & Meeusen, 2007*). Hong and colleagues (2006) reported that the best results in decreasing pain from myofascial trigger point were obtained with a deep pressure soft tissue massage. These results support our study where the pain threshold improved significantly in DTFM group. However the present study showed significant effect in Group A (positional release therapy) on pain threshold in within group. In support of present study Positional release technique is thought to achieve its benefits by means of an automatic resetting of muscle spindles which would help to dictate the length and tone into the affected tissues (*Atienza Meseguer et al., 2006*). Simons proposed that local pressure may equalize the length of the sarcomeres in the involved Trp (trigger point) and consequently decrease pain. Strain-counterstrain technique is usually applied with the targeted muscle in a shortened position, and used to treat tender points (*Fernandez et al., 2006*). It might be that pain relief from strain-counterstrain technique may result from the stimulation of Aδ fibres (*Atienza Meseguer et al., 2006)*. These reasons supports the results of our study where the pain threshold improved in the PRT group. Wong and Schauer-Alvarez found in their study that strain-counterstrain reduced sensitivity to palpation in subjects exhibiting tender points in hip musculature (*Atienza Meseguer et al., 2006*). Dardzinski et al found that the strain counterstrain technique was effective in reducing pain and improving function in patients with localized myofascial pain syndrome (*Dardzinski et al., 2006*). Results of the present study demonstrates that group B showed statistically significant improvement in pressure pain threshold when compared to group A. Reduction in myofascial trigger point tenderness after the application of PRT could be due to the manual contact component of the treatment and also due to change in trigger point sensitivity rather than any unintentional release of pressure as suggested by Lewis C and Fryer and Hodgson in their study. On the other hand transverse friction massage not only results in the resets of sarcomere lengthening but it also helps in the proliferation of the fibroblast which thereby not only improves the soft tissue healing but also realign the muscle fibres by offering the effective stretching and mobilization to the taut bands. This mechanism could be the reason for better result yielded in the DTFM group

Limitations of the study are small sample size and no blinding was done in the study. Future study can be done with broader dimension, long term follow up and with the use of other outcome measure (range of motion and ODI scale).

Conclusion: The present study demonstrates that both the technique is effective in improving the pain threshold in subjects with gluteus medius trigger point. Our study highlights that deep transverse friction massage is better choice of treatment in improving pain threshold in subjects with gluteus medius trigger point.

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Impact of Chronicity on Lipid Profile of Type 2 Diabetics

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Abstract

Aim: To study the impact of chronicity of type 2 diabetes on lipid profile in type 2 diabetics. **Material & Methods:** This study was conducted on 120 Punjabi male type 2 diabetics. Their age ranged from 30 to 70 years. The subjects were categorized into three groups, on the basis of the duration of detection of type 2 diabetes- group 1(below 4 years), group 2 (between 4 to 8 years) and group 3(above 8 years).**Results:** There was sharp and definite increase in the percentage of patients having >200mg/dl total cholesterol after four years of diabetes mellitus from 16% to 25% and then to 55% after 8 years of duration. The percentage of patients having >150mg/dl of low density lipoproteins (LDL) after 8 years of diabetes mellitus was much high (67%) as compared to group 1 (29%) and group 2 (49%) . There was also an increase in the percentage of patients having <160mg/dl of triglycerides after four years of diabetes mellitus from 14% to 37% of diabetes and then to 56% after 8 years. **Conclusion:** The chronicity of Type 2 Diabetes mellitus disturb the normal levels of lipid profile that is dyslipidemia if unchecked this may lead to atherosclerosis and ultimately Cardio-Vascular Disease (CVD) and it is the commonest cause of death in type 2 diabetics.

Key words: Type 2 Diabetes Mellitus, Lipid profile, Dyslipidemia.

Introduction

Dyslipidemia is one of the major cardiovascular disease (CVD) risk factors and plays an important role in the progress of atherosclerosis, the underlying pathology of CVD. The prevalence of dyslipidemia in type 2 diabetes is double with respect to the general population *(Haffner, 1998)*. In patients with type 2 diabetes, which is equivalent to CHD *(Juutilainen et al. 2005)*; it is most commonly characterized by elevated TG and reduced HDL-C *(Goldberg, 2001)*. These abnormalities can be present alone or in combination with other metabolic disorders. The prevalence of dyslipidemia varies depending on the population studied, geographic location, socioeconomic development and the definition used *(Wood et al, 1972; Berrios et al, 1997)*. Triglyceridemia has been associated with increased risk of coronary heart disease both in non-diabetic and type 2 diabetic subjects *(Frank et al., 2002, Sridhar, 2002)*. Remnants of triglyceride rich lipoproteins seem to be extremely atherogenic *(Car et al., 2004)*. LDL cholesterol is related to life style factors such as diet and exercise *(Khatit et al., 2008)*. It has been associated with metabolic syndrome *(Analava et al., 2007)*. The Pro-atherogenic properties of small LDL particles may relate to their ability to penetrate the arterial wall and thereby making them more susceptible to

oxidation, indirectly linked with coronary artery disease *(Goldfine and Beckman, 2008)*. Coronary artery disease represents a wide spectrum from angina pectoris, myocardial infarction and sudden death to silent myocardial ischemia *(Mozaffarian et al., 2006)*. Silent myocardial ischemia has a reported prevalence of 10-20% in diabetic population as compared to 1-4% in non-diabetic population *(Ronald et al., 2004)*. The present study was planned to identify the impact of Chronicity on lipid profile among type 2 diabetic Punjabi population.

Material and Methods

This prospective study was conducted on 120 type 2 diabetic patients. The age limit was taken from 30 to 70 years. Only male patients were selected on random base as subjects. The study protocol was reviewed and approved by the Ethics Committee of Punjabi University, Patiala. Following exclusion criteria was used-patients with type 1 diabetes mellitus, any liver, kidney or cardiac failure, neoplasm and patients who were on any type of anti-lipidemic therapy. The objectives of the present study were thoroughly explained to the subjects. Participants of the study were divided into three groups according to the duration of detection of diabetes mellitus. In the first group patients with history of type 2 diabetes mellitus below 4 years were included; second group included 4-8 years and third group included above 8 years duration of type 2 diabetes mellitus. The patient underwent a clinical assessment, which included history (a questionnaire) and clinical examination. The variables of questionnaire were age, sex, marital status, personal history (occupation, education, socio-economic status) exercise status, smoking status and family history (including family history of diabetes). The serum was separated immediately after obtaining the blood sample (overnight fasting) using centrifugation for 10 minutes. Lipid Profile [Total Cholesterol (TC), HDL & Triglycerides (TG)] were measured using Blood Analyzer by the qualified laboratory technician. The appropriate chemical testing kits were used. LDL was calculated by using Friedewald formula: LDL= TC – (TG/5) - HDL.

Results & Discussion

Among 120 patients with diabetes below 4 years of onset, 21(**48%**) had total cholesterol levels <150mg/dl while 16(36%) had total cholesterol levels 150–200mg/dl and 7(16%) had >200mg/ dl. Among those with diabetes for 4-8 years, 15(30%) had total cholesterol <150 mg/dl while 12(25%) had 150-200mg/dl and 22(**45%**) had levels >200mg/dl. Among those with diabetes for above 8 years, 5(19%) had total cholesterol levels < 150mg/dl while 7(26%) had 150-200mg/dl and 15(**55%**) had >200mg/dl.

