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Comparison of Grip Strength with Elbow Taping and Elbow Brace in Asymtomatic Computer Users

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Abstract: Due to regular usage of computers individuals are also more likely to develop musculoskeletal disorder in upper limbs, neck and shoulder. risk factors identified were marathon use of computers, poor postures, high stress, awkward positions, improper workstation setup, keeping elbows bent for long periods, poor lighting facilities, lack of frequent breaks, high stress work, work overload, sitting for long periods without break (6-7 hours continuously), holding still for long period, poor technique as while resting wrists, forearms or elbows while using keyboard or mouse. Study has reported that there is significant decrease in hand grip strength in both hands with increased duration of computer use. Evidence supports the use of elbow brace and elbow taping in relieving pain, thereby, improving the grip strength. But evidence is unclear whether the biomechanical and the proprioceptive effects of application of tape and brace bring about a change in grip strength in asymptomatic computer users.

Keywords: Posture, Asymptomatic, Musculoskeletal, Proprioceptive

I. INTRODUCTION

The human hand has been characterized as a symbol of power, as an extension of intellect and as the seat of the will [(1)]. Many daily activities and sporting events involve interaction with objects that are grasped in the hand. The manipulative ability of the human hand requires effective force and dexterity [(10)]. From sports like wrestling, tennis, football, basketball and baseball to daily activities such as carrying laundry, turning a door knob and vacuuming some degree of grip strength is necessary to be successful[(2)].

Hand grip strength has been used as an objective clinical measure in a variety of situations, for example grip strength has been used to assess general strength in order to determine work capacity, for extent of injury and progress in rehabilitation. It is also important as a screening test for the integrity of upper motor neurons and function of motor unit [(4).]

The direct training of one's grip strength has been mostly limited to spring loaded hand squeeze devices and variations of tennis ball squeezes. Many exercises currently used in gyms and fitness centres using grip enhancers and free weight bars of varying thickness and activities like pulling exercise such as dead lifts, bend over rows and pull ups all depend upon the person's level of grip strength. The training which ensures greater isometric strength demand of gripping muscles increases the grip strength [(2)]. Furthermore, there are two modalities, elbow brace and elbow taping which are useful in increasing the grip strength.

A. Biomechanics Of Elbow Brace & Tape

Elbow orthosis or commonly called elbow brace is either elastic or non elastic and is applied below the elbow, over the bulk of the wrist extensor muscles. Mechanism of action of elbow brace is - to constrain or inhibit full muscle expansion and decrease capacity of forearm extensor muscles to contract, create secondary origin;shorten length of muscle pull; change force direction; diffuse force load to less sensitive areas of forearm; dampen force transmission at proximal forearm; to decrease force on the lateral epicondyle; limit stress absorbed in the joint; decrease forearm muscle activity and reduce elbow angular acceleration[(4)]. Although many theories exist regarding the mechanism of action, two are referenced most commonly. The first theory involves constriction of the forearm musculature and inhibition of full muscle contraction .By inhibiting muscle expansion the band decreases the magnitude of muscle contraction and thereby reduces tension at the musculotendinous unit proximal to the band.

Either mechanism of action is affected inherently by the degree of constriction or pressure caused by the support band. The tighter the band the greater the effect. Potential complications related to excessive pressure include venous congestion and edema, transient anterior interosseous nerve syndrome and soft tissue necrosis. Thus, a band pressure applied at a safe pressure at rest that increases to a greater pressure during activity would allow a compromise between safety and efficacy[(5)]. Tape is used to prevent the soft tissues from becoming further injured or ruptured and at the same time allows an acceptable range of motions so that normal everyday activity can be maintained [(3)]. Clinically, in musculoskeletal conditions, by minimizing the aggravation of symptoms during the performance of therapeutic exercise, the use of a taping technique may facilitate the compliance to exercise rehabilitation programs [(5)].

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AIM

1) To investigate grip strength with and without elbow taping in asymptomatic computer users.
2) To explore grip strength with and without elbow bracing in asymptomatic computer users.
3) To study the relationship of grip strength with elbow taping and elbow bracing in asymptomatic computer users.

II. MATERIAL AND METHOD

50 Computer operators were taken for study from Hisar & Panipat city between the age group of 18-40 years. They were asymptomatic Computer users having minimum 8 hours of working both male and female.

Analysis of the data collected of grip strength with elbow taping & brace of 50 subjects was done by several suitable statistical analysis tests by using SPSS software 15.0 version in order to verify the investigation of the study. The results were considered statistically significant if the p-value <0.001.

The characteristics of the data were presented through tables and graphs.

