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RESEARCH ARTICLE

A STUDY ON EFFECT OF MCKENZE EXERCISE, KINERSIO TAPING AND IASTM ON NON-SPECIFIC NECK PAIN AMONG COLLEGE STUDENTS

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Abstract

The most common cause of neck pain is non-specific neck pain. Previous literature suggests that McKenzie Exercise had shown better results. Due to this exercise muscle strength is increase. Kinesio Taping & IASTM is a alternate technique which can improve range of motion, muscle flexibility and reduce pain without compromising the muscle performance. The main objective of this study is to evaluate effect of McKenzie exercise along with Kinesio Taping and IASTM in collegiate student having a non-specific neck pain. Pre & Post experimental study. 45 non-specific neck pain patients were recruited as per inclusion criteria. Three groups are formed about the purpose of the study and demonstrate about McKenzie exercise, Kinesio Taping and IASTM. The statistical outcomes of three groups namely A,B and C of the subjects to compare the effectiveness of all three groups, (A- 0.0311, B- 0.0305 and C- 0.0499) are less than Alpha value i.e. 0.05 for F statistic value which implies that all three groups namely A,B and C are statistically significant at $p< 0.05$. The group C (McKenzie exercise along with Kinesio Taping and IASTM) is more effective and statistically significant in reducing the non-specific neck pain among collegiate students as compared to other groups namely A and B.

Keywords: McKenzie Exercise, Kinesio Taping, IASTM, NDI and NPRS

Introduction

Neck pain is one of the most common musculoskeletal disorders worldwide. According to the Global Burden of Disease Study, low back and neck pain were the second leading causes of years for young adults aged 20–24 years. Furthermore, data from the GBD Study shows that neck pain is a rising Problem, with a 21% increase in the population prevalence of pain lasting more than 3 months. Neck pain is associated with disability and reduced quality of life, and in young adults, neck pain has been shown to be a risk factor for reduced general work. The economic consequences of neck pain are significant for both the individual and the society due to costs related to healthcare, insurances, loss of productivity, and sick leave. (Szeto and Lee 2002).

Young adulthood, often referred to as the age span between 18 and 23 years, is the transitional stage between adolescence and adulthood, when people are in the process of forming an adult identity. This period is characterised by extensive changes, handling choices and opportunities such as moving out from home, choice of education and career, and establishing an adult lifestyle. Inequalities in own socioeconomic status emerge, and biological parameters such as bone mass and muscle strength peak during this period. Previous studies have shown that exposures and choices made during young adulthood influence health and well-being, therefore, we believe that this period also is vulnerable for future musculoskeletal health, such as neck pain. Furthermore, in young adulthood, one has the opportunity of changing habits from earlier life. Consequently, young adulthood may be a critical time in the life course in which the long-term development and management of musculoskeletal pain could be influenced, ideally reducing episodes of neck pain and its' consequences in adulthood (Janwantanakul *et al.*, 2012).

Despite the high prevalence of neck pain leading to disability, neck pain in young adulthood has attracted little attention in the literature. Previous systematic reviews have investigated risk factors for non-specific neck pain in children, adolescents and adults, but not in the stage of young adulthood. Female sex, older age, being an ex-smoker, present or previous history of low back pain, previous episode of neck pain or psychosocial factors have been shown to be risk factors for neck pain in adults. (Hanten *et al.*, 2000).

The aim of this systematic review was to investigate risk factors for non-specific neck pain in young adults.Chronic non-specific neck pain is related to limited cervical mobility, impaired function, neck muscles myofascial pain syndrome, and stress at work. Chronic non-specific neck pain is diagnosed as cervical pain without a known pathological basis as the underlying cause of the complaints. Some symptoms are limited cervical spine mobility and neck muscles weakness, which may be often related to other problems, such as, vertebral, neck or shoulder impaired function, and mental and physical stress at work. Besides, chronic non-specific neck pain patients have more functional limitations (Cho et al., 2008).

Up to 67% of world's population may present chronic non-specific neck pain at least once in their lives. There is a relationship between functional limitation and disability in individuals with chronic pain, and they use health services and medication for pain relief very often. It is considered a public health and it is a frequent cause of job absenteeism which provokes high socioeconomic costs. (Shin 2008).

All the aforementioned factors are strongly related, affect one into the other, and may lead to a negative impact on health-related quality of life (HRQoL). There are different treatments for patients with chronic non-specific neck pain and many of them describe the need of a multidisciplinary approach. Regarding physical therapy interventions for treating chronic non-specific neck pain symptoms, the most common treatments include exercise therapy, stretching, electrotherapy and manual therapy. (Quek 2013).

Some recent studies have also reported the relation between chronic non-specific neck pain and Myofascial Pain Syndrome (MPS), caused by myofascial trigger points (MTrPs) in cervical muscles with a high prevalence in trapezius, levator scapulae, multifidi cervicali and splenius cervicis muscles. The most frequent conservative physical therapy interventions for treating MPS are stretching, massage, ischemic compression, and pressure release techniques.

There are some studies that report HRQoL in patients with chronic non-specific neck pain about different physical therapy interventions, such as global posture reeducation and static stretching; neck strength training; physical training, specific exercises and pain education; and home-based exercise. However, as far as the authors know, no studies relate chronic non-specific neck pain, MPS, DDN of MTrPs and HRQoL. (McKenzi 1983).

Neck pain with no known cause is called non-specific neck pain. It usually goes away on its own within a few days or weeks but the pain lasts longer in some people or its keeps on coming back. Neck pain is considered to be chronic if it lasts longer than three month.

Non-specific neck pain is sometimes called simple or mechanical neck pain. The cause and origin of neck pain is not known exactly (Kim 2014). They include minor strain and sprain to muscles or ligament in neck pain. Bad posture may also be a contributing factor in some cases. Pain develops in your neck and may spread to the shoulder or base of your skull. Neck pain is a sudden-onset (acute) bout. (Kim 2014). The back of your neck includes the cervical spine and the muscles and ligaments that surround and support it. Your cervical spine is made up of seven bones called vertebrae. The sides of your vertebrae are linked by small facet joints. Between each of your vertebrae is a disc. The discs are made of a tough fibrous outer layer and a softer gel-like inner part. The discs act like shock absorbers and allow your spine to be flexible. (John and Wright (1962). Strong ligaments attach to adjacent vertebrae to give extra support and strength. Various muscles attached to your spine enable your spine to bend and move in various ways.