Among 120 patients with diabetes below 4 years of onset, 10(23%) had HDL - cholesterol levels <40mg/dl while 34(**77%**) had >40mg/dl. Among those with diabetes for 4-8 years, 19(39%) had HDL cholesterol <40mg/dl while 30(**61%**) had >40mg/dl. Among those with diabetes for above 8 years, 17(**63%**) had HDL cholesterol <40mg/dl while 10(37%) had >40mg/dl.

Among 120 patients with diabetes below 4 years of onset, 31(**71%**) had LDL-cholesterol levels <150mg/dl while

13(29%) had >150mg/dl. Among those with diabetes for 4-8 years, 25(**51%**) had LDL cholesterol levels <150mg/ dl and 14 24(49%) had LDL cholesterol >150mg/dl. Among those with diabetes for above 8 years, 9(33%) had LDL cholesterol <150 mg/dl while 18(**67%**) had LDL cholesterol levels >150mg/dl. Among 120 patients with diabetes below 4 years of onset, 38(**86%**) had triglyceride levels from 40-160 mg/dl while 6(14%) had >160mg/dl. Among those with diabetes for 4-8 years, 31(**63%**) had triglycerides from 40-160 mg/dl while 18(37%) had >160mg/dl. Among those with diabetes for above 8 years, 12(44%) had triglycerides 40-160 mg/dl while 15(**56%**) had >160mg/dl.

Table: Duration of Type 2 diabetes and lipid profile of different groups.

Group	Group 1, (below 4 years)		Group 2, (4-8 years)		Group 3, (above 8 years)	
TC (mg/dl)						
<150	**21(48%)**	**135±5.9**	**15(30%)**	**141±2.2**	**5(19%)**	**148±4.1**
150-200	**16(36%)**	**168±8.2**	**22(45%)**	**177±6.9**	**7(26%)**	**181±3.3**
>200	**7(16%)**	**202±2.0**	**12(25%)**	**214±3.7**	**15(55%)**	**222±5.2**
HDL (mg/dl)						
<40	**10(23%)**	**39±3.5**	**19(39%)**	**35±3.0**	**17(63%)**	**31±4.2**
>40	**34(77%)**	**52±5.4**	**30(61%)**	**47±2.8**	**10(37%)**	**44±3.6**
LDL (mg/dl)						
<150	**31(71%)**	**121±4.1**	**25(51%)**	**134±5.4**	**9(33%)**	**140±2.0**
>150	**13(29%)**	**145±7.2**	**24(49%)**	**157±3.9**	**18(67%)**	**169±4.7**
TG (mg/dl)						
40-160	**38(86%)**	**120±7.2**	**31(63%)**	**143±3.7**	**12(44%)**	**147±5.3**
>160	**6(14%)**	**160±2.9**	**18(37%)**	**171±4.7**	**15(56%)**	**183± 2.0**

TC- total cholesterol, HDL- high density lipoproteins, LDL-low density lipoproteins, TG- triglycerides

The Patients with diabetes have a higher degree of atherosclerosis burden due to dyslipidemia than the people without diabetes *(Mohsin et al., 2007)*. New National Cholesterol Education Programme (NCEP) guidelines raise the risk factors of patients with diabetes without known CHD to CHD equivalent, a guideline substantiated by the results of numerous studies *(Alexander et al., 2003)*. For example in Finnish East West Study, patients with diabetes, without known heart disease had 20% chance of having a cardiac event over a 7 years time period *(Haffner et al., 2000)*. In Canadian patients with type 2 diabetes a Chart audit study revealed that 55% of patients with a diagnosis of <2 years had dyslipidemia. This population rose to 16% in patients with diabetes for >15 *years (Harris et al., 2005)*. The United Kingdom Prospective Study (UKPDS) calculated risk score for CVD, which indicates both the duration and the degree of glycemic control *(Guzder et al., 2005). Talat et al, (2003)* found that duration of diabetes was associated with higher incidence of dyslipidemia. In that study they found elevated total cholesterol, low density

lipoprotein and triglycerides. Our study is consistent with that.

Conclusion: The chronicity of Type 2 Diabetes mellitus can disturb the normal levels of lipid profile which can lead to dyslipidemia. The advanced dyslipidemia can progress the atherosclerosis and ultimately Cardio-Vascular Disease (CVD), commonest cause of death in type 2 diabetics.

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Comparative Dose-Response Study of Stretching On Strength of Proximal (Hamstring) and Distal (Calf) Muscle

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Abstract

Objective: To compare the stretching induced strength changes between the proximal and distal groups of muscles. *Methods:* Twenty-eight recreationally active male individuals participated in this study. They were assigned into Group A for proximal muscle (hamstring) and group B for distal muscle (calf) with 14 subjects in each group. This study is an experimental trial of self-stretching for 2 minutes (SS_2). This stretch duration involved a 30 second stretch and a 20 second relaxation period, intermittently. Maximum Isometric Voluntary Contraction Force (MIVCF) was measured in both groups before (pretest) and immediately after (posttest) stretching. Change in pre-stretching and immediately post-stretching MIVCF was compared between the two groups. *Results:* Maximum Isometric Voluntary Contraction Force increased with SS_2 in the hamstring by 1.31% and in calf muscle, it increased by 2.92%. However, these changes were statistically insignificant between the two groups ($p>0.05$). *Conclusion*: Shorter stretching (2 minute) increases maximum isometric voluntary contraction force in both muscles but relatively more in the calf.

Key Words: Stretching induced, strength, MIVCF, strain gauge

Introduction

Stretching is traditionally used as part of a warm-up to increase flexibility or pain-free range of motion (ROM) about a joint in an attempt to promote better performances and/or reduce the risk of injury *(Shellock and Prentice, 1985; Smith, 1994; Fowles et al., 2000)*. Athletic trainers and other rehabilitation professionals also recommend that their athletes or patients stretch before performing strengthening exercises or strength assessment tests *(Bixler and Jonese, 1992)*. However, authors of recent systematic reviews and many original studies have suggested that pre exercise stretching may temporarily compromise a muscle's ability to produce force *(Behm, 2001; Young and Elliott, 2001; Thacker et al., 2004; Shrier, 2004)*. It is possible that this short-term effect of stretching on muscle force production may affect the performance of various rehabilitation strengthening exercises. More importantly, pre exercise stretching may adversely affect the results obtained by muscle strength assessments and, in turn, influence a clinician's decisions regarding rehabilitation progression or return to play *(McHugh and Nesse, 2007; Herda et al., 2009)*. *Fowles et al (2000)* reported that 30 minute of passive stretching reduces

isometric torque by 28% and a 9% force deficit was still present at 1 hour post stretching. The reason for this reduction in muscle strength was thought to be mainly due to changes (decrease) in musculotendinous stiffness and altered motor control strategies (decreases in muscle activation) *(Behm, 2001; Knudson et al., 2001).*

In a study by *Ryan et al (2008)* it was suggested that shorter durations of stretching may not diminish muscle activation in the plantar flexors. In contrast, larger muscle groups such as the leg extensors have demonstrated reductions in muscle activation after 8 minute of stretching. Therefore, it is possible that the stretching induced decreases in muscle activation may be muscle specific, such that the suboptimal activation of the larger, proximal muscles may be amplified after stretching, whereas the near fully activated, distal muscles require longer durations of stretch to diminish muscle activation. Since then, no study has been done to test this hypothesis.

