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Additive Effect of Kinesiotaping on Neck Pain and Grip Strength in Violin Players: An Experimental Study

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ABSTRACT

Introduction: Professional violinists with complaints of the pain in the neck and shoulder region have increased muscle activity of sternocleidomastoid muscles, trapezius muscles and left deltoid muscle while playing violin. Neck pain is linked to changes in the neuromuscular control of the cervical muscles. To play violin, the flexor muscles must be in good working order to secure the instrument. Musicians' hands are weaker than nonmusicians' hands due to the protection musicians provide for their upper extremities.
Materials And Methods: It was an experimental study which was conducted in Pune.
Jamar hydraulic hand dynamometer, Foam Hand Grip, and Kinesio tape was used. 30 participants were selected and allocated in group A and B randomly using chit method. Group A was given kinesiotaping with conventional treatment while Group B was given conventional treatment only, for 4 weeks.
Results: Statistics analysis was done using SPSS software. Paired t test was used for within group analysis and Unpaired t test was used for between group analysis. Results suggests that group A was more effective than group B in reducing neck pain. For grip strength of right side, group A was more effective than group B in increasing the grip strength. For grip strength of left side, no group was better than other in increasing the grip strength.
Conclusion: The study concludes that there is a significant effect of adding Kinesiotaping along with conventional treatment in reducing neck pain and improving grip strength in violin players.

Key Words: Kinesiotaping, grip strength, neck pain, violin players.

INTRODUCTION

There is a four-stringed musical instrument which has been making the history of music in Europe musically rich. This instrument is called the violin. This four-stringed instrument has been immensely used in both Classical and modern music. But the process of learning to play an instrument is not always easy. Usually, the left side's neck and shoulder muscles are used to hold the violin while playing. When the chin rotates and depresses, the sternocleidomastoid supports the violin along with helping to support and sustain the violin, the trapezius also serves as an equilibrated muscle for the left arm that is constantly being abducted. The lifted left arm is supported by the left shoulder muscles, in particular the anterior deltoid. (1) The jaw, back, neck, shoulder, and hands of violinists often have muscular or nerve-related

problems. The disorders are brought on by stress from prolonged sitting or due to continuous holding the instrument, inappropriate postures, and recurrence. Musculoskeletal disorders are caused by both internal and external factors. It is well-known that professional musicians often suffer from physical complaints and pain when playing. Numerous studies demonstrate that between 60 and 90 percent of professional musicians suffer from pain of the musculoskeletal system. [(2)] Ergonomic analysis and biomechanical training focus on the connection between musicians and their instruments, and postural alignment is essential for achieving the correct neck and hand positions. The prevalence of neck and shoulder pain was 35.3% in the group of violists and violinists. [(3)] Cervical degenerative findings are common in asymptomatic subjects, particularly subjects aged 40 and older. [(4)] The results of previous study show that professional violinists with complaints of the neck shoulder region have increased muscle activity of the sternocleidomastoid muscles, trapezius muscles and left deltoid muscle while playing their instrument. Despite this increased muscle activity, complaints did not significantly predict the jaw-shoulder violin fixation force. Previous study reported more and the other study reported less activity of the left and right trapezius muscles in violinists playing with pain. [(5)] Focusing on strength-building exercises reduces injury risk is a well-known fact. In addition, prolonged maintenance of a static posture where the shoulders and neck are elevated or fixed laterally to hold instruments results in muscle imbalance, which may progress to chronic myofascial pain. [(6)] Handgrip is essential to play the violin. In most musical instruments, especially stringed ones, the dominant hand is typically used to control instrument volume through dynamic movements, whereas the non-dominant hand is primarily used to control sound tone and the physical stability of the instrument. The separation of roles between the 2 hands in a single motor task, particularly in stringed instruments, is notable. This separation of hand roles appears to be in line with the dynamic dominance theory, such that one arm/limb acts as a stabilizer whereas the other arm/limb performs dynamic actions in bimanual tasks. [(7)]