The spinal cord, which contains nervous tissue carrying messages to and from your brain, is protected by your spine. (John and Wright 1962) Nerves from your spinal cord come out from between the vertebrae in the neck to take and receive messages to the neck and arms. A major blood vessel called the vertebral artery also runs alongside the vertebrae to carry blood to the rear (posterior) part of your brain.non-specific neck pain is related to limited cervical mobility, impaired function, neck muscles myofascial pain syndrome, and stress at work.

The aforementioned factors are strongly related and may lead to a negative impact on health- related quality of life. There are some effective conservative Physical therapy interventions for treating chronic non-specific neck pain. (Park 2009).

The McKenzie Exercise encourages self-care treatment through repeated exercise focuses on extension, including ROM exercise, manipulation and patient education. McKenzie showed a significant difference in the degree of fatigue. McKenzie exercise delayed the replace of the fast twitch fibers which helped improve the muscle fatigue. (Algarni 2017). The McKenzie technique is generally believed as very successful program for the undefined spinal pain patients. The concept of McKenzie for neck pain offers benefits of slfe treatment, constant self-assessment, patient and control over their pain. The pain into posture syndrome, whereby pains symptoms are felt in the lower back without any substantial impairment or injury to the tissues.

Exercise therapy by the McKenzie method is a popular treatment for neck pain among physical therapists. Therefore the intention of this study is to test the effectiveness of the McKenzie exercise not only in management of back pain but also a neck pain. The burden these musculoskeletal pains is also responsible for making physiological and psychological stress among them distressing of their creative availability. (Algarni 2017).

Kinesio Taping is a type of natural therapy that involves the use of non-medicated adhesive tape on human muscles for pain control purposes. It utilized the homeostatic properties of muscles to improve symptoms and control pains, as an application of the Kinesio Taping normalizes reduced muscle strength, spasms and tension while facilitating blood, tissue fluid and lymphatic circulation with elasticity and increased tension. (Alshagga 2013).

Kinesio taping may also provide mechanical effects by inhabiting the neck pain. Kinesio taping is a natural therapy to provide a mechanical effect for inhibiting forward head posture with extended and increased tension and to control pain by normalizing reduced muscle strength, muscle cramps and tension, and balancing muscles, based on the muscle homeostasis principle. In recent years, clinicians have extensively used taping to prevent and treat musculoskeletal injuries in athletes. Kinesio tape is water-resistant, thin, and air permeable, as well as adhesive. It places constant shear to the skin because of its adherence properties that mimic those of the skin, and it can be used for 3 to 4 days without removal. One of the proposed mechanisms of Kinesio tape is to enhance proprioceptive sensibility after application, as it supports weak muscles, improves muscle functioning, decreases pain, repositions subluxated joints, and facilitates blood and lymph circulation. These effects allow affected fascia and muscle to return to normal functioning by decreasing abnormal muscle tension and improving joint function. [13] Kinesio tape

application is a popular method for rehabilitating athletes with mechanical neck pain. There is a need to collect empirical evidence on how this tape can enhance cervical proprioception. Indeed, to date there is limited evidence on the proprioceptive effect of Kinesio tape in athletes with neck pain, thereby formulating a compelling reason to conduct this study. The purpose of this study is to compare the effects of Kinesio tape application versus placebo application on cervical proprioception in athletes with mechanical neck pain. (Almhdawi 2017).

Instrument assisted soft tissue mobilization techniques of the cervical pain on the improvement of functionality of patient with mechanical neck pain. There are a number of different speeds & pressure that an IASTM-Trained physical therapist may use while conducting this specific techniques. It will based on nature of your condition & your specific needs. There different speed, pressure help relieve pain, decrease inflammation promote the healing process.

(Hurwitz 2018) IASTM application in targeted areas of the body combined with neuromuscular corrective exercises improved neck pain, ROM strength, and the functionality of women with painful cervical syndrome to a greater extent than a similar program including classical massage techniques instead of IASTM. The improvement of neck pain is a very important and innovative finding, as it highlights the possibility of correcting pathological postural adjustments through IASTM techniques in targeted areas and neuromuscular retraining exercises. The cervical ROM and strength of most cervical movements appear to have been positively affected by both therapeutic interventions without significant differences between them. A ROM improvement was found in the short-term for most cervical movements, and this finding is consistent with many studies that have evaluated the short-term effect of IASTM techniques on flexibility. (GBD 2016).

Need of Study

Presently, evidence is lacking to prove the efficiency of McKenzie Exercise along with Kinesio Taping & IASTM on non-specific neck pain. There is need to find cost effective treatment provide quick result. Hence the aim of study is to investigate the effectiveness of McKenzie Exercise along with Kinesio Taping & IASTM in collegiate student on non-specific neck pain.

Objectives of the Study

1. To investigate the effectiveness of McKenzie along with Kinesio Taping in collegiate student having a non- specific neck pain.
2. To investigate the effectiveness of McKenzie along with IASTM is collegiate student having a non-specific neck pain.
3. To investigate the effectiveness of McKenzie along with Kinesio Taping and IASTM in collegiate student having a non-specific neck pain.

Hypothesis

1. Null Hypothesis :- there will be no significant difference between McKenzie with Kinesio Taping, McKenzie with IASTM & McKenzie exercise along with Kinesio Taping & IASTM in collegiate student having a non-specific neck pain.
2. Alternate Hypothesis :- There will be significant difference between McKenzie with Kinesio Taping, McKenzie with IASTM and McKenzie with Kinesio Taping and IASTM in collegiate student having a non-specific neck pain.

Henriette Jahre, (2020), Neck pain is one of the most common musculoskeletal disorders worldwide. According to the Global Burden of Disease Study, low back and neck pain were the second leading causes of years for young adults aged 20– 24 years. The studies included many potential risk factors, but none of them showed consistent associations with neck pain. There is a paucity of high quality studies investigating risk factors for neck pain in young adults The studies included many potential risk factors, but none of them showed consistent associations with neck pain. There is a paucity of high-quality studies investigating risk factorsfor neck pain in young adults.

Gidey Gomera Weleslassie (2020) demonstrates that The findings of this study showed that NP is a common health problem among students in Ethiopia. Nearly 50 % of the study participants self-reported to have suffered NP in the preceding 12 months. Socio-demographic or individual related characteristics like past history of NP and lack of physical exercise, physical characteristics such as awkward neck posture and duration of reading were associated with NP. The medical school authorities are recommended to provide facilities to enhance physical activity among medical students and students are recommended to develop an awareness of related health hazards and encourage the habit of regular physical exercise.