The present study involved the comparison of a proximal muscle and distal muscles regarding strength loss after stretching. It is hypothesized that self-stretching would result in transient acute reduction in muscle strength and stretch induced strength loss would be greater for proximal muscle (Hamstring muscle) as compared to distal muscle (Calf muscles).

Materials & Methods

Subjects: A total of 28 male subjects with mean age 24.89 years were studied. Fourteen in group A participated in stretching and strength measurement of the proximal muscle (hamstring) and 14 in group B participated in stretching and strength measurement of distal muscle (calf). Inclusion criteria were; 20-30 years age group, subjects lacking at least 20 ˚ degrees of active knee extension with the hip in 90 degrees of flexion during active knee extension test for group A and for group B subjects having not more than 20 degrees of active dorsi-flexion in long sitting position with back supported against wall *(Worrell, 1994).* All the subjects were recreationally active (engaging in 1 to 5 hours of regular physical activity, not involving stretching exercises, per week). No one reported any current or ongoing neuromuscular diseases or musculoskeletal injuries specific to ankle, knee, or hip joints. None of the participants were competitive athletes. The study has the approval of Institutional Ethical Committee, Jamia Hamdard, New Delhi and written consent was obtained from all the participants. All subjects were recruited from Majeedia Hospital, New Delhi.

Study design: This was a pretest posttest experimental group designed to evaluate the effect of stretching on reduction of muscle strength and the comparison of a proximal muscle and distal muscles regarding strength loss after stretching. This study includes pre intervention assessment, Intervention and post intervention assessment.

Pre intervention assessment: Active range of motion and MIVCF were measured. All the procedures were explained to the subjects prior to assessment.

(A). AROM measurement*:* Active range of motion (AROM) was measured using Universal Goniometer.

1. For Hamstring muscle: Active knee extension test was performed *(Sullivan et al., 1992; Worrell et al., 1992)*. Subjects were made to lie supine. Hip joint was kept at 90 degrees of flexion. Immovable arm was placed parallel to long axis of the thigh. Fulcrum was placed at the lateral condyle of the femur. Movable arm was placed parallel to long axis of the leg. Subjects were asked to actively extend the leg up to maximum range. Lack in full extension at knee was noted.

2. For calf muscle: Subjects were made to lie in the supine position. Fulcrum of the goniometer was placed over the lateral malleolus. Immovable arm was placed parallel to the fibula. Movable arm was placed parallel to the lateral border of the foot. Subjects were asked to actively dorsiflex the foot from neutral ankle position (i.e. 90 degrees angle between foot and leg). The range, through which foot moved, was noted.

(B). Isometric strength measurement: The MIVCF was measured using electronic strain gauge device (Gold tech-model GTH, ENF Act 1985). It is a reliable and valid tool to measure muscle strength *(Kennedy, 1965; Tiainen et al., 2004; Vivodtzev et al., 2006)*.

1. For Hamstring muscle: Subjects were made to sit on quadriceps table with arms resting on thighs. Thighs were tied to quadriceps table with the help of a strap. Hip joint was kept at 90 degrees of flexion and knee joint at 60 degrees of flexion. Strain gauge was attached to subject's leg. Then he was asked to flex the knee with maximum effort and hold it for 5 seconds (Fig 1).

2. For Calf muscle: Subjects were made to lie supine on a metallic couch. One roll of bed sheet was kept below the knee to put it in 20 degrees of flexion. Strain gauge was attached to subject's foot. Ankle was kept at neutral position, having 90 degrees angle between foot and leg.

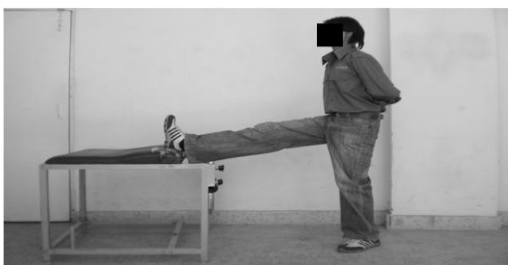
Figure 1: Measurement of isometric contraction of Hamstring muscle

Subjects were asked to plantar flex the foot with maximum effort and hold it for 5 seconds (Fig 2).

Figure 2: Measurement of isometric contraction of Calf muscle

Figure 3: Subject doing self stretching of hamstring muscl

Same procedure was used to measure post intervention assessment for isometric



strength. Assessment was done immediately after the stretching.

Intervention

(A). For Hamstring stretching: Subjects were asked to stand facing the wall or quadriceps table, depending on their height. They were asked to do anterior pelvic tilt and then place the heel of the leg to be stretched on the table, and further instructed to keep their hands on their hips, hold their head in a neutral position, look forward, keep the stretched leg fully extended, extend their cervical and thoracic spine and retract their scapulae while maintaining an anterior pelvic tilt. Then they were asked to move their trunks forward at the pelvis until they perceived a hamstring stretching sensation without pain (Fig 3).

(B). For calf stretching: Subjects were made to stand in walk standing position with right lower limb behind the left. Knee of the right lower limb was kept extended; subjects leaned forward over a couch, with foot completely in contact with the ground. They were asked to lean forward till they felt the stretch in calf region but not pain (Fig 4).

Figure 4: Subject doing self stretching of calf muscle (Runners' stretch)

Protocol of stretching: The subject was asked to stretch the muscle till subject felt the stretch but not pain. This position was instructed to be maintained for 30 seconds and then release it for 20 seconds for a total of 2 minute of time under stretch *(Safran, 1989)*.

Data Analysis

Statistical analysis was done using SPSS 15.0 Software (SPSS Inc., Chicago, USA). "Paired t-test" was used to find difference in strength before and after stretching in each group. For between group analyses an independent t-test was used. A statically significant difference was defined as $p < 0.05$.

Results & Discussion

There was a significant difference ($p < 0.05$) in the means of Pre stretching MIVCF values between Group A and Group B. On the other hand, there was no significant difference ($p > 0.05$) observed in the changes in MIVCF after 2 minute of stretching in Group A and Group B. However, 2 minute stretching of Hamstrings demonstrated an increase (insignificant) in MIVCF by 1.31%, and in calf muscle and MIVCF was found to increase (insignificant) by 2.92%. Between the groups analysis revealed insignificant difference ($p > 0.05$) in the changes in MIVCF after 2 minute of stretching in between Group A and Group B (Table 1).

Table 1: Comparison of mean changes of Maximum Isometric Voluntary Contraction Force (MIVCF) after 2 minute of stretching between group A and group B

	GROUP A	GROUP B	t-test	
			t	p
Mean changes in MIVCF (Kg.)	**0.15**	**0.95**	**0.28**	**0.478**

This study was designed to investigate the effect of stretching on reduction of muscle strength and the comparison of a proximal muscle and distal muscles regarding strength loss after stretching. The hypothesis stated that the self-stretching would result in transient

acute reduction in muscle strength and stretch induced strength loss would be greater for proximal muscle (Hamstring muscle) as compared to distal muscle (Calf muscles). Results of the present study found that shorter stretching (2-minute) of hamstring muscle does not have any statistically significant effect on MIVCF although it was found to increase clinically. Therefore, if an athlete stretches his hamstrings prior to sporting event for short duration (2-minute), it will not deteriorate his performance rather it could be beneficial. Shorter stretching (2-minute) of calf muscle resulted in statistically significant increase in MIVCF (11%); therefore shorter stretching (2-minute) of calf muscle could be beneficial prior to sporting event. By comparing the two results it is concluded that calf muscle seems to be relatively more responsive to stretching than the hamstrings.