In Playing-related musculoskeletal disorders, the critical components of physiotherapy are patient education regarding playing-related risk factor modification, postural training, and therapeutic exercises. Besides, Kinesio tape (KT), an alternative taping technique, is a method consisting of a tape with elastic properties and stretching capabilities used to treat pain or prevent injuries in conjunction with. [(8)] Kinesio taping is statistically superior to other treatments for relieving the pain intensity and range of motion of patients with myofascial pain syndrome at postintervention. [(9)] Moreover, KT has also been used for correcting posture, decreasing the pain, claiming to re-educate the neuromuscular system through proprioceptive input. [(10)] Other techniques to treat musculoskeletal pain are Acupuncture, Chiropractic adjustment, Occupational therapy, Pain relievers, Physical therapy, Steroid injections, and Therapeutic massage. Due to the prolonged and forceful use of the muscles that enable holding and playing the instrument, playing-related musculoskeletal disorders (PRMD) are common among musicians, particularly violinists. Neck pain is linked to changes in the neuromuscular control of the cervical muscles. To play violin, the flexor muscles must be in good working order to secure the instrument. [(11)] Kinesiology taping is becoming more and more well-liked on a global scale. Kinesiology tape was initially created and utilized for the treatment of injuries, joint stabilization, and pain reduction, but these days it is highly regarded for its abilities to avoid injuries and improve performance. Given all the benefits that using this elastic cotton fabric tape can offer, the popularity of kinesiology tape at the moment is not at all surprising. In contrast to many other therapies, kinesiology taping is minimally invasive, straightforward, inexpensive, and

painless, and it only takes a short period of time to apply. The most important guideline is that the person being taped must have clean skin that is free of sweat, oils, and grime. Additionally, lengthier body hair must be removed before taping in order to ensure good tape adhesion to the skin. The application of tape for a maximum of 24 hours is a particularly significant and fundamental criterion of kinesiology taping that is either unknown or disregarded in addition to these well-known guidelines. Kinesiology tapes should never be used by subjects for longer than a single day. This time restriction is in place for a number of reasons. The most common issues brought on by extensive kinesiology tape use are skin issues. This refers to more than just allergic responses that the adhesive used to attach the fabric to the skin may cause. Sweating, which is a normal component of daily activity, can especially cause skin issues. Kinesiology tape that has been exposed to perspiration should not be worn for longer than one day since it may irritate the skin. It is also advised to remove the tape as soon as possible after taking a shower because damp tape might have negative effects on the skin. The use of kinesiology tape repeatedly is impossible if unfavourable side effects (such as itching, skin irritation, etc.) manifest, and treatment must be stopped. As a result, the state of the skin needs to receive more care. Kinesiology tape is to be removed right once if itching or another unwanted consequence manifests. Because a subject's physical condition is constantly changing, the 24-hour application rule is also advised. Based on how well a patient is responding to treatment, the location and degree of tape stretching may change. As a result, as the course of treatment progresses, tape techniques must be adjusted daily. The skin's ability to respond to the stimulus brought on by kinesiology taping is another crucial element. Applying fresh kinesiology tape every day is required to offer effective skin stimulation. One of the fundamental principles of taping is also not to stretch the kinesiology tape's origin and insertion points. The skin must be completely covered with tape between the starting and termination points, which should be around 2-3 cm apart. Although the elasticity of the tape is one of the main benefits of kinesiology taping, it is not advisable to stretch the tape too far. Stretching of the skin is likewise governed by this principle. Before using tape, the skin shouldn't be stretched too far. It is important to check that the tape adheres to the skin adequately after application, however aggressive rubbing of the tape should be avoided. To avoid skin irritation, several suggestions are given. Before using kinesiology tape, it is advised to apply hypoallergenic under tape (50 75 mm) to the origin and insertion locations in order to prevent skin issues in certain body sections (such as the anterior aspect of the acromion). [(12)] Previous research on the clinical effectiveness of Kinesiotaping on playing-related pain, function, and muscle strength in violin players discovered that results in upper extremity function, hand function, grip, and pinch strength were comparable between groups after one week of intervention. In contrast to the effect of rigid taping, one of the studies concluded that after a one-week intervention, none of the participants reported any adverse effects from KT application. Furthermore, there was no difficulty with being taped during the performance in the study. As a result of its elastic woven cotton and heat-sensitive acrylic adhesive, KT usually provides symptomatic relief and comfort when used properly. It has also been proposed that KT could improve rhythmic movement precision by reducing timing variability and modulating neural mechanisms for rhythmic movements. According to human body biomechanics models, wrist issues affect the rough grip, pinch grip, and thenar muscle strength. The grip position of the violin differs significantly from the conventional joint positions. After hours of practice, a professional violinist can perform for an extended period of time in this posture. The musician has been unable to perform in the affected area for several weeks. The body's