Ester Cerezo-Téllez (2020), demonstrated that, chronic non-specific neck pain is related to limited cervical mobility, impaired function, neck muscles myofascial pain syndrome, and stress at work. Chronic non-specific neck pain is diagnosed as cervical pain without a known pathological basis as the underlying cause of the complaints. There are different treatments for patients with chronic nonspecific neck pain and many of them describe the need of a multidisciplinary approach. Regarding physical therapy interventions for treating chronic non- specific neck pain symptoms, the most common treatments include exercise therapy, stretching, electrotherapy and manual therapy. Some recent studies have also reported the relation between chronic non-specific neck pain and Myofascial Pain Syndrome (MPS), caused by myofascial trigger points in cervical muscles with a high prevalence in trapezius, levator scapulae, multifidi cervicali and splenius cervicis muscles. The most frequent conservative physical therapy interventions for treating MPS are stretching, massage, ischemic compression, and pressure release techniques.

Jiyoung Kim, (2018), The McKenzie Exercise encourages self-care treatment through repeated exercise focuses on extension, including ROM exercise, manipulation and patient education. McKenzie showed a significant difference in the degree of fatigue. McKenzie exercise delayed the replace of the fast twitch fibers which helped improve the muscle fatigue. These study outcomes clearly support the notion that sling and McKenzie exercise improved pain, Muscle strength and ROM of patients with chronic neck pain. These results suggest that sling and McKenzie exercise program is suitable for chronic neck pain.

(Khalid A. Alahmari 2020,)suggest that, The Kinesio tape application after 3 and 7 days effectively decreased joint position errors and neck pain intensity in mechanical neck pain participants compared to placebo, while there was no difference between both groups in the NDI. Kinesio Taping is a type of natural therapy that involves the use of non-medicated adhesive tape on human muscles for pain control purposes. It utilized the homeostatic properties of muscles to improve symptoms and control pains, as an application of the Kinesio Taping normalizes reduced muscle strength, spasms and tension while facilitating blood, tissue fluid and lymphatic circulation with elasticity and increased tension.

Methodology

Study design: - Pre & Post Experimental Study

Duration of study: - 3 month

Study setting: - The study was conducted in Kailash institute of nursing and paramedical science greater Noida. An athletic clines was obtained from institutional review board before the commencement of the study.

Sample criteria: - A total of 45 subjects with the history of non-specific neck pain were participated in the study. The subject were assigned into three groups A,B & C with mean age of (17 to 23) years respectively. All the subjects participated in the study after signing the informed consent. The study was conducted in the Kailash institute of nursing and paramedical science greater Noida.

Subject: - college student with non-specific neck pain.

Inclusion criteria:-

- Male and female with neck pain.
- Age 17-23 years old.
- Pain lasting for 4 months.

Exclusion criteria:-

- Trauma related neck pain.
- Cervical Rhizopathy or Vestubul this function.
- Serious spinal abnormality.
- Acute torticolis (acute spasm with no obvious underlying course)
- Cervical radiopathy.
- Musculoskeletal pain.

Protocol: - All the subjects were selected according to inclusion and exclusion criteria and were divided into three groups. In group A subject underwent with McKenzie exercise with Kinesio Taping, group B subjects underwent McKenzie exercise with IASTM, group C subjects underwent McKenzie exercise along with Kinesio Taping & IASTM.

Procedure: - A total 45 subjects were included for the study. Firstly all the subjects signed the informed consent form before starting the procedure. Each subjects was informed about the purpose of the study and demonstration about the McKenzie Exercise, Kinesio Taping & IASTM.

Group A (Experimental group) :-

Before starting the treatment, full examination of posture movement of cervical spinal and muscle tightness were recorded in the assessment form. Patients were made to till NDI & NPRS scale as parameter on comparative evaluation for pre & post treatment. Patient has been treated thrice a weak for one week.

McKenzie Exercise program :-

1. Chin tuck McKenzie Exercise.
2. Neck extension McKenzie Exercise.
3. Side bending McKenzie Exercise.
4. Neck rotation McKenzie Exercise.
5. Neck flexion McKenzie Exercise.
6. Shoulder Shrugh McKenzie Exercise.

Chin tuck:-

- The patient sit on the chair straight gaze focused in front.
- Now without titling the neck or head push your chin downwards.
- You will feel the stretch in the neck. Hold your position for a count of 10 & than release.

Neck extension :-

- Tilt the head backwards as far as possible.
- The face would be looking upwards, as if looking at the sky.
- Now in this backward tilted position, slightly turn your head right and left half inches.
- Hold this position 10 see than release.

McKenzie Side bending :-

- Keep the gaze straight forward and then bend the head sideways. So that ear touch your shoulder.
- Hold the position for a few second and repeat on opposite side.

Neck rotation McKenzie Exercise :-

- Turn the head toward your left at 1st without arranging your gaze, always have your gaze fixed in front of you.
- Feel the stretch & hold the position for a few second.
- Repeat on the other side.

Neck flexion McKenzie Exercise:-

- Your head towards your chest.
- Raise your hand & interlock your finger at the back of your head in such a way that elbow point downward.
- The weight of the hand will put pressure on the head & help you feel the stretch as the basic of your neck.

Shoulder Shrugh McKenzie Exercise.

- Then slowly inhale and lift the shoulders close to the ears as much as you can.
- Hold your breath 10 sec & exhale slowly.
- Return to the starting partition & inhale again.

Kinesio Taping:-

Kinesio taping is a type of natural therapy. That is involving the use of non-medicated adhesive type on human muscles for pain control. Taping group, to elastic Ist step were used 5cm wide, 11cm long. Cut a short strip of tape, measured between the 2 Y strip tails rip the backing paper into 3 sections, and remove the middle piece, strick the tape down with 50% stretch directly over any specific point of pain in the neck. Strick the ends of tape down with 0% stretch to prevent excessive recoil.

Group B (Experimental group):-

Before starting the treatment, full examination of posture movement of cervical spine and muscle tightness were recorded in the assessment form. Patients were made to till NDI & NPRS scale as a parameter on comparative evaluation for pre and post Rx. Patient has been treated thrice a week.

McKenzie Exercise

Program:-

1. Chin tuck McKenzie Exercise.
2. Neck extension McKenzie Exercise.
3. Side bending McKenzie Exercise.
4. Neck rotation McKenzie Exercise.
5. Neck flexion McKenzie Exercise.
6. Shoulder Shrugh McKenzie Exercise.

IASTM:-

In this technique of the cervical pain on the improvement of functionality of patient with mechanical neck pain. There are a number of different speeds & pressure.

The treatment invokes applying precise pressure to a targeted area to relieve tension caused by the soar tissue. Side going in a downward fashion, with that 45· Angle & I 'm going to switch gears I'm going to angle it at 45· Towards me and we are going to work in other.

