

Assessment of thoracic kyphosis and pinch grip strength in tattoo artist

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Abstract-

Background: This study has been undertaken to assess thoracic kyphosis and pinch grip strength in tattoo artist. Tattoo artist appear to sit for prolonged periods of time in awkward posture while grasping small vibrating tools that they use to perform fine. Prolonged sitting combined with an awkward posture might contribute to increased risk of developing spinal dysfunction.

Aim and objectives: To assess thoracic kyphosis and pinch grip strength in tattoo artist.

Method: sixty participants were selected according to inclusion and exclusion criteria. flexicurve ruler was used to assess thoracic kyphosis and pinch grip dynamometer was used to measure pinch grip strength. pearsons correlation test was done to determine the correlation. Statistical analysis was done using python software.

Result: There is weak correlation or negligible correlation between non dominant left hand and thoracic kyphosis index ($p=0.186$, $r=0.155$). Values between dominant right hand and thoracic kyphosis index ($p=0.104$, $r=0.212$) which shows weak correlation or negligible correlation between dominant Right hand and Thoracic Kyphosis Index.

Conclusion: It has been concluded that there is weak correlation between thoracic kyphosis and pinch grip strength in tattoo artist. Thoracic kyphosis were not associated with an increase effect on pinch grip strength.

Keywords: Thoracic kyphosis, Pinch grip strength, Tattoo artist.

I. INTRODUCTION

Tattoo originated in Polynesia and was first described by Captain Cook in 1769[2]. The tattoo art form was named from the tapping noise made by the tattoo needle on the skin, which was tatau or tatu in the native tongue. [2]. Body piercing and tattooing are becoming increasingly popular among adolescents and young adults. In recent years, there has been an increase in tattooing. Piercing various body places has been practiced by numerous people all over the world cultures for millennia [2]. Tattoos are a significant tool in ceremonies and traditions in many religions.

A tattoo artist, often known as a tattooer or tattooist, is someone who applies permanent or temporary tattoos. Tattoo artists typically learn their trade through apprenticeships under qualified and experienced artists. Tattoo artists must have design and creativity skills, as well as a steady hand, a love of alternative cultures, patience and dedication, good interpersonal skills, exceptional attention to detail, an empathic temperament, and the ability to convert clients' ideas into reality.

The musculoskeletal risk factors for tattoo artists are similar to those for dentists and dental hygienists, as outlined by Grieshaber (2012). According to Keester (2016), who analyzed the musculoskeletal discomfort, work, postures, and muscle activation in tattoo artists, discomfort prevalence exceeded 50% in the neck, followed by other joints.[1]

The posture for tattoo design is critical. The fingers holding the pen must be powerful and hard, while the palm remains soft, pliable, and empty. Tattoo artists undertake highly repetitious work while sitting with their upper back curved and their heads forward while designing tattoos. Tattoo artists must concentrate and perform repetitive movements with their wrist joints while keeping a single position for extended periods of time. The power of the combined contraction of the extrinsic and intrinsic hand muscles that flex the hand joint is known as grip strength, and it represents the overall muscle strength of the upper extremities. When holding objects with the thumb, fingers, or both, as well as the palm, hand grip strength results. When using a pinch grip, any one finger, or a group of fingers, can be utilized to control items in tandem with thumb motions without coming into contact with the palm. The muscles of the shoulder, upper arm, and wrist are used to create tattoos. The finger is the source of control and manipulation.

In India there is none of the studies investigating that occurrence of thoracic kyphosis and its effect on pinch grip strength among tattoo artist was done. So the purpose of this study is to correlate thoracic kyphosis and pinch grip strength in tattoo artist.

II. MATERIALS AND METHODOLOGY

The study was cross sectional study where 60 tattoo artist were selected according to convenient sampling. The inclusion criteria to select the study population were both male and females tattoo artist willing to participate in the study had worked experience more than 5-10years and worked 7-8 hours per day. The exclusion criteria were any neurological, musculoskeletal, cardiovascular condition, any recent trauma to upper or lower extremity, uncooperative subjects and recent surgery or fracture. Materials used in the study included consent form, demographic data proforma, pinch grip dynamometer, flexi curve ruler, graph paper, scale, pen and pencil.

III.PROCEDURE

Ethical clearance from the ethical committee was taken. Participant were selected according to the inclusion criteria and exclusion criteria, and who were willing to participate. The purpose of the study and the procedure was explained to the subject prior to the assessment. A written consent was taken in the language best understood by the subject. Demographic data was filled in. flexicurve ruler is used to assess thoracic kyphosis and pinch grip strength was measured using pinch grip dynamometer.