biomechanics reflect the issue (pain, stress) in one region to other regions. [13]. According to a study finding, there is a link between neck pain and hand grip strength. [14] . As a result, KT would be an excellent choice for treating violinists with shoulder-neck pain, and upper extremity pain. [13] It is hypothesised that musicians' hands are weaker than nonmusicians' hands due to the protection musicians provide for their upper extremities. [15] The aim of the study was to find the additional effect of kinesiotaping along with conventional treatment versus conventional treatment alone on neck pain and grip strength in violin players.

The objectives of the study were:

1. To find the additional effect of kinesiotaping along with conventional treatment on neck pain using neck disability index in violin players.
2. To find the effect of conventional treatment alone on neck pain using neck disability index in violin players.
3. To find the additional effect of kinesiotaping along with conventional treatment on grip strength using Jamar hydraulic hand dynamometer in violin players.
4. To find the effect of conventional treatment alone on grip strength using Jamar hydraulic hand dynamometer in violin players.
5. To compare the additional effect of kinesiotaping along with conventional treatment and conventional treatment alone on neck disability index and grip strength in violin players.

MATERIALS AND METHOD

This was a experimental study carried out in Music classes in Pune. Target population was violin players and sample size were 30. The duration of the intervention was 4-weeks, 6 days a week, 15 min conventional treatment, K tape application for 48 hours. Inclusion criteria were: Violin players playing for less than 3 months with incidence of pain after starting to play violin aged 18-40 years having score of 5-34 on neck disability index, both gender and willing participants. While, Individuals having recent history of cervical or upper extremity trauma like fractures, burns, crush injury, nerve injury or impingement, cervical spondylosis, individuals playing any other instrument other than violin and having neck pain prior to starting to play violin. Jamar hydraulic hand dynamometer, Foam Hand Grip, Kinesio tape, Neck Disability Index were the materials used.

PROCEDURE:

Title was approved by the institutional ethical committee. Violin players were identified and were screened according to inclusion and exclusion criteria. Willing participants were selected. 30 participants were randomly selected. Participants were randomly allocated in group A and B respectively used chit method with 15 participants in each group. Written signed consent was taken from the participants. Pre-readings were recorded on neck disability index and grip strength was measured using Jamar hydraulic hand-held dynamometer. Group A was given kinesiotaping along with conventional treatment. Kinesio tape was applied for 48 hours and then changed. While Group B was given conventional treatment only. Duration was for 4 weeks for 6 days a week Post reading were recorded. Data was collected and entered in a spreadsheet. Statistical analysis was done using paired and unpaired t test for within and between group analysis.

Conventional treatment for both the groups:

1. **Neck isometrics:**

a. Isometric flexion: apply light pressure to your forehead with your fingers and resisted with your neck muscles to keep your head upright.
b. Isometric extension: apply light pressure to the back of your head with your fingers and resisted with your neck muscles to keep your head upright.
c. Isometric side bending: apply light pressure to the side of your head (above

the ear) with your fingers and resisted with your neck muscles to keep your head upright.

d. Isometric rotation: used light pressure on the side of your forehead with your fingers, resisted turning with your neck muscles to keep your head upright.

note: did each exercise 3 times a day. Repeated each exercise 2 times. Held each position for 10 seconds.

2. Chin tucks

sat up straight with your shoulders backed and down, your eyes levelled, and your chin levelled. Pull your head backed and up tall, as if a string was being pulled from the top of your head.

note: did each exercise 3 times a day. Repeated each exercise 2 times. Held each position for 10 seconds.

3. Wall pushups [16]

stood with arms shoulder width apart at the wall, and then pushed the wall away until the elbows were fully extended and the scapulae were protracted as far as possible.