Group C (experimental group):- i.e. McKenzie exercise along with Kinesio Taping & IASTM. Showed more significant improvement after second session which could be due to increased blood circulation. Elevating the tissue temperature leads to chemical reaction in the cells within the body is influenced by temperature. An increase in the chemical reaction allows for an increasing in Oxygen uptake.

On analyzing the result between the groups, group A and group B concluding a minimal contribution of treatment in pain relief and group C was found more effective than the other two group i.e. group A & B. So McKenzie Exercise , Kinesio Taping and IASTM is more beneficial than 2 groups. Sample duration; - 4 weeks.

Instruction and tools used:-

- NPRS scale.
- Neck Disability Index.
- Kinesio Taping.
- IASTM.

Variable:-

- Independent variable- McKenzie exercise, Kinesio Taping and IASTM.
- Dependent variable: - NDI, NPRS.

Data Analysis & Interpretation

Section - I Demographic Characteristics of college students under McKenzie and Kinesio Taping (GROUP-A),Mckenzie along with IASTM (GROUP-B) and Mckenzie along with Kinesio Taping plus IASTM (Group C)

In this section, the demographic characteristics have been assessed below:

Table 1: - Frequency and Percentage wise Distribution of Demographic variables of college students under group A, B and C.

		GROUP-A (McKenzie and Kinesio Taping)		GROUP-B (Mckenzie along with IASTM)		GROUP-C (Mckenzie along with Kinesio Taping plus IASTM)	
S.No	**Demographic variables**	**Frequency (No.)**	**%**	**Frequency (No.)**	**%**	**Frequency (No.)**	**%**
1.	**AGE**						
	a. Below 18	1	6.67	0	-	0	-
	b. 18-20	8	53.33	8	53.33	9	60
	c. Above 20	6	40	7	46.67	6	40
2.	**Height (in cm)**						
	a. Below 160	4	26.67	6	40	3	20
	b. 160-170	7	46.67	5	33.33	6	40
	c. 170-180	3	20	3	20	4	26.67
	d. Above 180	1	6.67	0	-	2	13.33
3.	**Weight (in Kg.)**						
	a. Below 45	2	13.33	2	13.33	2	13.33
	b. 45-55	1	6.67	7	46.67	6	40
	c. 55-65	4	26.67	1	6.67	3	20
	d. Above 65	8	53.33	5	33.33	4	26.67
4.	**BMI**						
	a. Below 18	3	20	4	26.67	2	13.33
	b. 18-20	1	6.67	2	13.33	3	20
	c. Above 20	11	73.33	9	60	10	66.67
5.	**Gender**						
	a. Male	4	26.67	3	20	6	40
	b. Female	11	73.33	12	80	9	60

In the above table, the data has been assessed and their interpretation is givenbelow:

a) Based on the age under group A, about 01 student were under the age group of below 18, 08 were under the age group of 18-20 and 06 were under theage group of above 20.

In group B, about 08 students were under the age group of 18-20 and 07 are under the age group of above 20. In group C, about 09 students were under the age group of 18-20 and 06 are under the age group of above 20.

b) Based on Height (in cm) under group A, about 04 students were in the group of below 160, about 07 in the group of 160-170, about 03 and 01 were in the group of 170-180 and above 180.

In group B, about 06 students were in the group of below 160, about 05 in the group of 160-170, about 03 were in the group of 170-180. In group C, about 03 students were in the group of below 160, about 06 in the group of 160-170; about 04 and 02 were in the group of 170-180 and above 180.

c) Based on weight (in kg) under group A, about 03

d) Students were in the group of below 45, about 01 was in the group of 45-55, about 04 and 08 were in the group of 55-65 and above 55.

In group B, about 02 students were in the group of below 45, about 07 were in the group of 45-55, and about 01 and 05 were in the group of 55-65 and above 55. In Group C, about 02 students were in the group of below 45, about 06 were in the group of 45-55, about 03 and 04 were in the group of 55-65 and above 55.

e) Based on BMI under group A, about 03 students were in the group of below 18, about 01 was in the group of 18-20 and 11 were under above 20.

In group B, about 04 students were in the group of below 18, about 02 were in the group of 18-20 and 09 were under above 20. In group C, about 02 students were in the group of below 18, about 03 were in the group of 18-20 and 10 were under above 20.

f) Based on gender under group A, 04 were males and 11 were females. In group B, 03 were males and 12 were females. In group C, 06 were males and 09 were females.

Objective 1

To investigate the effectiveness of McKenzie along with Kinesio Taping in collegiate student on non- specific neck pain.

Table 1: To assess the effectiveness of McKenzie and Kinesio Taping (Group-A) during pre-week 0 and post week-2 on NDI and NPRS.

N=15

Domain (GROUP-A)	**Pre-Week 0**		**Post-Week 2**		**Mean Difference**	**'t' - value**	**Result**
	Mean	**SD**	**Mean**	**SD**			
NDI	35.86	8.04	24	7.82	27.82	**9.45****	**HS**
NPRS	8	0.84	5.28	0.88	0.04	**9.56****	**HS**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

The above table shows that the calculated 't' value of NDI AND NPRS scores under pre week 0 and post week-2 are statistically highly significant at P<0.05% level. Hence, H_0 is rejected. It can be concluded that the McKenzie along with Kinesio Taping is effective to reduce the non-specific neck pain or any other pain of students more positively. In other words, differences in pre and post weeks NDI and NPRS scores are highly significant.by 0.11 only.

Table 2: To assess the effectiveness of McKenzie along with Kinesio Taping (Group-A) during pre-week 0 and post week-4 on NDI and NPRS. **N=15**

Domain (GROUP=A)	**Pre-Week 0**		**Post-Week 4**		**Mean Difference**	**'t' - value**	**Result**
	Mean	**SD**	**Mean**	**SD**			
NDI	35.86	8.04	15.8	6.32	20.06	**4.07**	**S**
NPRS	8	.84	3.06	0.79	4.94	**2.79**	**S**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

The above table shows that the calculated 't' value of NDI AND NPRS scores under pre week 0 and post week-4 are statistically significant at P<0.05% level. Hence, H_0 is rejected. It can be concluded that the McKenzie along with Kinesio Taping is effective to reduce the non- specific neck pain or any other pain of students positively. In other words, differences in pre and post weeks NDI and NPRS scores are significant by 1.28 only.

To conclude that the group-A based on NDI scores is more effective and highly significant during pre and post weeks 2 or 4 whereas group-A based on NPRS scores is effective and significant during the same periods on non-specific neck pain among college students in a givenstudy.