In present study stretching of hamstring muscle resulted in increase in MIVCF, which is contrary to most of the previous studies, which have shown acute reductions in muscle strength, but their stretching durations were different from our study *(Worrell et al., 1994; Fowles et al., 2000; Herda et al., 2009;)*. Studies by *Fowles et al. (2000), Herda et al. (2009)* and *Worell et al. (1994)* demonstrated significant decreases in strength after 30, 20, 10 minutes of stretching, respectively. Thirty minutes stretching protocol of *Fowles et al. (2000)* caused greatest decrease in strength (28% decrease), followed by 20-min protocol of *Herda et al. (2000)* that resulted in 10% decrease and a 10 min protocol of *Worell et al. (1994)* resulted in 7% decrease. However, *Reyan et al. (2008)* found no changes in voluntary activation (VA) in the plantar flexors when examining the acute effects of only 10-min of stretching, but longer durations of stretching have elicited decreases in VA in the plantar flexors and leg extensors. The findings of the present study are consistent with the findings of *Reyan et al (2008)* and suggest that shorter durations of stretching do not diminish muscle activation in plantar flexors. No study has compared the acute effects of stretching on proximal and distal muscles. Proximal/larger muscles are sub optimally activated whereas the distal/smaller groups of muscles are fully activated *(Kent-Braun and Le Blanc, 1996)*. Motor unit number is different for proximal and distal muscles. This may be the reason of geting different response from proximal and distal muscles.

Future scope of research

1. EMG could be used in the same study to evaluate action potentials so as to find out the reasons for increase in the strength with 2-min stretching.
2. Since response of stretching may vary with different joint angles and muscle lengths, therefore further studies are needed to compare proximal and distal muscle at different joint angles.
3. More studies are needed to examine athletes under controlled conditions and with sophisticated equipment like dynamometer.
4. Further studies can be done in which the subjects can be recruited with precise amount of muscle tightness, same body stature, and body weight etc.

Conclusion: Shorter stretching (2 minute) increases maximum isometric voluntary contraction force in both muscles but more

in the calf. This stretching has beneficial effects on muscle performance.

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Effectiveness of Integrated Soft Tissue Mobilization on the Functional Outcome in Chronic Low Back Pain Patients

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Abstract

The experimental study is aimed to analyze the effectiveness of integrated soft tissue mobilization on the pain, lumbar spine mobility and the outcome on functions in chronic low back pain (CLBP). Irrespective of low back pathologies, soft tissues are vulnerable for dysfunction and paves way for pain-spasm vicious cycle. Very few studies in CLBP are being performed to explore its effect and integrated approaches in soft tissue mobilization were not studied. Totally sixty participants were randomized into control and experimental groups in the present study. Baseline measurements of pain severity, lumbar spine mobility and Oswestry disability Index (ODI) were measured. The control group received treatment in the form of strengthening program and stretching maneuvers. The experimental group received the all form of soft tissue mobilization. After three weeks of follow up, all the measurements were taken again. The experimental group showed significant improvement as compared to the control group in terms of lumbar spine mobility, reduction of disability and moderate improvement in pain severity. This study adds the importance of integrated soft tissue mobilization in recovery from CLBP. It further establishes soft tissue mobilization as a part of functional mobilization in rehabilitating CLBP.

Keywords: chronic low back pain, soft tissue mobilization, lumbar spine mobility, ODI

Introduction

The commonest symptom in musculoskeletal pathologies is low back pain and is considered as a most common health disorder in modern society. The causes include a wide variety of pathologies of lumbar spine and surrounding structures. Research by Anderson suggests that 70 to 85 % of the population will come across low back pain at least once in their lives. Almost 90% of the acute low back pain show better improvements regardless of the therapy; remaining 10% are prone to develop chronic low back pain. Overall 90% of social costs are accounted for low back disorders (*Anderson*, 1996). This is one of the causes for long term absenteeism from work (*Hazard*, 1996) increased loss of work, sickness compensation, long term disability for long periods, need for social support and a functional restoration programs.

Depending on the duration of symptoms, low back pain can be classified as acute, sub-acute or chronic. According to European guidelines, chronic low back pain is defined as low back pain and discomfort, located below the costal margin and above the inferior gluteal folds, with or without radiating leg pain, persisting for a minimum of 12 weeks (*Airaksinen*, 2004). The 2nd most known

reason to visit the physician is noted to be chronic low back pain (*Hart*, 1995 & *Swedlow*, 1992). In India, approximately 35% people suffer from chronic back pain (*Andersson, 1999)*.

The lumbosacral region consists of 5 lumbar vertebrae and 5 sacral vertebrae fused together. These structures are an important weight bearing components supporting the trunk and upper body in postures of sitting, standing. The lumbar region is structured is such a way so as to provide maximum mobility of the spine. In order to protect the structures around this region, many ligaments and muscles surround it. The important structures in stabilizing the lumbosacral region include the erector spinae group, mutlifidus, abdominals, thoracolumbar fascia, iliopsoas and gluteus medius. The thoracolumbar fascia is an important passive structure which runs along the length of the back and provides stability during contraction of various groups of muscles at the back.

The four primary soft tissues of the body are epithelial, muscular, nervous and connective tissue. All these soft tissue structures have individual and unique functions which, when integrated work as a dynamic biomechanical unit (*Keller, 1999)*. *Grieve (1981)* has emphasized that these structures are functionally interdependent upon each other. Grieve also states that most abnormalities presenting as joint pain may be the expression of an underlying imbalance of the whole musculoskeletal system, i.e., articulation, ligaments, muscles, fascial planes and inter muscular septa, tendons and aponeurosis.

For chronic low back pain a model proposed by *Helene Langevin et al* in *2006* is pathophysiological model, which suggests a multivariate causes and pathological process is complex in chronic low back pain. The several models of abnormal movement patterns include that of pain – spasm –pain model by *Roland (1986)* and pain adaptation model describing selective increased activity of antagonist muscle causing decreased range of motion by *Lund (1991)*. The pain spasm pain cycle is a protective mechanism of the body to injury (*Scott*, 2004). Due to injury the nociceptors around the injured area get stimulated and send signals to the brain via the spinal cord where pain is perceived. Thus the brain sends signals to the surrounding muscles to contract in order to protect the area. This constant muscle contraction causes a decrease in circulation causing hypoxia due to the lack of blood circulation and oxygen and tissue damage. This leads to muscle spasm which further increases pain. This study suggests that abnormal movement patterns-hypomobility or hypermobility leads to fibrosis of connective tissue directly or indirectly via injury and inflammation respectively. The pathological changes in a muscle, during the initial phases of immobilization is shortening of muscle and associated connective tissue leading to true shortening of the muscle fibers. Hence, they propose that due to the limited activity in chronic low back pain, connective tissue fibrosis leads to altered muscle activation patterns, muscle spasm, neutrally mediated inflammation and micro trauma. The altered mechanical loads lead to the connective tissue plasticity causing

fibrosis in connective tissues like ligaments and joint capsules.

Mostly chronic low back pain without specific pathological changes suffer from musculoskeletal dysfunction and treating these disturbances causes decrease in pain in many (*Rosomoff, 1989).* With the above beliefs one can conclude that whatever may be the reason of chronic low back pain, the ultimate brunt bearer are the soft tissue structures which need to be addressed during the due course of treatment.