4. **Stretching:** exercise training in the form of stretching exercises had been performed for levator scapulae, upper fibres of trapezius, sternocleidomastoid and scalene muscles; the stretching had been maintained for 15 - 30 s, followed by 30 s relaxation with 4 repetitions.

- upper trapezius: the patients had been asked to sat upright on a chair and looked straight ahead. To reduce scapular elevation and upward rotation, the ipsilateral handed had been placed below the buttock. Patients would then been asked to perform deep neck flexion, ipsilateral neck rotation toward painful side, and contralateral lateral bending used the opposite handed in a diagonal direction. Patients had been asked to maintained deep neck flexion when performing the ipsilateral neck rotation and contralateral lateral bending during stretching in more tensed position. [17]
- levator scapulae: participants would sit on a stool and contralaterally rotate their head in the direction of the shortened ls. An examiner would kneel behind the participant and apply the manual stretched. As the participants exhaled, the examiner would apply an inferior stretching forced to the superior angle of the scapula and elevate the armed on the side of the shortened ls. Simultaneously, the participants would force their head in cervical flexion and lateral flexion used their handed. This position had been maintained until the participants felt a "good stretch" had been achieved on the shortened ls without causing discomfort. [18]
- sternocleidomastoid: the patient had been placed in a supine position with shoulders at the edge of the table, her head held at the base of occiput, rotated away from the affected side, laterally flexed toward the affected side, extended at the lowered cervical and flexed at the upper cervical (chin tucked with neck extension). [19]
- scalene: manual stretching exercises of the middle scalene, in the starting position, subjects had been instructed to bend their neck laterally in the opposite direction. Then, the practitioner standing behind the subject would press the shoulder with one handed while touching one side of the head and applied a lateral load with the other handed.
- anterior scalene, in the same position, the subject had been instructed to bend the neck laterally in the opposite direction, direct the eyes upwards, and slightly bend the neck posteriorly. In this position, the practitioner standing behind the subject would press the shoulder with one handed while touching one side of the head and would apply a load with the other handed laterally and posteriorly
- posterior scalene, in the starting position, the subject had been instructed to bend the neck forward and then laterally in the opposite side, and to looked to the side and downward. The practitioner standing behind the subject would press

the shoulder with one handed while touching one side of the head and would apply a lateral load with the other handed. [20]

5. **Spring exercises-** 10 sec held, 10 repetitions 3 minutes [21]

Group A:

Participants will be given Kinesiotaping along with conventional treatment.

Kinesiotaping with respect to site:

1. Neck [22]:

- Cut an approximately 20cm "Y" strip of tape. Remove the paper backing from the anchor. Place the anchor of the tape strip without stretching the tape, in the centre of the spine about 5-10cms below the anchor of the neck.
- Tilt head forward and to the left. Begin applying the right tape tail up the right side of the neck. Be careful not to apply the tape tail over loose hair.
- Using the left tape tail, repeat the previous step for the opposite side of the neck.
- Once applied in the correct place, it is important to rub both tape tails to activate the adhesive.
- Next, cut an "I" strip of tape approximately 10-12cm in length. Tear the tape's paper backing in the centre of the tape strip and expose the centre portion of the adhesive. Using minimal tension, apply the tape strip over the strained portion of the neck. Apply ends with no stretch. Rub the tape. Application complete.

2. Deltoid [23]:

The tape was applied with the participant on a self-stretch. Participants were first instructed to stand with their shoulders rolled anteriorly in protraction. The first strip was applied from the deltoid tuberosity of the humerus to the acromioclavicular joint, following the path of the posterior shoulder. This was applied with tape-off tension, which meant the tape was applied directly to the skin as it comes off the paper without stretching the tape. Tape-off tension provided approximately 15% to 25% stretch due to the natural elastic properties of the tape. The participants were then instructed to lift their shoulders up toward their ears, bring them down, and relax, as if standing in perfect posture. From this position, the second strip was applied from the deltoid tuberosity to the acromioclavicular joint following the path of the anterior shoulder, with tape-off tension. While remaining in this position, the third and final strip known as the decompression strip was placed directly over the participant's location of greatest pain with approximately 50% tape stretch and with tape-off tension on both ends. The decompression strip was applied in the horizontal direction, perpendicular to the direction of the muscle fibers.