Objective 2

To investigate the effectiveness of McKenzie along with IASTM among collegiate student having a non-specific neck pain.

Table 3: To assess the effectiveness of McKenzie along with IASTM (Group-B) during pre-week 0 and post week-2 on NDI and NPRS.

Domain (GROUP-B)	Pre-Week 0		Post-Week 2		Mean Difference	't' - value	Result
	Mean	SD	Mean	SD			
NDI	36.93	6.67	26.26	7.17	10.67	**2.28***	**S**
NPRS	8.13	0.74	5.53	0.91	2.60	**3.47***	**S**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

The above table shows that the calculated 't' value of NDI AND NPRS scores under pre week 0 and post week-2 are statistically significant at P<0.05% level. Hence, H_0 is rejected. It can be concluded that the McKenzie along with **IASTM** is effective to reduce the non-specific neck pain or any other pain of the college students. In other words, differences in pre and post weeks NDI and NPRS scores are significant.by 1.19 only.

Table 4: To assess the effectiveness of McKenzie along with IASTM (Group-B) during pre-week 0 and post week-4 on NDI and NPRS.

Domain (GROUP-B)	Pre-Week 0		Post-Week 4		Mean Difference	't' - Value	Result
	Mean	SD	Mean	SD			
NDI	36.93	6.67	17.46	4.86	19.47	**2.41***	**S**
NPRS	8.13	0.74	3.13	0.91	5	**5.85****	**HS**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

The above table shows that the calculated 't' value of NDI AND NPRS scores under pre week 0 and post week-4 are statistically significant at P<0.05% level. Hence, H_0 is rejected. It can be concluded that the McKenzie along with **IASTM** is also effective to reduce the non-specific neck pain or any other pain of the college students. In other words, differences in pre and post weeks NDI and NPRS scores are significant by 3.17 only.

To conclude that group B based on NDI and NPRS scores is effective and significant to reduce non-specific neck pain of the college students during pre and post weeks 2 or 4 in a given study.

Objective 3

To investigate the effectiveness of McKenzie along with Kinesio Taping and IASTM among collegiate student having a non-specific neck pain

Table 5: To assess the effectiveness of McKenzie along with Kinesio Taping and IASTM (Group-C) during pre-week 0 and post week-2 on NDI and NPRS.

N=15

Domain (GROUP-C)	Pre-Week 0		Post-Week 2		Mean Difference	't' - value	Result
	Mean	SD	Mean	SD			
NDI	32.4	6.67	18.6	3.86	13.8	**2.56**	**S**
NPRS	7.6	0.91	4.6	1.24	3	**2.60**	**S**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

The above table shows that the calculated 't' value of NDI AND NPRS scores under pre week 0 and post week-2 are statistically significant at P<0.05% level. Hence, H0 is rejected. It can be concluded that the McKenzie along with Kinesio Taping and IASTM is effective to reduce the non-specific neck pain among college students. In other words, differences in pre and post weeks NDI and NPRS scores are significant.by 0.04 only.

Table 6: To assess the effectiveness of McKenzie along with Kinesio Taping and IASTM (Group-C) during pre-week 0 and post week-4 on NDI and NPRS.

Domain (GROUP-C)	Pre-Week 0		Post-Week 4		Mean Difference	't' - value	Result
	Mean	SD	Mean	SD			
NDI	32.4	6.67	6.73	1.09	25.67	**5.57**	**HS**
NPRS	7.6	0.91	1.8	0.86	5.8	**2.68**	**S**

(*-P<0.05, significant and **-P<0.01 & ***-P<0.0001, Highly significant)

The above table shows that the calculated 't' value of NDI AND NPRS scores under pre week 0 and post week-4 are statistically significant at P<0.05% level. Hence, H0 is rejected. It can be concluded that the McKenzie along with Kinesio Taping and IASTM is also effective to reduce the non-specific neck pain or any other pain of the college students. In other words, differences in pre and post weeks NDI and NPRS scores are significant by 2.89 only.

To conclude that group C based on NDI and NPRS scores is effective and significant to reduce non-specific neck pain of the college students during pre and post weeks 2 or 4 in a given study.

To compare the effectiveness between Group-A (McKenzie along with Kinesio Taping), Group- B (McKenzie along with IASTM) and Group -C (McKenzie along with Kinesio Taping and IASTM) among collegiate student having a non-specific neck pain.

Table 7 ANOVA Group-A (McKenzie along with Kinesio Taping), Group- B (McKenzie along with IASTM) and Group -C (McKenzie along with Kinesio Taping and IASTM)

DOMAIN	SOURCE OF VARIANCE	SUM OF SQAURES	df	MEAN SQAURE	F	P*
GROUP A	Between groups Within groups Total	612.934 4141.937 4754.871	2 88 90	3225.095 887.452	3.632	**0.0311***
GROUP B	Between groups Within groups Total	1940 2922.713 2924.652	2 88 90	970.021 287.980	3.361	**0.0305***
GROUP C	Between groups Within groups Total	6298.054 9623.438 15,921.492	2 88 90	3542.778 628.980	5.632	**0.0499***

Note. *Statistically significant differences below 0.05

The above table represents the statistical outcomes of three groups namely A, B and C of the subjects. In order to compare the effectiveness of all three groups, the ANOVA test was worked out. It is evidenced that the p-value of all 3 groups (A-0.0311, B-0.0305 and C-0.0499) are less than alpha value i.e. 0.05 for F statistic value which implies that all three groups namely A, B and C are statistically significant at $p<0.05$. To conclude that, the group C (McKenzie along with Kinesio Taping and IASTM) is more effective and statistically significant in reducing the non-specific neck pain among collegiate students as compared to other groups namely A and B.

Discussion

The purpose of the study was to investigate the effectiveness of McKenzie Exercise along with Kinesio Taping & IASTM in collegiate student on non-specific neck pain as many researches were lacking to find the the efficiency of McKenzie Exercise along with Kinesio Taping & IASTM on non-specific neck pain In the present study we tried to find out cost effective treatment which provide efficient results.

The study is of experimental nature in which we had to see the efficiency of McKenzie exercise along with Kinesio Taping & IASTM. A total of 45 patients with history of non-specific neck pain were taken and were assigned into three groups. The subjects in group 1st were given McKenzie exercise Kinesio Taping. The subject in group 2nd was given McKenzie exercise with IASTM. The subjects in group 3rd were given McKenzie along with along with Kinesio Taping & IASTM.