Clinical test: Measurement of thoracic kyphosis

Description of the test: Performed with participant in standing position and was examined for the landmark C7 and T12 on spine. The top of flexi curve was placed with flat part against the spine of C7 spinous process and moulded the flexi curve along the contour of the spine of T12 spinous process which provided replica of spinal shape. Then the flexi curve shape was traced onto the graph paper. The flexi curve was positioned so that C7 mark was at the corner of a grid square on the graph paper and T12 mark was on the same line. The side of flexi curve touching the skin onto the graph paper was traced. The points C7 and T12 were marked from the flexi curve onto the paper. The height of the thoracic kyphosis (h) in cm was determined by drawing a perpendicular line from the highest point in the thoracic curve to the point at which it intersected the straight line drawn from C7 to L1. Index of kyphosis = $(H/L) \times 100$.

Clinical test: Measurement of pinch grip strength

Description of the test: performed with participant sitting on chair with back and arm supported, elbow flexed to 90 degree, arm adducted at side and forearm and wrist in mid-position. Participants were instructed to squeeze the dynamometer with maximum effort and maintain it for 5 seconds. 3 readings were taken and a mean value of them was considered for the study.

IV.STATISTICAL ANALYSIS

Data was collected on an assessment sheet and encoded for computerized analysis. Table and graphs were using Microsoft Excel. Statistical analysis was done using python software. Pearson’s correlation test was run to determine whether or not there is a correlation between the pinch grip and thoracic kyphosis.

V.RESULTS

A total 60 participant were included in the study from those 47 participants were male and 13 participants were females.

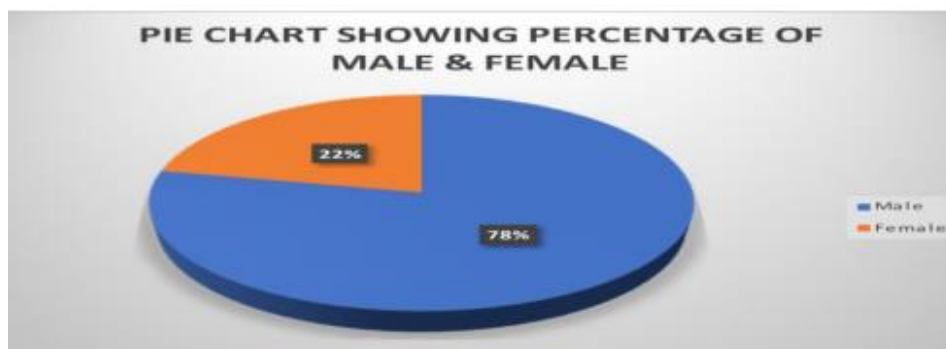


Figure 1: percentage of male and female

Fig1 Illustrates that 60 tattoo artist were assessed for thoracic kyphosis and pinch grip strength in which 47 were male and 13 were female having percentage of male 78% and female 22%.

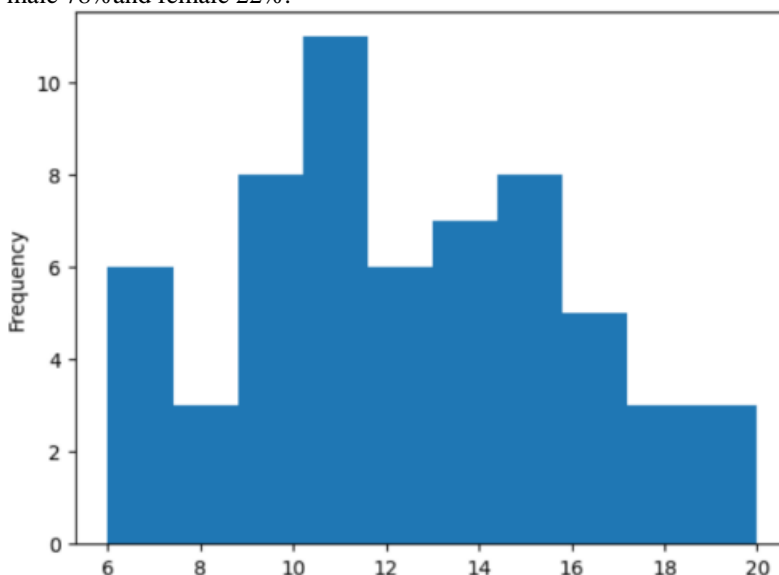


Figure: 2 Distribution of mean grip strength of left (non dominant) hand

Fig 2 Illustrate that maximum pinch grip strength mean value is 20 and has frequency e 3.

