Comparative Analysis of EMG Activity of Upper Limb Muscle During Different Yoga Poses

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ABSTRACT : The objective of this study was to analyze the forearm muscle activation during upper limb yoga pose by using Surface electromyography. We investigated the muscle in the forearm like Biceps branchii, Triceps Branchii , Flexor Carpi Ulnaris and Branchioradialis during several yoga poses: (Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana) compared to quiet standing (mountain pose).Five healthy men and Five healthy women with more than six month of continues of continuous yoga experience who practiced at least 1h per week were recruited. EMG activity was recorded from the aforementioned muscles during mountain pose ("rest") for 50 s, five times.Subjects then performed the following yoga poses in a randomized sequence while surface EMG activity was recorded: Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana. EMG data were band pass filtered and the root mean square (RMS) was obtained. The peak RMS of each of the resting trials was obtained and averaged to produce an average peak resting RMS value. The study revealed significantly greater EMG activity in FCU and BR in all four poses when compared to BB and TB. In conclusion, upper limb yoga poses require increased use of the wrist musculature when compared to elbow musculature.

Keywords: Upper limb, Surface Electromyography, Root Means Square, Yoga

1. Introduction:

Yoga is the significant exercise followed by world over to raise the health and fitness by coordinating the mind, body and spirit. Patients are requested by their health professionals to follow the yoga practice to raise the mental and physical well-being. The yoga followers reported that, the benefits (5) investigated the physical demands associated with five sitting asana. In this case, surface EMG output of the Biceps branchii, Triceps Branchii , Flexor carpi Ulnaris and Branchioradialis were

of yoga included improved blood circulations, improved respiration, improved cardiac function, improved mind well-being of concentration improvement, improvement in muscle strength and flexibility. During Yoga muscle activation is determined by Surface Electromyography in the most of the research because its simplicity to acquire the signal and moreover during other type of exercise SEMG is followed to quantify muscle activity.

Broad exploration exists researching different recovery practices utilizing surface EMG. (4)used EMG information to break down various lower arm muscle four activities. In that review, 23 "genuinely dynamic subjects" performed 4 activities (Pullups, Grip Crush, Forearm Pull and Forearm Squeeze). Subjects played out a warm up and had the option to rehearse each activity before beginning. Maximal willful isometric constriction (MVIC) information were gathered, trailed by a 5-min rest before practice testing started. The normal of this information was determined and the percent MVIC was resolved. The creators found that for each of the 4 muscles, there were genuinely critical contrasts in the mean EMG signal plentifulness across the 4 activities This data might be applied in a clinical setting when endorsing objective explicit furthest point muscles The convention utilized by (4)compliments the convention utilized in this investigation, and the creators support the requirement for additional examination with respect to surface EMG of muscle movement in explicit activities. Maybe than use MVIC, different creators have utilized pullups as a benchmark estimation to analyze strong work during yoga presents.

analyzed. The EMG activity recorded during the poses was compared to EMG output during pullups at a self-selected constant speed. The authors concluded that the four muscles analyzed demonstrated an increase

in activity during certain asana when compared to pullups . (6) had similar results when comparing EMG activity of the Biceps branchii, Triceps Branchii , Flexor carpi Ulnaris and Branchioradialis of the subject's dominant limb during 5 asana. The authors normalized the EMG output in each pose to the EMG data that resulted from pullups. Researchers concluded that each pose elicited different muscle activity at the shoulder, Elbow and wrist.

(7) assessed how muscle use designs shift dependent on expertise level of the specialists. There were 36 yoga experts with in any event 3 months of yoga practice insight. Members could be categorized as 1 of 3 classes, amateur, progressed, or yoga teacher. These creators reasoned that the 11 distinct stances inspected, inspired diverse muscle movement in all members. Creators likewise noticed that the enactment example of the muscles differed, in light of the ability level of the yogi. The ends from this examination uncover that there is a need to utilize the expertise level of the members for incorporation/avoidance purposes, further infer that specific stances can be utilized to target explicit gatherings of muscles. Further examination into yoga will permit medical services experts to devise a training explicitly intended to suit the specialist's requirements

In view of the past writing, the greatness of EMG yield for different muscles shifts relying upon the posture or action. Because of the huge variety saw in the numerous EMG considers, further EMG research is required in regards to explicit yoga presents. The earlier examination likewise uncovers a shift from normalizing EMG information to a MVIC (Norcross et al., 2010) (because of its trickiness) to

Table 1 Participant demography

Variables	Male(n=5)	Female(n=5)
Age	40±2.5	40±1.8
Height(m)	160±8.4	160±2.6
Weight (kg)	73±1.7	68±2.1
Body Mass Index kg/(m)^2	25.4±3.4	24.7±3.2

the utilization of a more solid variable, for example, pullups or calm standing. Thusly, for the current examination, a static movement (calm position, or mountain present), was utilized to standardize information. The reason for this examination was to survey the EMG yield of four furthest point muscles, Biceps branchii, Rear arm muscles Branchii , Flexor carpi Ulnaris and Branchioradialis of experienced yoga specialists during four yoga presents (Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana) contrasted with calm standing (mountain pose).