With the advent of physiotherapy, many tried to find out the effects of conventional therapy as against surgical treatment to treat chronic low back pain. The studies finding the efficacy of modalities in chronic low back pain, include transcutaneous electrical nerve stimulation (TENS) (*Lucie, 1991 & Marchand, 2003),* interferential therapy (*Werners, 1999),* laser (*Bjordal, 2003)* and short wave diathermy (*Sweetman, 1993)*. Many of those disabled with chronic low back pain do seek for treatment. Although many treatment modalities do promise relief of pain, not much evidence is present as to its true potential in relieving and curing the disability. With the question of immobilization during rehabilitation; many concluded the beneficial use of exercises (*Hagen, 2000, Kuukkanen, 2000, Mannion, 2001, Moseley, 2002, Peterson, 2002, Aure, 2003, Liddle, 2004, Jousset, 2004, Niemisto, 2003 &*). Interest then emerged in the role of manual therapy, mobilization and massage (*Furlan, 2002, Hemmila, 2002, Aure, 2003, Cherkin, 2003, Chiradejnant, 2003, Harvey, 2003, Licciardone, 2003, Walach, 2003, Assendelft, 2004, Jette, 2006).*

Manual medicine or therapy infers to hands on treatment which includes gentle stretching of joint or mobilization to improve spinal joint mobility (*Greenman, 1996).* The effects of massage in non-specific low-back pain was studied by *Furlan et al (2010),* who concluded that massage might be useful in sub-acute and non-specific chronic low-back pain patients. The primary purpose of these approaches is to treat symptomatic soft tissues. Soft tissue mobilization offers a functional approach, ultimately improving the patients' capacity to maintain balanced posture and improving body mechanics. The integrated approach encompassing evaluation of soft tissues system and application of specifically directed manual therapy techniques to facilitate normalization of soft tissue dysfunction is called functional mobilization (*Pustaver, 1995*). Soft tissue techniques causing mechanical stretching of the soft tissues, leading to connective tissue remodeling, encouraging circulation, enhancing venous and lymphatic return, also showing neurologic effects of release of endogenous opioids thus relieving musculoskeletal pain. To intervene specific musculoskeletal dysfunctions, manual treatments along with tailored exercises are in need (*Bookhout*, 1996).

An experimental study conducted by *Geisser et al in 2005,* aimed at examining the efficacy of manual therapy with specific exercise program for treating CLBP and disability. The tailored exercise program was compared with nonspecific program comprising stretching of soft tissues, aerobic fitness and manual

therapy. Manual therapy with specific exercise reported better results and further studies are needed to examine the effects on improved function.

Evidences suggest that manual therapy and specific exercises showed positive impact in pain and disability. But no such evidence has specified the effects of manual therapy alone. Also several studies have analyzed few soft tissue structures but lack an integrated approach considering the skin, fascia, muscle, connective tissue, and neuromuscular component.

With the above views, emphasizing the need for further research, this study aims at analyzing the effectiveness of integrated soft tissue mobilization on the pain, mobility and functional outcome in chronic low back pain patients.

Materials and Methods

The experimental study was approved by the ethics committee of Sri Ramachandra University.

Study participants: Patients coming to the outpatient physiotherapy department of Sri Ramachandra Hospital were included. Chronic low back pain patients referred for physiotherapy by the orthopedic department were considered. Patients diagnosed as having low back ache for more than 3 months of duration with age group between 18 to 45 years were recruited. Subjects with previous spinal surgeries, neurological disorders, congenital spinal conditions and Spondyloarthropathies were excluded.

Study design & Size: Randomized control trial and using a two sample comparison of means needed sample size of 70 subjects. To account for possible loss, 60 subjects were recruited. Simple randomization method was used to allocate the subjects into two groups, namely the control group and the experimental group.

Outcome measures - The baseline measures includes, visual analogue scale (VAS) - Self-report of rating scale of pain intensity of their average or usual pain. VAS has good reliability and concurrent validity when compared to other methods (*Donald, 2003*). Modified Schober's test (MST) was used to measure lumbar spine mobility of flexion and extension measures in pre and post treatment period as a measure of functional mobility. (*Macrae, 1969, Domjan, 1990*).

The revised Oswestry Disability Index (ODI) by *Davidson et al (2002)* was used as a functional outcome measure. This is a self-report questionnaire; the patient is instructed to fill it out. The patient follows the general instructions given at the top of the questionnaire. Each section had 6 possible answers. Statement 1 was graded as 0 point; statement 6 was graded as 5 points. A score of 50 was considered to indicate 100% disability. The disability scores between 0%-20% denoted minimal disability, 20%-40% denoted moderate disability, 40%-60% indicate severe disability, 60%-80% denotes crippled and 80%-100% denotes bedriden status.

A total of 77 subjects enrolled for the study. Of these, 7 subjects refused to participate, 10 subjects were not regular until follow up. After recruitment on eligibility, informed consent was obtained on explaining the treatment to be given. All subjects were given self-report measures and outcome measures. Subjects in the control group received exercises which included core strengthening of the

lumbo-pelvic complex (*Sahrman, 2002 & Bookhout, 1997*) includes abdominal progression; hip extensor in prone, hip abductor and external rotator training in side lying, multifidus strengthening and stretching exercises. The stretches included quadriceps, lumbar extensors, hamstring and prone lying on elbows.

The experimental group received an integrated Soft tissue mobilization including muscle energy technique, trigger point release, myofascial release, thoracolumbar lateral, longitudinal stretch, deep longitudinal inhibitory pressure. Trigger points were released by applying deep pressure with the thumb/ olecranon process at the tender points along the piriformis and gluteus medius muscles and pressure was gradually released as pain reduced. Post isometric relaxation was taught by asking the patient to contract the back extensor muscles isometrically in supine position and then relaxing it. Mechanical stretching was done by thoracolumbar lateral, longitudinal stretch given to the patient in prone position. Thoracolumbar deep pressure with thumbs or thumb reinforced by hand given over the involved muscle. Each patient in the experimental group was treated with soft tissue mobilization three times in a week.
Both the groups were given a pain relief modality given to the patients as a usual treatment approach in the outpatient department. Exercises were continued as a home program and reviewed regularly. After three weeks, follow up of the self-report measures and outcomes were administered.

The data collection started at baseline comprising of the patient profile, pain severity using VAS, functional mobility of the patient using MST and ODI questionnaire. Post intervention values were got after three weeks of intervention. The process of data analysis consisted of baseline comparison between the control and the experimental groups, post treatment assessments between the groups, pre and post treatment comparison of various variables in the control and the experimental group.

Results & Discussion

The effectiveness of integrated Soft tissue mobilization on pain, functional mobility and functional outcome was analyzed using inferential statistics (two-tailed test). The data analysis was done using SPSS and statistical significance level was set. In the study, sixty participants participated of which 19 were males and 41 were females. All the 60 subjects were followed up till the end of the study (each group n=30). All the participants were regular for follow up and there is no missing data. In the control group 11 participants were male and 19 participants were females with a mean age of 35.57 yrs. In the experimental group 8 males and 22 females participated with the mean age of 36.03 yrs (Table 1). Overall 31.7% of males and 68.3% of females participated in the study.