In our present study we first investigated the demographic variables namely, age, height, weight,

BMI and gender. According to our results given in **Table 1** it can be concluded that all variables under group A has major difference in frequency as compared to other groups' namely B and C. Theoretically, BMI have a more significant difference in group A then other groups. This result has been shown in many researches (Gidey Gomera Weleslassie 2020).

According to our results given in Table 1 found that the McKenzie along with Kinesio Taping is effective to reduce the non-specific neck pain or any other pain of students more positively. In other words, differences in pre and post weeks NDI and NPRS scores are highly significant. It has been also found that the McKenzie exercise based on NDI scores is more effective and highly significant during pre and post weeks 2 or 4 whereas the same based on NPRS scores is effective and significant during the same periods on non-specific neck pain among college students in a given study.

The McKenzie exercise encourages self-care treatment through repeated exercise and focus on extension, including ROM exercise, manipulation and patient education. In the study of men and women with non-specific neck pain is reported that McKenzie exercise significantly ameliorated. The cervical posture of people with non-specific neck pain. Kinesio- Taping is a type of natural therapy that involves the use of non-medicated adhesive tape on human musclefor pain control purpose.

According to one systematic review conducted by (Jemyung Shim 2018) reported that from reviewing the included studies, up to approximately half of the respondents had reportedly recovered from massive neck pain. The same study also supported our study and found that McKenzie exercise changes in the structure and soft tissue of the cervical spine, thus reducing its function and pain. The therapeutic strategy of the McKenzie exercise includes self- therapeutic exercise, mobilization, manipulation, and patient education. (Saime Ay 2017) Supported our study which concluded that the Kinesio Taping leads to improvements on pain, pressure pain threshold and cervical range of motion, but not disability in short time. Therefore, Kinesio Taping can be used as an alternative therapy method in the treatment of patients with MPS.

According to our results given in Table 2 it can be concluded that the McKenzie along with **IASTM** is effective to reduce the non-specific neck pain or any other pain of the college students. In other words, differences in pre and post weeks NDI and NPRS scores are significant. group B based on NDI and NPRS scores is effective and significant to reduce non-specific neck pain of the college students during pre and post weeks 2 or 4 in a given study.

(Scott W. Cheatham 2016) also supported our study and found that IASTM techniques, combined with neuromuscular retraining exercises based on a holistic model of treatment of the human body, can significantly reduce pain and improve the corresponding function of patients with cervical pain.

According to our results given in Table 3 it van be concluded that the McKenzie along with Kinesio Taping and IASTM is effective to reduce the non-specific neck pain among college students. In other words, differences in pre and post weeks NDI and NPRS scores are significant. The same exercise based on NDI and NPRS scores is effective and significant to reduce non-specific neck pain of the college students during pre and post weeks 2 or 4 in a given study.

One study done (Khalid A. Alahmari 2020) also supported our study and found that there was no difference between the groups in the NDI. Kinesio Taping is a type of natural therapy that involves the use of non-medicated adhesive tape on human muscles for pain control purposes. It utilized the homeostatic properties of muscles to improve symptoms and control pains, as an application of the Kinesio Taping normalizes reduced muscle strength, spasms and tension while facilitating blood, tissue fluid and lymphatic circulation with elasticity and increased tension.

It is utilize the homeostatic properties of muscle to improve symptom and control pain, as an application of the Kinesio Tape normalize reduce muscle strength, spasms and tension while facilitating blood, tissue fluid and lymphatic circulation. IASTM is widely used to control pain associated with musculoskeletal lesions, and it series of therapeutic

effect are maximized by relaxing muscle at the lesions as much as possible furthermore, ISATM is generally the physical therapy of choice to stimulate to blood circulation for patient with non-specific neck pain.

In our present study, In order to compare the effectiveness of all three groups, it is evidenced that the p-value of all 3 groups (A-0.0311, B-0.0305 and C-0.0499) are less than alpha value

i.e. 0.05 for F statistic value which implies that all three groups namely A, B and C are statistically significant at $p<0.05$. To conclude that, the group C (McKenzie along with Kinesio Taping and IASTM) is more effective and statistically significant in reducing the non-specific neck pain among collegiate students as compared to other groups namely A and B.

The result of this study shown in Table 4 of Group A as well as Group B & Group C showed significant improvement in perception of pain, in term of their pre & post result comparison

i.e. in all groups the treatment protocol highly efficient in reducing non-specific neck pain. All participants in experimental group A, B & C. Received their specified intervention plan.

The concept of relief of non-specific neck pain and decrease muscle tenderness by McKenzie exercise along with Kinesio Taping & IASTM Can be understood through it neuro physiological effects such as inhibitory Golgi tendon reflex and descending pathway of pain modulation theories, anti-inflammatory and vascular effect. The increased blood flow to muscle results is removal of the waste products which are responsible for pain reduction. It also activates the cutaneous receptors which are responsible for blocking of non-inceptive stimulus. It also found that McKenzie exercise along with Kinesio taping and IASTM improved ROM. This is possibly because of the change in fascia properties.

Conclusion

The result show that significant difference in the effect of McKenzie exercise with Kinesio Taping and McKenzie exercise with IASTM. When compared to McKenzie exercise along with Kinesio Taping & IASTM among collegiate student having a non-specific neck pain. The present study also concluded that McKenzie along with Kinesio Taping & IASTM is more effective in decreasing pain in non-specific neck pain in collegiate student.

Its appears to be simple, harmless, non-invasive and effective way of restoring pain andmuscle tandon.

Limitations of the Study

1. Since the study is restricted to Noida, the findings cannot be generalized.
2. It may not represent the entire adults group in Noida.
3. The study was limited to 30 sample size.