2 Materials and Methods:

2.1. Participants details:

We enlisted ten volunteers for this examination who practice the yoga routinely at any rate most recent half year without break and least one hour every day. Potential members were enlisted through messages, informal exchange and conveyed to nearby yoga teachers, our foundation resources, staff and understudies and other known yoga experts. Incorporation standards included being capable yoga specialists matured 30-50. Avoidance models included shortfall of any of the incorporation standards, history of neurologic pathology, muscular medical procedure on either furthest point inside the most recent three years, and any furthest point or back torment. Preceding partaking in the examination, subjects were given a short outline of the investigation and were taught on the likely dangers and advantages of taking an interest. Subjects then, at that point marked an educated assent structure. Subjects were additionally told they could exit the investigation whenever without outcomes.

2.2. Procedure

The skin was scoured with Isopropyl liquor until erythema was available, and expendable terminals were set over the stomaches of the accompanying muscles , Biceps branchii (BB), Rear arm muscles Branchii(TB) , Flexor carpi Ulnaris(FCU) and Branchioradialis(BR). Terminal arrangement was controlled by the SENIAM (Surface ElectroMyoGraphy for the Non-Intrusive Appraisal of Muscles) convention. One ground cathode was put on the reference point of the testing hand . Scientists

affirmed right EMG arrangement by setting a fringe nerve trigger on the terminals and noticing a jerk withdrawal of the muscle. Terminals were then gotten by pre-wrap, clinical tape and Gauze to forestall development during asana.

Standard EMG information were gathered during mountain present (Tadasana), or calm standing (Wang et al., 2013) by means of a solitary finished intensifier with normal mode dismissal proportion (CMRR) of 130 db. Subjects wore a battery worked 4-channel transmitter to move the EMG sign to a beneficiary where the information were additionally intensified (multiple times for an all out gain of 2000), The subject was told to remain in anatomical position (mountain present), legs shoulder width separated, arms supinated and stole to 30. EMG information were recorded for 50 s, multiple times. Subjects then, at that point played out the accompanying yoga presents in a randomized grouping while surface EMG movement was recorded: Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana. The request for the stances was randomized, and each posture was disclosed to the subject exhaustively dependent on standard language EMG information were recorded for all stances and performed for at least 20 s, multiple times, with a 60-s break in the middle to forestall weakness. Information assortment started once the subject detailed that they were set in the posture.

2.3. Data processing

3. Results

After calculating normalized EMG compared with standalone pose , During Bakasana (crow pose) , EMG activation of FUC and BR was more compared to BB and TB (p< 0.001) but in that pose the difference between Normalized EMG was very less in the wrist musculature and elbow musculature refer fig 1. At Mayurasana forearms muscle like FCU and BR activated more with high EMG difference see fig .2. With significance of p 0.001. During downward facing tree pose total weight of body was balanced by wrist, So FCU and BR was activated more than TB and BB. Fig.3. Lastly in the Tittibhasana(firefly pose) TB, BB , FCU and BR activated more or less equally with significance difference of (p <0.001) refer fig .4.

The raw EMG information were band pass sifted utilizing a fourth request Butterworth channel with cutoff frequencies of 10 and 500 Hz. The root mean square (RMS) of the sifted signal was acquired utilizing a 250 ms window. The pinnacle RMS of every one of the mountain present preliminaries was gotten and arrived at the midpoint of to deliver a normal pinnacle resting RMS esteem. The RMS information of Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana were then isolated by the normal pinnacle resting RMS esteem and increased by 100 to standardize the posture RMS information to the resting preliminaries. The normal standardized EMG of the posture preliminaries for the center 10s of the preliminary was then gotten for every preliminary of each subject