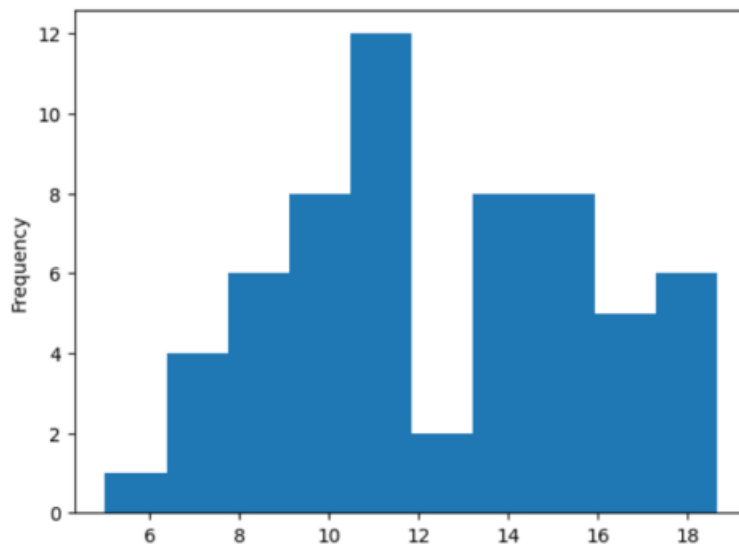


Figure: 3 Distribution of mean grip strength of right (dominant) hand

Fig 3 Illustrate that mean value of pinch grip strength of right hand of male and female tattoo artist and having maximum frequency is 12.

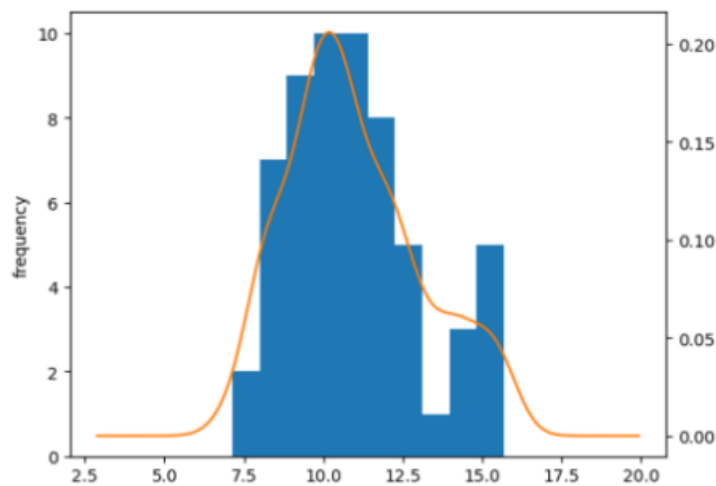


Figure: 4 Distribution of thoracic kyphosis index

Pearson’s correlation test was used to determine the Correlation for Non Dominant Left hand and Thoracic Kyphosis Index. Coefficient values between non dominant left hand and thoracic kyphosis index($p=0.186,r=0.155$)which shows weak correlation or negligible correlation between Non Dominant Left hand and Thoracic Kyphosis Index.

Pearsons correlation values between dominant right hand and thoracic kyphosis index ($p=0.104,r=0.212$)which shows weak correlation or negligible correlation between dominant Right hand and Thoracic Kyphosis Index

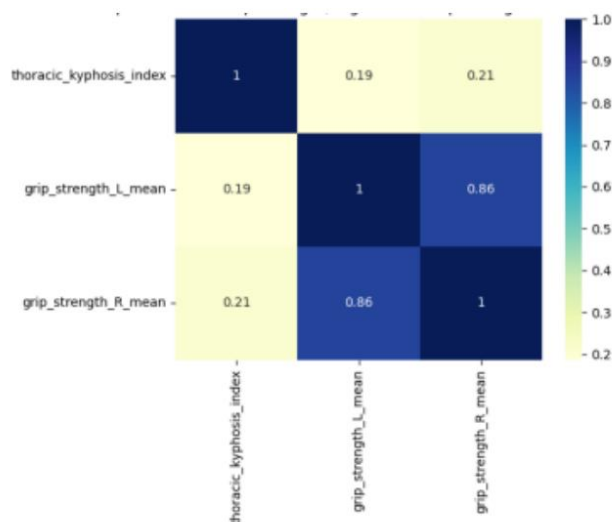


Figure: 5

Fig 5 Illustrate that the above heat map plots correlation between left pinch grip strength, right pinch grip strength and thoracic kyphosis index.. In correlation with thoracic kyphosis the R value of left pinch grip strength is 0.19 and the R value of right pinch grip strength is 0.21. R value of the entire sample with the highest possible value i.e. 1 at the Centre this shows that there is negative correlation between thoracic kyphosis and pinch grip strength.