3. Upper trapezius application [24]

Clinical implications: trapezius spasm, postural problems, chronic neck pain.

Procedure: course of tape: from mid-clavicle to appoint at the level of T7, medial to the medial border of the scapula. apply the tape with a posterior-inferior force, to bunch the upper trapezius fibers, from mid-clavicular region anteriorly till the level of t7 posteriorly.

4. Biceps application [25]:

Use two pieces of Y tape. The patient is lying down on a chair. Below the inside of the elbow, one of the tapes' beginnings is applied. Shifting the skin establishes the tape's starting. The two tails of the band travel parallel to the front edge of the deltoid muscle and terminate in the coracoid process before encircling the biceps brachii muscle body. In front of the discomfort location is where the second tape for fascia repair starts. The arm has extended. The direction of the muscle fibers is followed by a transverse strain on the fascia. To prevent compression of the biceps tendon, it is pushed posteriorly.

5. Wrist application [26]

Wrist flexors: The kinesiology tape was applied on the flexors of the wrist from the

medial epicondyle to the wrist joint on the palmar side when the wrist was in the extension position.
For the lumbricals, musculi interossei dorsalis, and palmaris, the tape was cut in half and was applied from the region between the fingers to both wrist joint while the fingers were spread apart.
Wrist extensors: The tape was applied from the lateral epicondyle to the wrist joint on the dorsal side while the wrist was flexed

6. Forearm application [27]:

The KT was a standard 5-cm (width) tape cut in a "Y-strip" and applied with approximately 30% tension over the muscle. The proximal head of the Y-strip was applied to the dorsal side of the wrist, and the tails were placed along the ulnar and radial wrist flexors and extensors to the medial and lateral epicondyle, respectively. Another spiral tape was placed along the forearm (from elbow to the wrist). To standardize the stretch tension, a 3-cm line was drawn on the tape before application, then the tape was stretched to approximately 4 cm in length for taping (approximately 30% tension).

7. Sternocleidomastoid [28]:

To apply the tapes to the SCM, the subjects turned their head away from the side on which the tape was to be applied and bent their neck laterally in a sitting position, and the base of the tape was attached to the mastoid process. Thereafter, the tape was attached in a "Y-shape" to the clavicular portion and sternal portion.

Group B:

Participants were given conventional treatment only.

RESULTS

Table 1:

Participants	
Males	Females
63%	37%

Table 2:

NECK DISABILITY INDEX WITHIN GROUP ANALYSIS	**Group A**		**Group B**	
	Pre	**Post**	**Pre**	**Post**
Mean	26.7	22.0	26.9	24.3
SD	4.58	4.28	4.84	4.59
T	14.6		8.37	
p	<0.01		<0.01	

Interpretation: Paired t test was applied for within group analysis where $p<0.05$ which suggests that both groups were effective in reducing neck pain.

Table 3:

NECK DISABILITY INDEX BETWEEN GROUP ANALYSIS	**Group A**	**Group B**
Mean difference	4.0	2.6
Standard Deviation	1.23	1.23
t	4.437	
p	0.001	

Interpretation: Unpaired t test was applied for between group analysis where $p<0.05$ which suggests that Group A was more effective than Group B in reducing neck pain.

Table 4:

GRIP STRENGTH RIGHT SIDE WITHIN GROUP ANALYSIS	**Group A**		**Group B**	
	Pre	**Post**	**Pre**	**Post**
Mean	27.2	30.9	33.6	35.7
Standard Deviation	7.98	7.67	11.3	10.5
T	-6.20		-6.88	
p	<0.01		<0.01	

Interpretation: Paired t test was applied for within group analysis where $p<0.05$ which suggests that both groups were effective in increasing right hand grip.