2.4. Statics Analysis

A straight blended model, with irregular captures for subject and for preliminaries settled inside subject, and a fixed impact for muscle bunch was performed to decide whether muscle yield varied dependent on present. Standardized EMG information (utilizing the RMS) were utilized for all factual examination. A huge factor impact for muscle was trailed by two way ANOVA combined examinations between muscle gatherings. The models were arrived behind schedule for every one of the stances. A preset a was set at p < 0.05 and examinations were performed utilizing Microsoft dominate
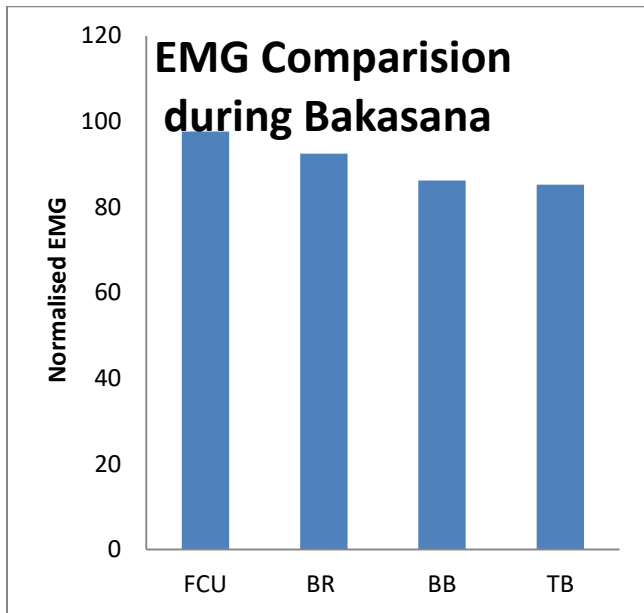
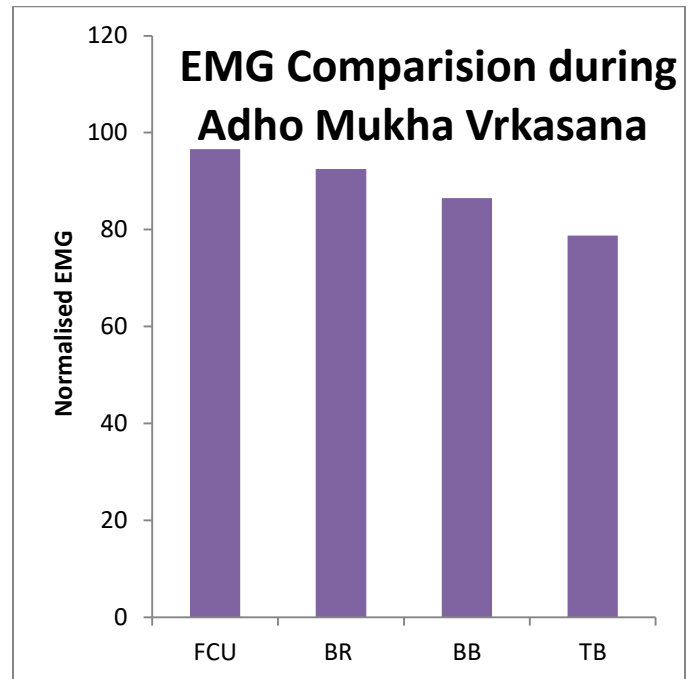Chart 1. EMG Activity during Bakasana with significance difference of p<0.001

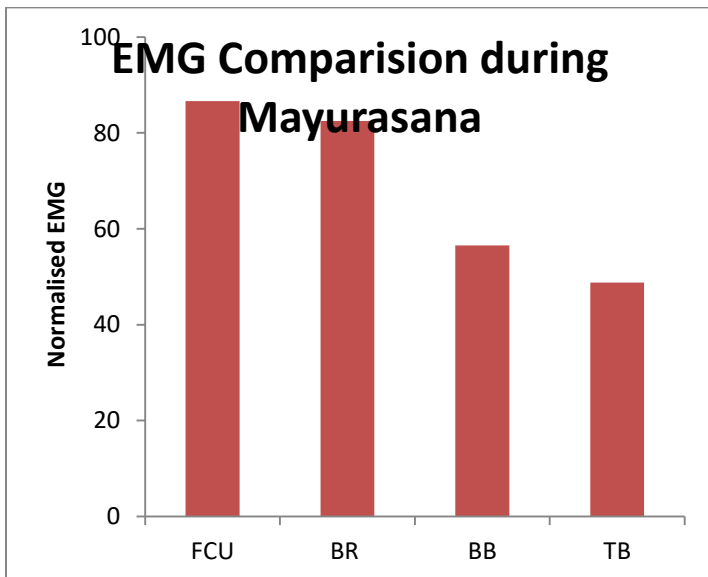Chart 3. EMG Activity during Adho Mukha Vrkasana with significance difference of p<0.001

