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DOES BREAST SIZE AFFECT POSTURE?

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INTRODUCTION

The mass of large breasts acting anterior to the trunk creates a flexion torque on the thoracic spine that is thought to increase thoracic kyphosis. This increased thoracic kyphosis, in turn, is believed to contribute to upper body musculoskeletal dysfunctions reported by women with large breasts [6, 7], although this notion has not been proven. Due to the interdependence of the upper limbs to the thoracic and cervicothoracic spine, posture of the shoulders can also be affected by changes in spinal alignment, whereby a greater degree of scapulae elevation/posterior tilt and protraction can result. The more kyphotic the posture in the thoracic region, the greater the compensatory movements can become [6]. These changes in postural alignment displayed by women with large breasts have been linked to the reporting of musculoskeletal pain [9]. In fact, large breast size has been associated with musculoskeletal symptoms such as neck and back pain, headaches and nerve irritation, all of which can be severe enough to deter these women from participating in physical activity and can ultimately force women with large breasts to seek reduction mammoplasty (breast reduction surgery) [2, 6, 9].

Symptoms associated with a large breast size are more readily reported as the average Australian bra size has increased over the past five decades from a 10B to a 14C [10]. With 40% of the Australian female population wearing a bra cup size of DD or larger, the impact of increasing breast size and the likely associated increase in breast-related musculoskeletal symptoms is an important health issue [4]. Although poor posture has been theoretically related to the musculoskeletal problems experienced by women with large breasts [6, 7, 9], most previous studies in this field have failed to directly measure the posture of their participants. Therefore, the purpose of this study was to investigate whether there was any significant difference in the upper torso posture of women with large breasts compared to women with small breasts. It was hypothesized that, compared to women with small breasts, women with large breasts would show more pronounced: (i) kyphotic curvature in the thoracic and cervicothoracic region, (ii) forward head positioning, and (iii) scapular protraction.

METHODS

Twenty-two women aged between 18-35 years in the healthy weight range (BMI 18-25 kg/m²) were recruited as participants. Eleven of the participants represented women

with large breasts ($\geq D$ bra cup size) and the other 11 participants represented women with small breasts ($\leq B$ bra cup size). This cohort was chosen to ensure the results were independent of the effects of ageing and obesity, which have been shown to influence posture [5, 8].

Anatomical landmarks were identified directly on the participants' skin at the tragus, lateral neck, scapula (acromion process, inferior angle and midpoint on the medial border), and spinous processes (at the level of thoracic vertebrae T1 and T12, and at the level of the midpoint on the medial scapular border) [1]. Participants were simultaneously photographed from a lateral and posterior view using a G12 Powershot digital camera (Canon, Japan) stabilized on a tripod and positioned to minimize perspective errors. The photographs were analysed using Siliconcoach software (Dunedin; NZ) to obtain four measurements of upper torso posture: thoracic kyphosis ($^{\circ}$), cervicothoracic kyphosis ($^{\circ}$), head forward position ($^{\circ}$) and scapular protraction (cm, see Figure 1).

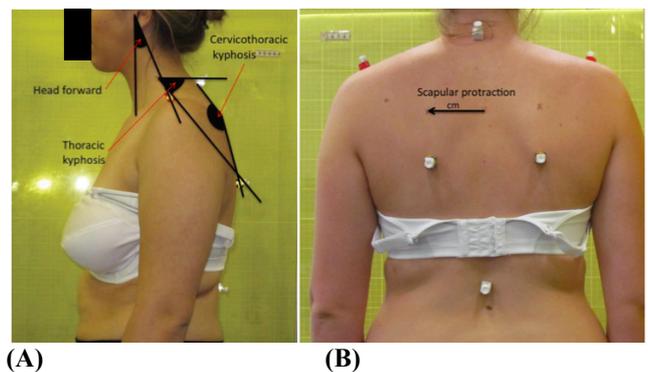


Figure 1: (A) Lateral view showing an example of measurements for thoracic kyphosis, cervicothoracic kyphosis and head forward position, and (B) posterior view showing an example of measuring scapular protraction.

Ratings of musculoskeletal discomfort in the upper torso were also assessed using a visual analogue scale (VAS, 0-10), where 0 = no pain and 10 = the worst possible pain. Independent *t*-tests were then used to determine whether there was any significant ($\alpha \leq 0.05$) difference in the four posture variables and the musculoskeletal discomfort

reported by the 11 women with large breasts compared to the 11 women with small breasts.

RESULTS AND DISCUSSION

Descriptive statistics for the four variables characterizing upper torso posture of the two participant groups are shown in Table 1. In contrast to our hypothesis, no significant differences were found in thoracic kyphosis, cervicothoracic kyphosis, head forward position, or scapular protraction when comparing the data obtained for the women with large breasts and the women with small breasts. There was, however, greater variability in thoracic kyphosis displayed by the women with large breasts compared to their counterparts with small breasts, as indicated by the higher standard deviation for this variable. Although there were no significant between-group differences reported for upper torso musculoskeletal discomfort, the women with large breasts reported more neck, upper back, shoulder and breast discomfort, whereas the women with small breasts reported more head pain. The upper back and shoulders were rated as the regions of most discomfort by women with large breasts, with discomfort scores as high as 9 out of 10.

The lack of significant between-group differences in upper torso posture in this study may have been influenced by factors such as the young age and average BMI of the participants (age: 20.5 ± 0.9 years; BMI: 21.57 ± 1.5 kg/m²). We speculate that consistently bearing a large breast mass on the anterior torso is likely to have a more pronounced effect on the upper torso in a cohort of older women. This is hypothesized because the natural aging process affects the mechanical properties of the anatomical supporting structures of the breast (overlying skin, superficial fascia and suspensory ligaments), and therefore reduces breast support after menopause [3], although this notion requires further investigation. Upper body musculoskeletal dysfunctions reported by women with large breasts may have other contributors beyond postural changes which are also worthy of further investigation, such as restrictions in joint range of motion and

compromized muscle strength of the cervicothoracic region and shoulder complex.

CONCLUSIONS

Although the current study found no significant difference in posture between women with large breasts compared to women with small breasts, many of these women reported musculoskeletal pain in their upper torso, highlighting the need for future research into the effects of breast size on musculoskeletal structure and function of the upper torso. Investigations of the possible mechanisms behind musculoskeletal pain suffered by women with large breasts is recommended, following a broader assessment of the musculoskeletal system of the cervicothoracic region and shoulder complex, including joint range of motion, muscle strength/endurance and posture.

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Table 1: Mean \pm standard deviation values for the four posture variables and the *P*-values comparing these variables for the women with large breasts (\geq D bra cup size) compared to the women with small breasts (\leq B bra cup size).

Posture Measurement	Large Breasts (n = 11)	Small Breasts (n = 11)	<i>P</i> -value
Cervicothoracic Kyphosis (°)	150.0 \pm 5.8	153.7 \pm 6.4	0.17
Thoracic Kyphosis (°)	56.5 \pm 5.6	58.8 \pm 2.6	0.22
Head Forward (°)	12.1 \pm 8.3	10.0 \pm 6.7	0.61
Scapular Protraction (cm)	9.1 \pm 1.2	8.8 \pm 0.8	0.73