Table-1 Patient demographics

	GROUP	N	Mean	SD	SEM
AGE	Control	30	35.57	7.718	1.409
	Experimental	30	36.03	7.779	1.420

Table- 2 Gender distribution between groups

			GROUP		
			Contrl	Expmntl	Total
Gender	Male	N	11	8	19
		%	36.7	26.7	31.7
	Female	N	19	22	41
		%	63.3	73.3	68.3
Total		N	30	30	60
		%	100.0	100.0	100.0

Table- 3a - Pre (VAS_1) and Post (VAS_2) Comparison of VAS in the control group

	Mean	N	SD	Mean Diff.	T	p
VAS_1	6.67	30	1.446	2.10 ± 1.54	7.47	.000
VAS_2	4.57	30	1.547			

Table 3b: Pre (VAS_1) and Post (VAS_2) Comparison of VAS in Experimental Group

	Mean	N	SD	Mean Diff.	T	p
VAS_1	6.77	30	1.501	1.63 ± 1.37	6.50	.000
VAS_2	5.13	30	1.548			

The mean value for pain severity (VAS) for the control group was 6.67 and after intervention the mean value of VAS was 4.57. The pain severity noted to be declined with a difference of 2.10. The mean value for pain severity (VAS) for the experimental group was 6.77 and after intervention the mean value of VAS was 5.13.The pain severity was observed to decline significantly with a mean reduction of 1.6 (p=0.000). Compared to the experimental group, control group showed greater improvement in pain severity as evidenced by mean reductions in VAS scores.

Table-4 (a) Lumbar flexion range in the control group

	Mean	N	SD	SEM
MS_FLEXION_1	4.87	30	1.306	.238
MS_FLEXION_2	6.00	30	1.313	.240

The functional mobility tested by MST in the control group showed a mean flexion of 4.87 pretest and 6 in post-test showing a significant increase (p=0.000).

Table-4 (b) Lumbar flexion range in Experimental group

	Mean	N	SD	SEM
MS_FLEXION_1	5.67	30	1.155	0.211
MS_FLEXION_2	6.37	30	1.377	0.251

The experimental group showed a mean of 5.67 before and 6.37 after intervention in the range of flexion with a significant difference.(p=0.000).Overall the lumbar flexion range has improved in experimental group than control group.

Table-5 (a) Lumbar extension range in Control group

	Mean	N	SD	Mean Diff.	T	p
MS_EXTENSION_1	3.77	30	.935	-.533±1.106	-2.64	.013
MS_EXTENSION_2	4.30	30	.988			

The ranges for extension showed a mean extension of 3.77 before and 4.30 after intervention in control group (p=0.013).

Table-5 (b) Lumbar extension range in Experimental group

	Mean	N	SD	Mean Diff.	T	p
MS_EXTENSION_1	3.10	30	1.125	-.333±0.479	-3.81	.001
MS_EXTENSION_2	3.43	30	1.194			

In the experimental group the mean extension before intervention was observed to be 3.10 and after intervention 3.43 with a significant mean difference of 0.333±.479 (P<0.001). On comparing the experimental group, control group was found to show minimal improvement in the lumbar extension range.

Table-6 (a) Oswestry Disability Index (ODI) in the control group

	Mean	N	SD	Mean diff.	T	P
ODI_1	20.93	30	6.378		7.323	.000
ODI_2	14.50	30	6.061	6.433±4.812		

The measures of ODI showed a mean value of 20.93 before intervention and 14.50 after the follow up, with mean difference of 6.433±4.812 (p=0.000).

Table-6 (b) Oswestry Disability Index in the Experimental group

	Mean	N	SD	Mean difference	T	P
ODI_1	23.90	30	7.635	8.167±5.931	7.542	.000
ODI_2	15.73	30	7.230			

The experimental group showed a mean ODI value of 23.90 before the intervention and 15.73 after the intervention with a mean difference of 8.167± 5.931 (p=0.000). Overall, the functional outcome of ODI values shows reduction in the disability index in the experimental group than the control group.

Table- 7 (a) Measures of disability in control group

	Mean	N	SD	Mean difference	T	P
D_1	41.87	30	12.757	12.867±9.623	7.323	0.000
D_2	29.00	30	12.123			

The measure of disability calculated with the help of ODI shows a mean value of 41.87 pre-test and 29 post-test in the control group. The mean difference is 12.867±9.623 (p=0.000).

Table-7 (b) Measures of disability in experimental group

	Mean	N	SD	Mean difference	T	P
D_1	47.80	30	15.271			.000
D_2	31.00	30	14.797	16.800±12.280	7.494	

In the experimental group the mean value of disability is 47.80 before and 31.00 after the intervention with mean decrease of 16.800±12.280 (p=0.000). The disability measures in the experimental group are lower, when compared to control group.

Table-8 (a): Disability grade (pre test) in the control and the experimental group

			GROUP		Total
			Contrl	Exptal	
Dis_Grd_1	Minimal	N	1	2	3
		% within GROUP	3.3%	6.7%	5.0%
	Moderate	N	13	5	18
		% within GROUP	43.3%	16.7%	30.0%
	Severe	N	14	15	29
		% within GROUP	46.7%	50.0%	48.3%
	Crippled	N	2	8	10
		% within GROUP	6.7%	26.7%	16.7%
Total		N	30	30	60
		% within GROUP	100.0 %	100.0%	100.0 %

The disability grade distributions in both groups are two participants in the control group are in crippled category and 8 participants in the experimental group. One in the control group and two subjects in the experimental group are in minimal disability category while in the moderate disability category 13 in the control group and 5 in the experimental group. Similarly in severe disability category 14 subjects in the control group and 15 in the experimental group were observed. No subjects were reported in the bedridden category.

Table-8 (b) Disability grading (post test) in control and experimental group

			GROUP		Total
			Contrl	Exptal	
Dis_Grd_2	Minimal	N	7	8	15

		% within GROUP	23.3%	26.7%	25.0%
	Moderate	N	18	15	33
		% within GROUP	60.0%	50.0%	55.0%
	Severe	N	5	5	10
		% within GROUP	16.7%	16.7%	16.7%
	Crippled	N	0	2	2
		% within GROUP	.0%	6.7%	3.3%
Total		N	30	30	60
		% within GROUP	100.0%	100.0%	100.0 %

The disability grade distributions in both groups are as follows. Two participants in the control group are in crippled category as compared to 8 participants in the experimental group. One in the control group and two in the experimental group are observed in minimal disability category. In the moderate disability category 12 subjects were observed in the control group and 5 in the experimental group while in the severe disability category 14 in the control group and 29 in the experimental group. No subjects were observed to belong in the bedridden category.