Unpaired sample t-test was used to compare normal grip strength, grip strength with brace & grip strength with tape.

III. RESULT

A. This study was done on 50 subjects whose grip strength were taken without taping or brace, with brace and with taping.
B. Research hypothesis has been verified that Elbow brace is more effective in improving grip strength as compared to elbow taping in asymptomatic computer users.
C. Null hypothesis is rejected that there is no significant difference in grip strength with elbow taping and elbow brace in asymptomatic computer users.

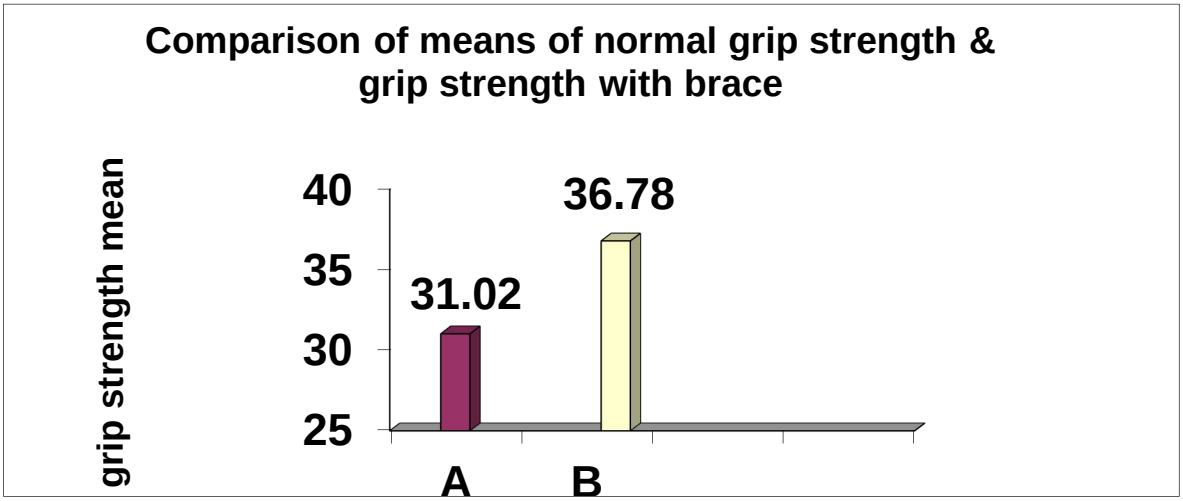


FIG:1 On comparing normal grip strength and grip strength with brace, a highly significant difference was found (0.0046).

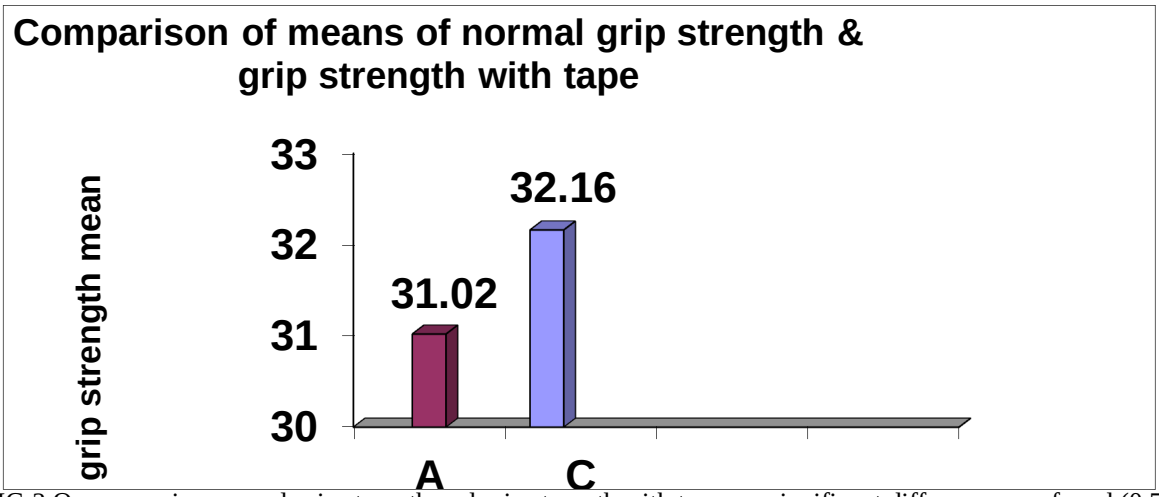


FIG:2 On comparing normal grip strength and grip strength with tape, no significant difference was found (0.562).