References

1. Szeto, G.P and Lee, R (2002). An ergonomic evaluation comparing desktop, notebook, and subnotebook computers. *Arch Phys Med Rehabil*,. 83: 527–532. [PubMed] [Google Scholar]
2. Janwantanakul, P., Sitthipornvorakul, E and Paksaichol, A (2012): Risk factors for the onset of nonspecific low back pain in office workers: a systematic review of prospective cohort studies. *J Manipulative Physiol Ther*, 35: 568–577. [PubMed] [Google Scholar]
3. Hanten, W.P., Olson, S.L, Russell, J.L. (2000). Total head excursion and resting head posture: normal and patient comparisons. *Arch Phys Med Rehabil.*, 81: 62–66. [PubMed] [Google Scholar]
4. Cho, W.H., Lee, W.Y. Choi, H.K. (2008). An investigation on the biomechanical effects of turtle neck syndrome through EMG analysis. *KSPE*. 1: 195–196. [Google Scholar]
5. Shin, D.C. (2008). The effects of a deep cervical flexion exercise on neck-shoulder pain, muscle strengthening, and cervical alignment in sedentary workers. Graduate School, Sahmyook University. [Google Scholar]
6. Quek, J., Pua, Y.H. Clark, R.A. (2013). Effects of thoracic kyphosis and forward head posture on cervical range of motion in older adults. *Man Ther*., 18: 65–71. [PubMed] [Google Scholar]
7. McKenzie, R.A. (1983). Treat your own neck. Lower Hutt: Spinal Publication. [Google Scholar]
8. Kim, S.Y. (2014). The effect of Mckenzie

exercise on forward head posture and respiratory function. Department of Physical Therapy, Graduate School, Catholic University of Pusan. [Google Scholar]

9. John, R.J and Wright, V. (1962). Relative importance of various tissues in joint stiffness. *J Physiol*., 17: 824–828. [Google Scholar]
10. Park, Y.K., Hyun, S.W. Seo, H.K. (2009). The effectiveness of joint mobilization and myofascial release on the neck. *Journal of Korean Academy of Orthopaedic Manual Therapy*., 15: 69–79. [Google Scholar]
11. Algarni, A.D., Al-Saran, Y. Al-Moawi, A. Bin Dous, A. Al-Ahaideb, A and Kachanathu, S.J. (2017). The Prevalence of and Factors Associated with Neck, Shoulder, and Low-Back Pains among Medical Students at University Hospitals in Central Saudi Arabia. Pain Res Treat. 2017:1235706.
12. Alshagga, M.A., Nimer, A.R. Yan, L.P and Ibrahim, I.A. Al-Ghamdi, S.S and Radman Al-Dubai S.A. (2013). Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian medical college. BMC Res Notes., 6:244.
13. Almhdawi, K.A., Mathiowetz, V. Al-Hourani, Z. Khader, Y. Kanaan, S.F and Alhasan, M.(2017). Musculoskeletal pain symptoms among allied health professions' students: prevalence rates and associated factors. J Back Musculoskelet Rehabil. 2017. 30(6):1291–301.
14. Hurwitz, E.L., Randhawa, K. Yu, H. Cote, P and Haldeman, S.(2018). The global spine care initiative: a summary of the global burden of low back and neck pain studies. Eur Spine J., ;27(Suppl 6):796–801.
15. GBD. (2016). Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the global burden of disease study 2016. Lancet. 2017;390(10100):1211–59.
16. Hoy, D., March, L., Woolf, A. Blyth, F. Brooks, P. Smith, E. Vos, T. Barendregt, J. Blore, J and Murray, C. (2014). The global burden of neck pain: estimates from the global burden of disease 2010 study. Ann Rheum Dis. 2014;73(7):1309–15.
17. Bostrom, M., Dellve, L, Thomee, S and Hagberg, M. (2008). Risk factors for generally reduced productivity--a prospective cohort study of young adults with neck or upper-extremity musculoskeletal symptoms. Scand J Work Environ Health. 34(2):120–32.
18. Arnett, J.J. (2000). Emerging adulthood. A theory of development from the late teens through the twenties. Am Psychol., 55(5):469–80.
19. Schulenberg, J and Schoon, I. (2012) The transition to adulthood across time and space: overview of special section. Longit Life Course Stud., 3(2):164–72.
20. Sweeting, H., Green, M, Benzeval, M and West, P.(2016). The emergence of health inequalities in early adulthood: evidence on timing and mechanisms from a West of Scotland cohort.BMC Public Health., 16:41.
21. Heaney, R.P., Abrams, S. Dawson-Hughes, B. Looker, A. Marcus, R. Matkovic, V and Weaver C.(2000). Peak bone mass. Osteoporos Int., 11(12):985–1009.
22. Heaney, R.P., Abrams, S. Dawson-Hughes, B. Looker, A. Marcus, R. Matkovic, V and Weaver C.(2000). Peak bone mass. Osteoporos Int., 11(12):985–1009.
23. Dodds, R.M., Syddall, H.E. Cooper, R. Benzeval, M. Deary, I.J. Dennison, E.M. Der, G. Gale, C.R. Inskip, H.M and Jagger, C. (2014). Grip strength across the life course: normative data from twelve British studies. PLoS One. 9(12):e113637.
24. Räikkönen, E., Kokko, K. Chen, M and Pulkkinen, L.(2012). Patterns of adult roles, their antecedents and psychosocial wellbeing correlates among Finns born in 1959. J Longitudinal LifeCourse Stud., 3(2):17.
25. Salmela-Aro, K., Kiuru, N. Nurmi, J.E and Eerola, M. (2011). Mapping pathways to adulthood among Finnish university students: sequences, patterns, variations in family- and work-related roles. Adv Life Course Res., 16(1):25–41.