The experimental study analyzed the effectiveness of integrated Soft tissue mobilization on the functional outcome of chronic low back pain patients, noted to have decrease in pain score (VAS) in both the control and the experimental groups. Many studies have shown the effects of exercises in pain decrement and functional improvement in chronic low back pain as against treatment received by a general practitioner. Though conflicts do exist with this thought; the European guidelines suggest that exercises along with usual physiotherapeutic methods are efficient in the rehabilitation of chronic low back pain. The study results also support a reduction in pain and improved spinal mobility. There was reduction of pain and improved functional mobility in the experimental group that is, those who received soft tissue mobilization. *Gert Bronfort et al* in 2003 suggested mobilization can be an option for the treatment of both low back pains after a systemic review conducted among ten randomized control trials. The guidelines further suggest that there is limited evidence of combined therapy of massage with remedial exercises and education for pain relief and functional improvements. Even though the results show a mean of 2.10 ± 1.54 in pain, -1.133 ± .819 in flexion and -0.533±1.106 in the extension ranges in the control group; mean of 1.63 ± 1.37 in pain and -.700±1.055 in flexion and -0.333±.479 in extension ranges in the experimental group. There was a significant difference in the results of pain and functional mobility within the experimental group. This agrees with similar finding reported in previous studies done by *Gert Bronfort et al (2003)* that concluded little evidence that back exercise is superior to mobilization. The functional performance of the patients checked by Oswestry Disability Index showed a mean difference of 6.433±4.812 in the control group and 8.167±5.931 in the experimental group. *Gronbald et al (1997)* tried to find out the interrelationship between spinal movements, performance tests, pain severity and disability evaluation. They concluded that there is moderately

significant ($p < 0.01$) inverse correlation between disability evaluation and in all performance tests in women population. This could be a cause for not having a similar correlation with functional outcomes of modified Schobers Test and that of Oswestry Disability Index.

The oswestry disability index includes basic functional assessment of movements. The process involved comparing the original performance of various tasks with noted restriction on corresponding subsections. A factor-analytic study was also undertaken by *Fisher & Johnston (1997)* determined two specific factors of disability and changes in the disability were reliably measured by the Oswestry Disability Questuinnaire.

Francisco el al (*2004*) conducted a correlational study and concluded clinically significant decrement in pain leading to almost recognizable changes in disability and quality of life. Similarly in the present study, % of disability with ODI, there was a drastic change in disability progressing from crippled to severe- moderate- minimal disability in both control and experimental groups. The number of subjects in the crippled category reduced from 2 to 0 in the control group and from 8 to 2 in the experimental group after intervention. In the severe category the number of subjects decreased from 14 to 5 in the control group and from 15 to 5 in the experimental group. The number of subjects increased in both minimal and moderate category after intervention in both the control and experimental groups. The progression towards lesser disability was seen more in the experimental group. Hence, the integrated soft tissue mobilization showed better functional outcome in chronic low back pain subjects.

Soft tissue techniques although used in practice by therapists, this integrated approach encompassed techniques addressing all soft tissue structures involved in the pathophysiology of back pain. Soft tissue mobilization addresses a more efficient biomechanical function because of release of fascial tension (*Ganong, 1978)*. It also provides local and general vascular changes in the vascular and lymphatic circulation. Another model proposes that soft tissue techniques lead to connective tissue remodeling, encouraging circulation, enhancing venous and lymphatic return, also showing neurologic effects of release of endogenous opioids thus relieving musculoskeletal pain. These physiological models suggest the importance of implementing soft tissue techniques in rehabilitating chronic low back pain. Even though the intervention is for shorter duration, the functional outcome in the interventional group showed better improvements. The functional outcomes are the overall indicators and it is considered to be an ultimate outcome in any rehabilitation.

Hence, considering the above physiological factors, importance of manual techniques, the results of the study seems to be justified. Soft tissue mobilization to the low back region can thus help in providing pain relief, mobility and functional improvement. The limitations include a relatively smaller sample size in order to make the results more valid and long term effects need to be monitored. As not much has been studied

related to the integrated soft tissue mobilization techniques towards outcomes of pain, mobility within a larger population of low back pain, there is much scope in future to establish this through research. Integrated soft tissue mobilization forms an integral component in rehabilitation of chronic low back pain with optimal duration of training.

Conclusion: The experimental study on the effects of integrated soft tissue mobilization in chronic low back pain subjects revealed a decrement in pain, lumbar mobility and the overall functional outcome in both the groups. In specific, integrated soft tissue mobilization group showed a moderate improvement in the functional outcome than the control group. The integrated soft tissue mobilization plays an integral component in the intervening chronic low back pain.

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A Case study of a Rare Case of Turner's Hypoplasia and Unilaterally Fused Deciduous and Permanent Lateral Incisor Caused By Trauma

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Abstract

Orofacial trauma is a serious orodental and general health problem that may have medical, esthetic and psychological consequences for children and their parents. When the root of the primary tooth is close to the unerupted permanent tooth, primary tooth trauma may result in developmental disturbances and pulpal reaction in that permanent tooth. We report an unusual case of an 8 year old girl who met with trauma at 15 months of age in which injury to the primary dentition resulted in developmental disturbances in the crown of the permanent tooth and fusion between permanent and deciduous tooth. Localized malformation of the crown and enamel hypoplasia was treated with a light-cured composite resin restoration. The treatment of fused permanent and deciduous incisor is also discussed.

Introduction

Hypoplasia is defined as a quantitative defect of enamel visually and is histomorphologically identified as an external defect involving the surface of the enamel and associated with reduced thickness of enamel *(Ozturk et al, 2004)*.Turner's hypoplasia usually manifests as a portion of missing or diminished enamel, generally affecting one or more permanent teeth in the oral cavity. If it involves anterior teeth, most likely cause is traumatic injuries leading to primary incisors being knocked out or driven into the alveolus affecting the permanent tooth bud. The affect of trauma are more pronounced if it occurs prior to third year of life. The topographic relationship of the primary teeth to the permanent tooth germ explains the potential for possible developmental disturbances *(Andreasen & Andreasen, 1994)*. The developmental defects of the permanent successor tooth range from mild alteration in enamel mineralization in form of simple white or yellow brown discoloration to crown dilaceration, crown duplication, root dilaceration, root duplication, odontome like malformation, disturbed eruption, partial or complete arrest of root formation to severe sequestration of the developing tooth germ *(Andreasen & Andreasen, 1994, Shafer, 2007)*. Hypoplasia was categorized into the following types by *Silberman et al (2010)* Type I hypoplasia: Enamel discoloration, Type II hypoplasia (Abnormal coalescence), Type III hypoplasia (Some parts of enamel missing due to hypoplasia) & Type IV hypoplasia: A combination of previous three types of hypoplasia. According

to them both dentitions could be affected by enamel hypoplasia; however, the incidence is more severe in permanent dentition. The characteristics of clinical enamel hypoplasia include unfavorable esthetics, higher dentin sensitivity, malocclusion and dental caries susceptibility *(White & Pharaoh, 2006)*. The treatment challenge in this type of injury is to promote a complete oral rehabilitation in both esthetics and function.

A case report of a 8-year-old female patient with chief complaint of anterior malformed teeth and abnormally large teeth in upper left maxillary region following a traumatic injury while playing is presented below.

CASE REPORT

Fig. 1.

An 8-year-old female patient reported to the Department of Pedodontics and Preventive Dentistry with chief complaint of anterior malformed teeth and abnormally large teeth in upper left maxillary region. On clinical examination, the maxillary left central incisor showed yellowish brown discoloration with type IV enamel hypoplasia (enamel discoloration, abnormal coalescence, some parts of enamel missing) and left permanent lateral incisor was fused with deciduous lateral incisor (Figure 1).

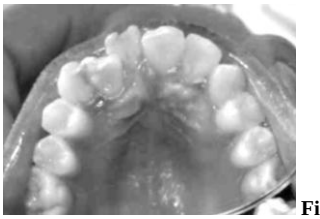

Fig. 2

The incisal aspect of the turner hypoplstic tooth showed a portion of missing or diminished enamel and the fused deciduous and permanent lateral incisor showed an extra cusp on the labial surface and talons cusp palatally (Figure 2).