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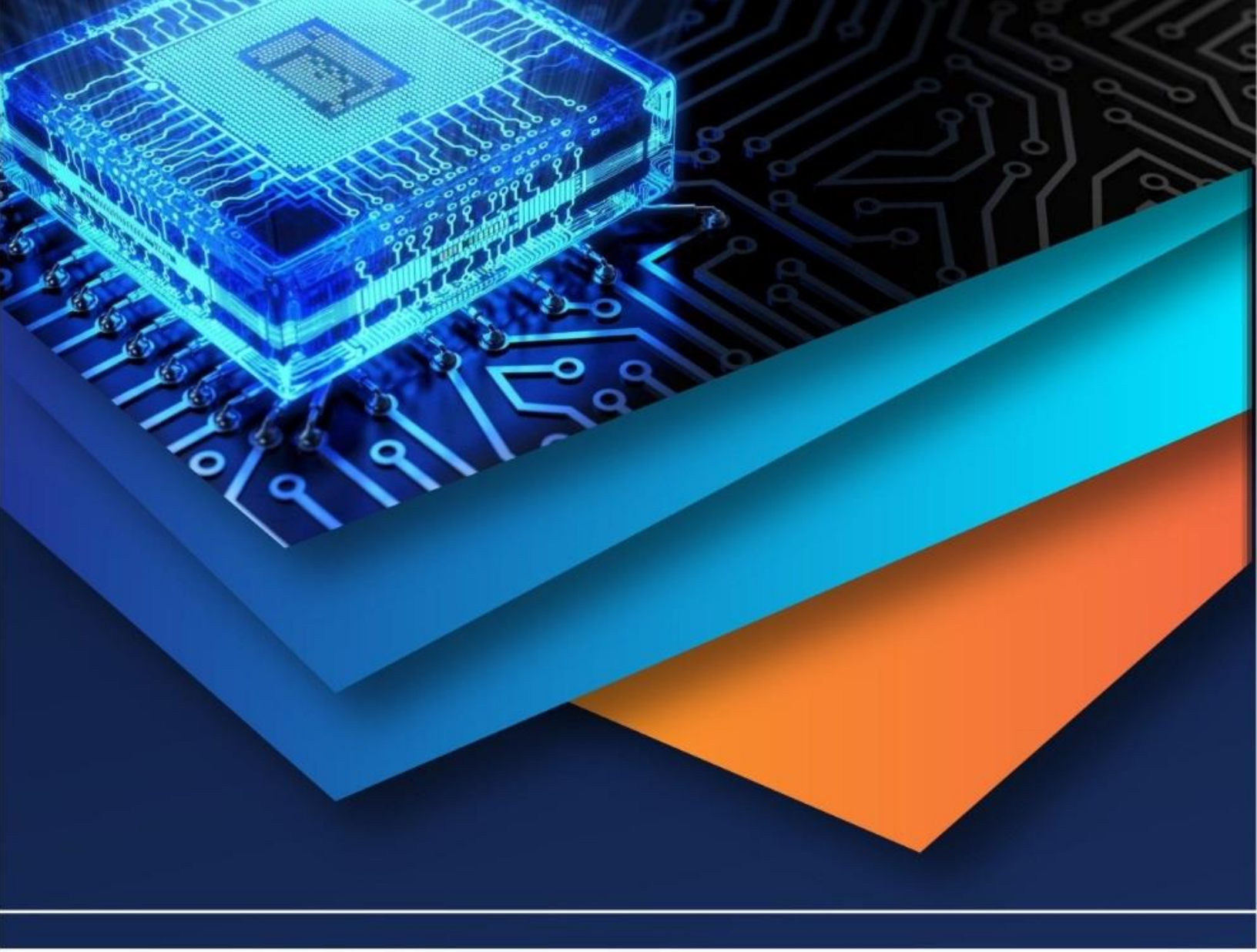
IV. CONCLUSION

The present study has investigated the hand grip strength of asymptomatic computer users within the age group of 18-40 years with elbow brace and elbow taping. The result of this study indicates that on comparing baseline grip strength with the brace grip strength, the grip strength significantly increases with elbow brace. The significant improvement in grip strength with brace can be attributed to the brace which was applied circumferentially over the wrist extensor belly giving an overall proprioceptive feedback. The muscles are held secured beneath the brace and allowing limited excursion of the muscle. The pressure applied to the wrist extensor muscle by the brace (cuff pressure-40mm hg) enhances its effect to counteract wrist flexion moment and thereby allowing the finger flexors to contract effectively. This finding is in favour with the study conducted by Wadsworth et al, that demonstrated that armband may also facilitate muscle contraction by sensory skin stimulation or muscle belly pressure, and thereby increasing the strength on the unaffected arm as well, while wearing the armband.

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