

# DIFFERENCES IN UPPER BODY POSTURE AND POSTURAL MUSCLE ACTIVATION IN FEMALES WITH LARGER BREAST SIZES

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## INTRODUCTION

Breast hypertrophy is a common medical condition whose morbidity has increased over recent decades. Symptoms of breast hypertrophy often include musculoskeletal pain in the neck, back and shoulders, painful shoulder grooves from bra straps, and numerous psychosocial health burdens. It is postulated that the size and weight of hypertrophic breasts alters the body's center of gravity, leading to secondary effects on the musculoskeletal system [1].

While numerous prospective studies to date have provided subjective evidence of the health burdens of breast hypertrophy, limited studies have been performed examining the quantitative effects of excess breast tissue mass on spine biomechanics and cervico-thoracic muscle activation. To date, reduction mammoplasty is the only treatment shown to significantly reduce the severity of the symptoms associated with breast hypertrophy. However, due to a lack of sound scientific evidence in the medical literature justifying the medical necessity of reduction mammoplasty, insurance companies often deny requests for coverage of this procedure. Therefore, the purpose of this study is to investigate biomechanical differences in the upper body of women with larger breast sizes in order to provide scientific evidence of the musculoskeletal burdens of breast hypertrophy to the medical community.

## METHODS

22 female subjects (average age 25.90,  $\pm$  5.47 years) who have never undergone or been approved for breast augmentation surgery, were recruited to participate in this study. Kinematic data of the head, thorax, pelvis and scapula was collected during static trials and during each of four different tasks of daily living. Surface EMG (sEMG) data from the Midcervical (C-4) Paraspinal, Upper

Trapezius, Lower Trapezius, Serratus Anterior, and Erector Spinae muscles were recorded in the same activities. Maximum voluntary contractions (MVC) were used to normalize the sEMG data, and %MVC during each task in the protocol was analyzed. Kinematic data from the tasks of daily living were normalized to average static posture data for each subject.

Subjects were divided into groups of control subjects (n=12, reported bra-cup size A, B, or C) or hypertrophy subjects (n=10, reported bra-cup size D or larger) [2]. To compare results between the groups, a two-tailed independent t-test was performed for each dependent variable with significance set at  $\alpha=0.05$ .

## RESULTS AND DISCUSSION

Significant differences in torso flexion were found between the control group and the hypertrophy group during both the pencil activity ( $p=0.054$ ) and the step up activity ( $p=0.001$ ). There were also significant differences in lower trapezius muscle activation during the static trial ( $p=0.051$ ). Average static posture data is shown in Figure 1. Although not significant, women in the hypertrophy group also tended to exhibit greater head flexion, pelvic tilt and torso flexion under static conditions, and also exhibited increased muscle activation in all five muscles under the same conditions.

Despite the relatively few significant differences in static posture alignment found in this study, it is important to note that the hypertrophy group did tend to present with greater amounts of cervical lordosis (head flexion), forward shoulder position (shoulder protraction), thoracic kyphosis (torso flexion) and lumbar lordosis (pelvic tilt) than women in the control group. These findings are supported by postulations by Letterman et al [1], who postulated that the types of structural changes we saw are a direct result of a change in the body's

center of gravity to compensate for the weight and position of hypertrophic breasts [1].

While the muscle activation differences between the two groups were not significant, higher levels of muscle activation exhibited by hypertrophy subjects during both static posture and tasks of daily living may be related to the altered static postural alignment exhibited by these same subjects. Changes in the direction of muscle pull as a result of an altered static skeletal alignment may affect the amount of muscle tension required to maintain a static position[3], thus possibly explaining chronic musculoskeletal weakness and pain experienced by women with breast hypertrophy.

### CONCLUSIONS

Results of this study provide scientific information regarding the effects of breast hypertrophy on the musculoskeletal system. Of greatest interest, are the slight differences in both upper body posture and muscle activation seen in women with larger breast sizes under static conditions.

While none of the postural alterations seen in women with large breasts were significantly different from those seen in women with smaller breasts, the data presented shows a trend towards altered musculoskeletal alignment due to the size

and weight of larger breasts. However, future research should involve a larger sample population in order to see true statistical differences between the two groups.

Therefore, results of this study provide scientific evidence of the physical burdens placed on the musculoskeletal system in the case of breast hypertrophy, and should be considered when determining the medical necessity of reduction mammoplasty.

### REFERENCES

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### ACKNOWLEDGEMENTS

Special thanks to Mikaela Boham for generously giving her time to help complete the data collection for this study.

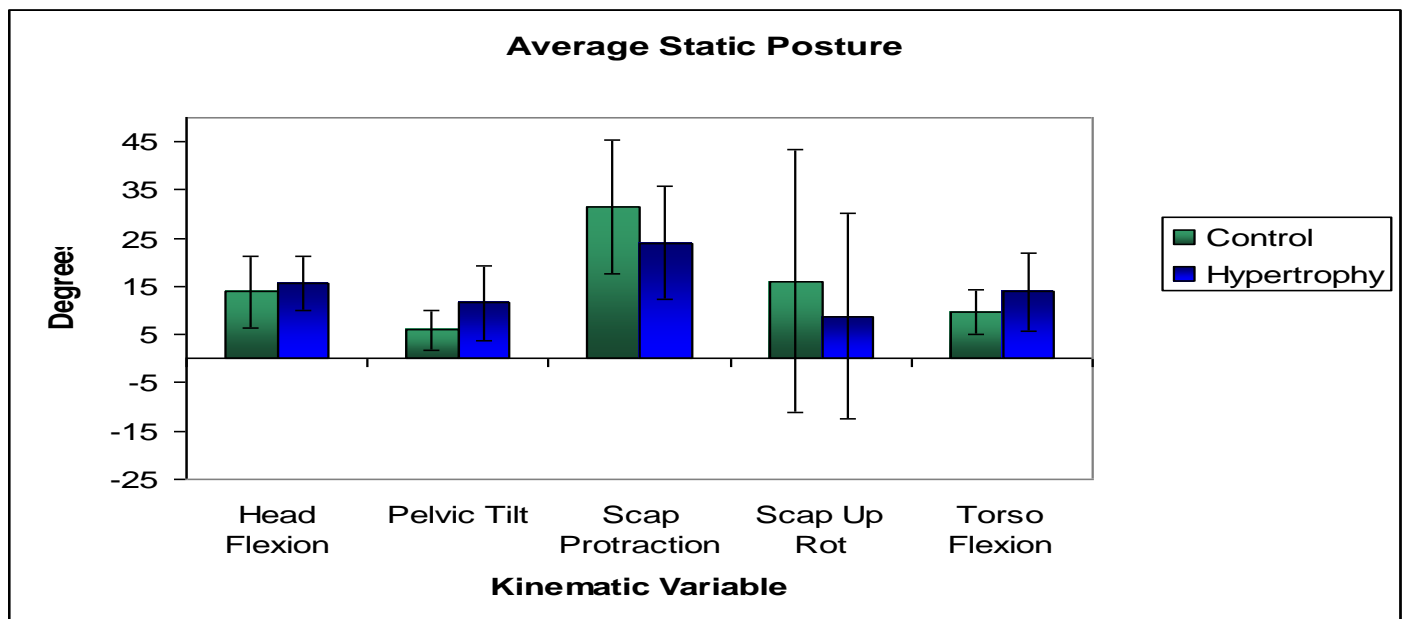


Figure 1. Average Static Posture Data