The maxillary central incisor (hypoplastic tooth) was not tender on percussion and no caries was detected clinically. Patient had a history of trauma at the age of 15 months, followed by avulsion of left central incisor and intrusion of left lateral incisor. Her medical history was irrelevant with his condition. Intraoral Periapical Radiograph (IOPA) showed fusion of permanent left lateral incisor with deciduous left lateral incisor and diminished or missing enamel on left central incisor. (Figure 3)

Fig. 3

The fused teeth <22-62> had an irregular labial and lingual surface with an incisal ditch with a labial groove. Both the

fused teeth were also caries free. The periapical radiograph exhibited that only the crowns of <22-62> were fused with non union of their pulp chambers and root canals.The pulp chamber of deciduous lateral incisor was resorbed and there was fusion of enamel only with permanent lateral incisor. Occlusal view revealed abberant morphology of permanent left lateral incisor and also the presence of irregular surface of left central incisor (Figure-4).

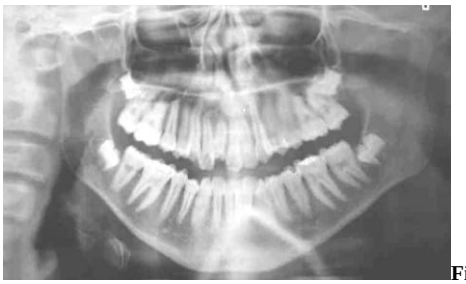

Fig. 4

Orthopantomogram confirmed the presence of fusion in deciduous and permanent left lateral incisor and turner hypoplasia in left central incisor along with normal set of complementary teeth (Figure-5).

Fig. 5

Fig. 6

A multidisciplinary approach was adopted for the management of the case. Esthetic treatment with palatal contouring and light cure composite restoration was performed on left central incisor. Composite build up was done for the proper shape of the teeth. Since the fusion of deciduous and permanent teeth was of only crown, therefore selective grinding of the resorbed crown of deciduous lateral incisor was done to give proper shape to permanent lateral incisor and keep the patient on regular follow up.(Figure 6)

Discussion

Hypoplasia is a disturbance that occurs at the time when teeth are developing and is associated with macroscopic enamel defects. Traumatic injuries to the primary dentition are very common, affecting from 4-30% of all children *(Velasco, et al, 1997)*. If a traumatic injury occurs to a deciduous tooth during the period when the crown of the succeeding permanent tooth is being formed, there occurs disturbance in the ameloblastic layer of the permanent tooth and result in a hypoplastic tooth. The effect of trauma is more pronounced if it occurs prior to third year of life. This was first discovered by Turner in 1912.These single teeth are called Turner's teeth and the condition is called Turner's Hypoplasia. *Diana Ribeiro et al (2009)*

reported from their longitudinal study of 8 years that discolorations of enamel and/or enamel hypoplasia (46.08%) were the most prevalent sequelae on permanent dentition due to traumatic injury. [7]

Tooth fusion is defined as union between the dentin and/ or enamel of two or more separate developing teeth.[1,2] The fusion may be partial or total depending upon the stage of tooth development at the time of union . If the contact occurs before the calcification stage, the teeth unite completely and form one large tooth. Incomplete fusion may be at root level if the contact and union occurs after formation of crown. Fusion can occur at the level of enamel or enamel and dentin, which results in the formation of one clinically enlarged crown. Fused teeth can have separated pulpal space, one pulp chamber and two canals or take the form of a large bifid crown with one pulpal space. Etiology of fusion is not fully explained. Some authors state that it is a result of physical forces that lead to the necrosis of epithelial tissue between the two joining buds, they come into contact and fuse.[5, 6] .According to other authors, fusion is a result of the persistence of the interdental lamina between the two buds during embryological development. Fusion may be unilateral or bilateral and most commonly occurs in primary teeth with more predilection for anterior teeth.[7] Fusion may occur between two normal teeth or between a normal tooth and a supernumerary tooth. Clinically fused anterior teeth frequently have a groove or notch on the incisal edge that goes in buccolingual direction and radiographically, the dentin of fused teeth always appears to be joined in some region with separate pulp chambers and canals.

In the rare case report we reported here, the patient had a history of trauma in their deciduous dentition below the age of 3 years and had type-IV enamel hypoplasia (enamel discoloration, abnormal coalescence, some parts of enamel missing) along with fusion of deciduous left lateral incisor and permanent left lateral incisor. The brown discoloration occurs due to disturbances in ameloblastic layer, leading to defective matrix formation caused by traumatic injuries, but the stretched inner enamel epithelium continues to induce the differentiation of new odontoblasts and hence the dentine formation is not disrupted. The fusion between deciduous lateral and permanent lateral incisor also occurred due to traumatic injury in the deciduous dentition which had led to fusion between the two teeth.

Thus, this a rare case report in which following trauma to deciduous dentition, there occurs fusion between deciduous lateral and permanent lateral incisor and turner's hypoplasia in permanent central incisor. This is a rare occurrence not yet reported so far.

Conclusion: An injury to a young child's teeth can be physically and emotionally traumatic. The dentist must take time to carefully examine and analyze not only the damage itself, but also the possibilities of sequelae to the permanent tooth germ and the overall health of the child. For this reason, treatment of trauma in primary dentition must include long-term follow-up of sequelae in the permanent dentition.The case we report here stresses the importance of traumatic injuries to

primary dentition because of their effects on the permanent tooth germ.

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INTRODUCTION

METHODS

RESULTS

DISCUSSION

CONCLUSION

ACKNOWLEDGMENTS: Provide information sufficient to identify sources of support, technical assistance, and intellectual contributions not associated with authorship.

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Journal Article, Article not in English:

Seker-Aygül, Z., Akova, B. and Gür, H. 2001. The relationship of stress and stress management factors with injury in soccer players. *Turkish Journal of Sports Medicine*, **36:** 71-80. (In Turkish: English abstract).

Journal Article in press:

Gür, H., Cakin, N., Akova, B., Okay, E. and Kücükoglu, S 2002. Concentric versus combined concentric- eccentric isokinetic training: Effects on functional capacity and symptoms in patients with osteoarthrosis of the knee. *Archives of Physical Medicine and Rehabilitation*, in press.

Journal Article in electronic format:

Weigand, D.A., Carr, S., Petherick, C. and Taylor, A. 2001. Motivational climate in Sport and Physical Education: The role of significant others. *European Journal of Sports Science (serial online)* **1(4)**, (13 screens/inclusive page), October. Available from URL: http://www.humankinetics.com/ejss

Book:

Guyton, A.C. and Hall, J.E. 1996. *Textbook of medical physiology*. 9th edition. W. B. Saunders Company, London.

Chapter in edited book:

Wilson, C.H. 1984. Exercise for arthritis. In: *Therapeutic exercise*. Ed: Basmajian, J.V. 4th edition. Baltimore: Williams and Wilkins. 529-545.

Thesis:

Özyener, F. 2000. *Effects of work intensity on dynamics of pulmonary gas exchange during exercise in humans*. Doctoral thesis, University of London, London. 79.

Thesis not in English:

Özer, Ö. 2001. *The effect of muscle exercise to oxygen kinetics in chronic smoker*s. Doctoral thesis, University of Uludag, Bursa. 1-54. (In Turkish: English abstract).

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MAIN TEXT

CONCLUSION

ACKNOWLEDGMENT

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