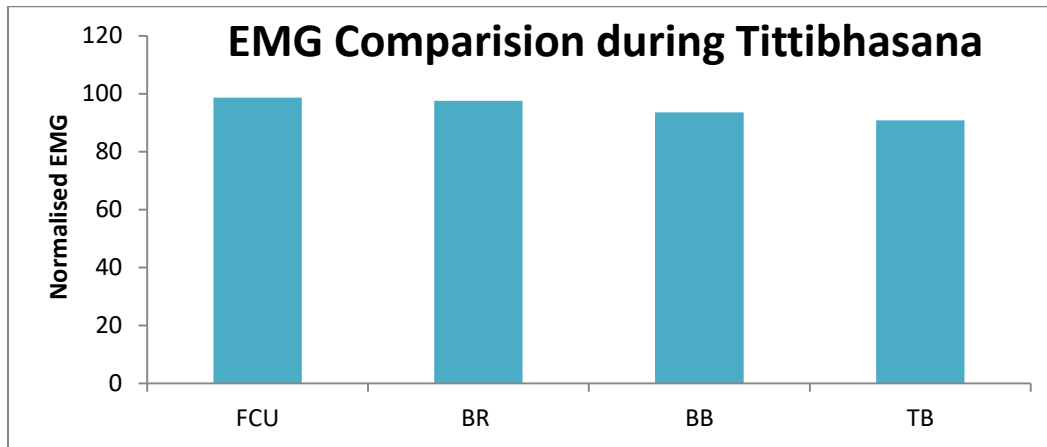Chart 2. EMG Activity during Myursana with significance difference of p<0.001

Chart 4. EMG Activity during Tittibhasana with significance difference of p<0.001

4. Discussion

The reason for this investigation was to utilize surface EMG to inspect the muscle enactment of the muscles during four yoga postures of Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana when contrasted with a rest present (mountain present). The creators tracked down that generally speaking; the FCU and BR muscles were more dynamic in the entirety of the postures when contrasted with the BB and TB muscles.

MVIC is an ordinarily utilized technique to standardize the consequences of EMG information to analyze muscle activty among presents as well as subjects (8) Notwithstanding, there have been some new cases that MVIC is untrustworthy, as there is no obvious method to distinguish if the subject is selecting the entirety of their muscle filaments standing (mountain present). Rather than contrasting EMG information with a "greatest" yield, the creators standardized the information to an accepted least and giving their most extreme exertion .This limit was disposed of in the current examination, as EMG action was standardized to calm.

The aftereffects of this investigation uncovered that muscle execution varies between various upper appendage yoga presents. FCU and BR example size is little; along these lines it is hard to accept that the discoveries of this information can be applied to all populaces. At long last, just surface EMG was utilized to decide muscle movement. For this

had altogether more noteworthy EMG movement when contrasted with BB during both half moon (p < 0.001) and tree present (p <0.001). In this manner, it is clear that the wrist musculature is predominant in these help exercises (9). This utilization of wrist musculature may demonstrate that subjects used a wrist methodology all through each posture. The wrist technique reestablishes the focal point of mass (COM) to a place of strength through body development at the wrist joints. Obviously in every one of the four represents, the FCU and BR were initiated more than BB and TB optional to the emotional foremost dislodging of the subjects(10). All members used their wrist methodology to settle themselves in every one of the postures. While inspecting the measure of normal EMG yield, Bakasana unmistakably inspires more prominent EMG yield at the wrist when contrasted with Tittibhalasana and Myurasana. In the wake of thinking about the segments of the wrist system, obviously this expanded wrist yield is because of the front relocation of the subject's focal point of mass in Bakasana when contrasted with Tittibhalasana and Myurasana.

In the past examination just ladies professional was thought of however we have included men likewise yet this investigation has some restriction. Right off the bat, the situation, it is absolutely impossible to verify that the movement being recorded was genuinely from the muscle that was expected on being tried. More examination would should be led in various age

ranges and level of aptitude to have the option to apply the discoveries to everybody.

5. Conclusion

All in all, this examination tracked down that in each of the four yoga presents (Bakasana, Mayurasana, Adho mukha Vrksasana and Tittibhasana) the normal EMG information in the wrist musculature (FCU, BR) were more dynamic than that in the Elbow (BB, TB). This data is helpful for an assortment of reasons and can be utilized for a

few unique populaces. For instance, there is proof to recommend that fortifying the FCU and BR muscles are useful in reinforcing lower arms. It is likewise valuable data for Actual Advisors to use in the center, with the goal that a patient may utilize these yoga acts like an activity remedy to fortify the wrist muscles rather than customary reinforcing works out. At long last, yogis who need to improve their reciprocal postures can utilize this data to pick which stances will be advantageous to reinforcing the wrist muscles, subsequently improving their stances.

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