VI .DISCUSSION

The following study was undertaken with an aim to find whether or not there is a correlation between Thoracic kyphosis and pinch grip strength in tattoo artist. The selection criteria according to inclusion criteria and experience of more than 5years and hours of daily activity set at minimum 7 to 8 hrs. In the study flexi curve ruler used to assess thoracic kyphosis and pinch grip dynamometer to record the pinch grip strength and best of the 3readings was used to find correlation. Pearson correlation test was used to determine correlation in this study. Tattoo artists appear to sit for prolonged periods of time in awkward posture while grasping small vibrating tools that they use to perform fine detailed visually guided work on a client who is often in recumbent position. Increased forward curve of the spine along the sagittal plane is referred to as thoracic kyphosis. However, an increased amount of curvature in the thoracic spine is seen starting at the age of 40, with women having a more rapid rate compared to men. The biomechanics that influences the curvature lies in the shape of the vertebral body and intervertebral disc, with an interior wedge increasing the angle of kyphosis. Postural kyphosis typically first manifests in adolescence, affecting more women than men. Slouching causes the spine's forward curvature to increase, which in turn stretches the posterior ligaments and the extensor muscles in the back, weakening the spine over time. The MCP, PIP, and DIP of the fingers are flexed as the thumb is opposed and flexed in a pinch grip movement. With this grip, compression is primarily provided by the extrinsic hand muscles (flexor digitorum superficialis, flexor digitorum profundus, and Palmaris longus), with assistance from the interossei, flexor pollicis brevis, and adductor pollicis. Researchers Eman, Sameer, and Faye identified a highly significant correlation between neck pain and hand grip strength in their research of dentists. According to a study, hand grip strength and neck pain have a substantial positive link. The strength of your hold will increase as your neck ache gets worse. With a 300g weight attached to a (Futek, LSB200) dynamometer that monitored forces applied to the object, they measured the grip strength of participants with neck discomfort and the control group. They discovered that, as compared to patients without discomfort, subjects with neck pain employed much stronger grip forces. The grip force levels in all subject groups decreased after the initial lift object as they habituated to the lifting job, but they were remained significantly greater in the subject with pain. According to the study's findings, dentists typically use flexion and side-bending techniques, however rotation and flexion combined was more painful. These outcomes might be brought on by strain on the ipsilateral facet joint, which raises the danger of facet joint damage in neck rotation. According to another study, the ipsilateral neural foraminal size decreases by 15% and 23% at 20° and 40° of head rotation, respectively, in comparison to the neutral position. The increase in posterior tensile tension on the spinal canal and soft tissue structure was discovered while the neck was flexed. Combining the two actions puts a heavy pressure on the neck structure, increasing pain.

A research project on the use of computers and smartphones by young adults. For this study, researchers at Caiyo University's faculty of physical therapy used a random sample of 335 undergraduate volunteers. A total of 102 right-handed volunteers are eligible for the study, therefore they were being screened for that. The results indicate that there was no discernible variation in the strength of the hand grip. Depending on the type of deformity, the participants were divided into three groups; group A contained 30 people with normal posture. Group C had 38 people with a forward head and rounded shoulders, while group B had 34 persons with rounded shoulders. The findings revealed no discernible difference in hand grip strength across the three groups, which can be attributed to a number of variables. First off, the postural deformity was not severe enough to elicit distal changes in the individuals because they were young and asymptomatic; this factor may also be to blame for the lack of a relationship between grip strength and FHP. Second, they haven't yet experienced extended workdays. Thirdly, until the unfavorable effects of RSP and FHRSP are demonstrated, the participants' age is still relatively young. It is noticed that the FHRSP did not affect the hand grip strength, and there was no correlation between the value of CVA, which represents the FHP, and grip strength that was supported by Zafar and Alghadir [9] who measured the hand grip strength by using a hand-held dynamometer with nearly the same age group and concluded that there was no effect of head and neck positions on hand grip strength in healthy young adults.