26. Schoon, I., Chen, M. Kneale, D and Jager, J. (2012). Becoming adults in Britain: lifestyles and wellbeing in times of social change. J Longitudinal Life Course Stud., ;3(2):17.
27. Fernandez-de-Las-Penas, C., Alonso-Blanco, C. Hernandez-Barrera, V. Palacios-Cena, D. Jimenez-Garcia, R. Carrasco-Garrido, P.(2013). Has the prevalence of neck pain and low back pain changed over the last 5 years? A population-based national study in Spain. Spine J., 13:1069–76.
28. Mesas, A.E., Gonzalez, A.D. Mesas, C.E. de Andrade, S.M. Magro, I.S and del Llano, J.(2014). The association of chronic neck pain, low back pain, and migraine with absenteeism due to health problems in Spanish workers. Spine (Phila Pa 1976).;39:1243–53.
29. Palacios-Cena, D., Alonso-Blanco, C. Hernandez-Barrera, V. Carrasco-Garrido, P. Jimenez-Garcia, R and Fernandez-de-las-Penas, C. (2015). Prevalence of neck and low back pain in community-dwelling adults in Spain: an updated population-based national study (2009/10-2011/12). Eur Spine J., 24:482–92.
30. Cerezo-Tellez, E., Torres-Lacomba, M. Fuentes-Gallardo, I. Perez-Munoz, M. Mayoral- Del-Moral, O. Lluch-Girbes, E. Prieto-Valiente, L and Falla, D.(2016). Effectiveness of dry needling for chronic nonspecific neck pain: a randomized, single-blinded, clinical trial. Pain., 157:1905–17.
31. Cerezo-Tellez, E., Torres-Lacomba, M. Mayoral-Del Moral, O. Sanchez-Sanchez, B. Dommerholt, J and Gutierrez-Ortega, C. (2016). Prevalence of myofascial pain syndrome in chronic non-specific neck pain: a population-based cross-sectional descriptive study. Pain Med., 17:2369–77.
32. Lame, I.E., Peters, M.L. Vlaeyen, J.W. Kleef, M and Patijn, J. (2005). Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. Eur J Pain., 9:1524.
33. Gross, A.R., Paquin, J.P. Dupont, G. Blanchette, S. Lalonde, P. Cristie, T. Graham, N. Kay, T. M. Burnie, S.J and Gelley, G. (2016). Exercises for
41. randomized controlled trial. Clin Rehabil., 30:64–72.
mechanical neck disorders: a Cochrane review update. Man Ther., 24:25–45.
34. Cunha, A.C.V., Burke, T.N. França, F.J.R and Marques, A.P.(2008). Effect of global posture reeducation and of static stretching on pain, range of motion, and quality of life in women with chronic neck pain: a randomized clinical trial. Clinics. 63:763–70.
35. Ylinen, J., Kautiainen, H. Wiren, K and Hakkinen, A. (2007). Stretching exercises vs manual therapy in treatment of chronic neck pain: a randomized, controlled cross-over trial. J RehabilMed. 2007;39:126–32.
36. Hoving, J.L., Koes, B.W. de Vet H.C. van der Windt, D.A. Assendelft, W.J. van Mameren, H. Deville, W.L. Pool, J.J. Scholten, R.J and Bouter, L.M. (2002). Manual therapy, physical therapy, or continued care by a general practitioner for patients with neck pain. A randomized, controlled trial. Ann Intern Med., 136:713–22.
37. Childs, J.D., Clealand, J.A. Elliot, J.M. Teihen, D.S. Wainner, J.S. Whitman, J. Sopky, B.J. Godges, J.J and Flynn, T.W. (2008). Neck pain:clinical practice guidelines linked to the international classification of functioning, disability, and health from the Orthopaedic section of the American Physical Therapy Association. J Orthop Sports Phys Ther., 38:A1–A34.
38. Hou, C.R., Tsai, L.C. Cheng, K.F. Chung, K.C and Hong, C.Z.(2002). Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. Arch Phys Med Rehabil., ;83:1406–14.
39. Sihawong, R., Janwantanakul, P. Sitthipornvorakul, E and Pensri, P. (2011). Exercise therapy for office workers with nonspecific neck pain: a systematic review. J Manip Physiol Ther., 34:62–71.
40. Tunwattanapong, P., Kongkasuwan, R and Kuptniratsaikul, V. (2016). The effectiveness of a neck and shoulder stretching exercise program among office workers with neck pain: a
42. Kang, J.H., Park, R.Y. Lee, S.J. (2012). The effect of the forward head posture on postural

balance in long time computer based worker. Ann Rehabil Med., (1):98-104.
43. Morningstar, M. (2002). Cervical curve restoration and forward head posture reduction for the treatment of mechanical thoracic pain using the pettibon corrective and rehabilitative procedures. J Chiropr Med., 1(3):113-5.
44. Chae, Y.W.(2002). The measurement of forward head posture and pressure pain threshold in neck pain. J Kor Phys Ther., 14(1):117-24.
45. Harrison, D.E., Haas, J.W and Cailliet, R. (2005). Concurrent validity of flexicurve instrument measurements sagittal skin contour of the cervical spine compared with lateral cervical radiographic measurements. J Manipulative Physiol Ther., 28(8):597-603.
46. Chae, Y.W. (2009). The effect of forward head posture and cervical ROM on chronic and episodic tension-type headache in university students. J Kor Phys Ther., 21(2):717.
47. Kim, I.G. and Lee, S.Y. (2018). The effect of forward head posture and tension type headache on neck movement: for office worker. J Kor Phys Ther., 30(6):218-23.
48. Kapreli, E., Vourazanis, E and Strimpakos, N. (2008). Neck pain causes respiratory dysfunction. Med Hypothesis., 70(5):1009-13.
49. Comerford, M. J and Mottram, S.L. (2001). Movement and stability dysfunction-contemporary developments. Man Ther., 6(1):15-26.
50. Key, J., Clift, A and Condie, F. (2008). A model of movement dysfunction provides a classification system guiding diagnosis and therapeutic care in spinal pain and related musculoskeletal syndromes: a paradigm shift-part 1. J Bodyw Mov Ther., 12(1):721.
51. Dimitriadis, Z., Kapreli, E and Strimpakos, N. (2013). Respiratory weakness in patients with chronic neck pain. Man Ther., 18(3):248-53.
52. Bovim, G., Schrader, H and Sand, T. (1994). Neck pain in the general population. Spine (Phila Pa 1976) 1994 Jun 15;19(12):1307–1309. [PubMed] [Google Scholar]
53. Borghouts, J.A., Koes, B.W. Vondeling, H and Bouter, L.M. (1999). Cost-of-illness of neck pain in The Netherlands in 1996. Pain. 1999 Apr;80(3):629–636. [PubMed] [Google Scholar]
54. Côté, P., Cassidy, J.D and Carroll, L.(1998). The Saskatchewan Health and Back Pain Survey. The prevalence of neck pain and related disability in Saskatchewan adults. Spine (Phila Pa 1976) 1998 Aug 1;23(15):1689–1698. [PubMed] [Google Scholar
55. Hurwitz, E.L., Coulter, I.D. Adams, A.H. Genovese, B.J and Shekelle, P.G.(1998). Use of chiropractic services from 1985 through 1991 in the United States and Canada. Am J Public Health.May; 88(5):771–776. [PMC free article] [PubMed] [Google Scholar]
56. Gross AR, Kay T, Hondras M, Goldsmith C, Haines T, Peloso P, Kennedy C, Hoving J. Manual therapy for mechanical neck disorders: a systematic review. Man Ther. 2002 Aug;7(3):131–149. [PubMed] [Google Scholar]
57. Bronfort, G., Evans, R. Nelson, B. Aker, P.D. Goldsmith, C.H and Vernon, H. A. (2001). Randomized clinical trial of exercise and spinal manipulation for patients with chronic neck pain. Spine (Phila Pa 1976) 2001 Apr 1;26(7):788–799. [PubMed] [Google Scholar]
58. Aker, P.D., Gross, A.R. Goldsmith, C.H and Peloso, P. (1996). Conservative management of mechanical neck pain: systematic overview and meta-analysis. BMJ. 1996 Nov 23;313(7068):1291–1296. [PMC free article] [PubMed] [Google Scholar]

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