Table 5:

GRIP STRENGTH LEFT SIDE WITHIN GROUP ANALYSIS	GROUP A		GROUP B	
	Pre	Post	Pre	Post
Mean	25.9	27.9	30.9	32.6
Standard Deviation	8.41	8.53	9.79	9.90
T	-10.2		-14.7	

Interpretation: Paired t test was applied for within group analysis where p<0.05 which suggests that both groups were effective in increasing left hand grip

Table 6:

GRIP STRENGTH RIGHT SIDE BETWEEN GROUP ANALYSIS	Group A	Group B
Mean difference	3.66	2.06
Standard Deviation	2.28	1.16
T	2.414	
p	0.0226	

Interpretation: Unpaired t test was applied for between group analysis where p was<0.05 which shows that Group A was more effective than Group B intervention in increasing right hand grip strength.

Table 7:

GRIP STRENGTH LEFT SIDE BETWEEN GROUP ANALYSIS	Group A	Group B
Mean difference	2.0	1.73
Standard Deviation	0.75	0.45
T	1.169	
p	0.25	

Interpretation: Unpaired t test was applied for between group analysis where p was>0.05 which shows that no group was better than other in increasing left hand grip strength.

DISCUSSION

The aim of the study was to examine whether the addition of Kinesiotaping along with conventional treatment was superior to conventional treatment alone in reducing neck pain, and increasing grip strength.

This Study showed that Group A and B showed significant decrease in neck pain post intervention as we obtained significant differences between both groups while Group A was significantly more effective than Group B. Proposed mechanisms for the use of KT are to decrease pain and inflammation by facilitating lymphatic drainage and blood flow and used for correcting posture, claiming to re-educate the neuromuscular system through proprioceptive input[13]) A study supporting this result was done by Eman A. Elhosary et.al in 2017 which suggests that application of Kinesio taping to the skin may stimulate cutaneous mechanoreceptors and assist postural alignment. Kinesio tape is easy to apply and works well to relax muscles. The aim of our study was to investigate the effect of KT on neck pain. This can be accomplished by the tape decreasing mechanical irritation of the soft tissues and improving circulation of blood and lymphatic fluids. [29] Group A was effective in reducing NDI and improving grip strength the stretch applied to the tape creates tension in the skin which improves communication with mechanoreceptors and increases the number of motor units recruited during a muscle contraction). The tape can improve muscle function by facilitating inward contraction through these effects. [30]

Table 4 and 5 show that both the groups showed significant increase in grip strength bilaterally of post intervention.

Table 6 shows that group A was significantly more effective than group B in increasing right side grip strength while table 7 shows that no group was better than other in increasing left side grip strength. The reason might be because all participants had right hand dominance. Study supporting this result

was done by Thiago Vilela Lemos et.al in 2015 conducted a study stating that In the comparison of handgrip strength between the dominant and non-dominant hands, it was observed that the dominant hand demonstrated greater handgrip strength at all the assessment times, when considering the average dynamometry value, especially in the Kinesio and Control groups, the Kinesio Taping method can improve the strength of muscles weakened by correcting muscle function with stimuli and reinforcement. Therefore, the mechanoreceptor stimulus induced by the Kinesio Taping provided a faster response in the right hand than in its counterpart. The left hand possibly required greater tension and a longer period for it to receive sufficient stimulation to achieve the same results as for the right hand. (30)

In group B, conventional treatment was given. The results were positive in reducing neck pain and improving grip strength. The reason for this might be that isometric exercises strengthen weak muscles without stimulating pain-sensitive structures such as ligaments, tendons, or neck joints, making them more acceptable to the patient. They cause contraction in a specific group of muscles without changing muscle length, impeding involved joints' movement. (31) Isometric exercises when combined with stretching, not only improves strength but also settles pain. Stretching intends to expand muscle-ligament flexibility, improve range of motion or musculoskeletal capacity, and prevent injuries. These exercises improve unbalanced neck muscle activation and reduces neck pain. (32) Also, an adjustable foam gripper was used in conventional treatment. It is shown to enhance grip by increasing strength and tone of wrist and hand muscles via adaptations in neuromuscular system.

CONCLUSION

The study concludes that there is a significant effect of adding Kinesiotaping along with conventional treatment in reducing neck pain and improving grip strength. Anthropometric measures were not taken into consideration and Pinch grip was not measured were the limitations of this study. Long tern effects of kinesiotaping can be studied and study can be carried out in other population like swimmers, teachers etc.

Declaration by Authors

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