In addition, Zafar and Alghadir who measured hand grip strength using a hand-held dynamometer with nearly the same age group and came to the conclusion that head and neck positions had no impact on hand grip strength in healthy young adults, found no correlation between the value of CVA, which represents the FHP, and grip strength. These findings support the observation that the FHRSP had no effect on hand grip strength. The findings of Sawyer [10] who did not find a significant difference in the strength of serratus anterior, posterior deltoid, infraspinatus, teres minor, and lower trapezius muscles between the FHRSP group and the normal posture group. This indicates that the proximal shoulder muscle strength was not affected by FHRSP and indirectly does not affect the distal hand muscles reflected by hand grip strength. Furthermore, these results could be explained by Talati et al. [11] who concluded that there is no significant association between FHP, thoracic kyphosis, and lumbar lordosis in normal adults aged 18–35 years, which supports the absence of correlation between the CVA and hand grip strength weakness. According to Sawyer's research, between the FHRSP group and the normal posture group, there was no appreciable variation in the strength of the serratus anterior, posterior deltoid, infraspinatus, teres minor, and lower trapezius muscles. This shows that FHRSP did not have an impact on the proximal shoulder muscles, which in turn shows no impact on the distal hand muscles as seen in the strength of the hand grip [10]. Additionally, Talati et al found that there is no significant correlation between FHP, thoracic kyphosis, and lumbar lordosis in healthy adults aged 18 to 35 could be used to explain these findings. This conclusion supports the idea that the CVA and hand grip strength weakness are unrelated [11] It is apparent that the dominant hand grip strength was greater than the non-dominant hand in each group, which is consistent with the findings of Incel et al, who found that right-handed respondents' dominant hands were stronger than their left hands [12]. They clarified that by handling objects and performing daily tasks with the dominant hand. Furthermore, Han et al. showed that in righthanded respondents, the grip strength of the right hand was 5-6% greater than the grip strength of the left hand [13].

A study was done at the 13th Annual Northern Ink Xposure in Toronto. The demographic of attendees at the 13th Annual Northern Ink Xposure Tattoo Convention in Toronto (June, 2011) served as the source of participants for this study. Participants gave IRB approval before submitting their survey replies in an encrypted drop box. Basic demographic data regarding gender, race, education, prior musculoskeletal problems, and job history were collected by the self-administered questionnaire. A modified version of the Cornell Musculoskeletal Discomfort Questionnaire was then given to the participants to complete. The results of this study show that tattoo artists endure severe pain and suffering while doing their jobs. For a longer period of time, a static posture is required for the task of making a tattoo. The participants in our study used a hand-held tool with precision for 7-8 hours, depending on the size, design, and area of the body that needed to be tattooed. Even though studies have shown that this population is highly susceptible to ergonomics, there isn't much indication of pain or discomfort in the evaluations and assessments. A research on tattoo artists that was done in Ohio. The 34 participants have between 1 and 22 years of tattooing experience and 2 to 22 years in the body modification industry. They put in between 2 and 7 days and 14 hours a week of tattooing work. In the current study, 71% of the total scores fell into the categories of actions levels 3 or 4, where improvements are necessary soon or right away, respectively. 48% of the total scores were 5 or 6, and 23% of the scores were 7. According to this participant's assessment level, the two hands were used in a variety of ways, and the neck and trunk scored consistently over extended periods of time. While artists were standing or sitting. In this study, muscle activity levels for the trapezius muscles at the 10th and 50th percentiles were higher than those suggested generally by Jonsson (1978). In fact, the prevalence of neck and shoulder discomfort among the female dental hygienists studied by Akesson et al. (2012) and the female tattoo artists in the current study was comparable to the mean 10th and 50th percentile values reported by Akesson et al. (1997) in their study of female dentists, and the 50th and 90th percentile values reported by Akesson et al. (2012) in their study of female dental hygienists.

According to the results of the Rapid Upper Limb Assessment, tattoo artists are at an increased risk of acquiring musculoskeletal issues because of the extended uncomfortable postures they maintain while working. Participants in this study frequently displayed elevated, unsupported arms, prominent neck flexion, forward head posture, and an unsupported flexed trunk, all of which are recognized risk factors in the dentistry industry.

VII.CONCLUSION

This study concluded that thoracic kyphosis have no effect on pinch grip strength in tattoo artist. Moreover thoracic kyphosis were not associated with an increase effect on pinch grip strength. Thoracic kyphosis was assessed using flexi curve ruler and pinch grip strength was measured using pinch grip dynamometer and it concluded that there is negative co-relation between this two variables. It is believed that these risk factors will result in cumulative trauma, which is brought on by long durations of holding the same posture.

VIII.SCOPE OF FURTHER STUDY

The sample size undertaken in either group was small as the study was done on a small scale. The data distribution might vary with a large population and thus might bring alteration in the result. Thus further studies in this field can take the above mentioned suggestion into the consideration.

IX.LIMITATIONS

In this study, sample size taken was small. There is possibility that tattoo artist carries experience more than 30 years in a field can be seen different changes in their body structure.

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