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Can breast characteristics predict upper torso musculoskeletal pain?

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ABSTRACT

Background: Several studies have associated a large breast size with an increased prevalence and severity of musculoskeletal pain, particularly pain in the upper torso. Despite this evidence, no research has explored whether breast size or related characteristics are risk factors for upper torso musculoskeletal pain.

Methods: A backward multiple regression analysis was performed to identify whether characteristics of the breasts and upper torso, as well as physical factors known to be associated with musculoskeletal pain, could predict musculoskeletal pain among a cohort of 378 Australian women aged 18 years and over who had a wide range of breast sizes.

Findings: The model identified that breast volume, age and nipple-to-nipple distance predicted 23% of the variance in upper torso musculoskeletal pain reported by the participants.

Interpretation: Women with a larger breast volume, lower age and a greater nipple-to-nipple distance were predicted to report a higher upper torso musculoskeletal pain score.

1. Introduction

Musculoskeletal pain is widespread among adults and is acknowledged to be multifactorial in origin (Leroux et al., 2005; McBeth and Jones, 2007; Picavet and Schouten, 2003). Several physical risk factors for musculoskeletal pain have been identified including female gender (Leveille et al., 2005; Rollman and Lautenbacher, 2001), older age (Goh et al., 1999), obesity (Hinman, 2004), and level of physical activity (Vuori, 1995). Although the notion of breast size as a physical risk factor for musculoskeletal pain has not been previously explored in the literature, several studies have associated a large breast size with an increased prevalence and severity of musculoskeletal pain, particularly pain in the upper torso (BeLieu, 1994; Coltman et al., 2013; Glatt et al., 1999; Gonzalez, 1993; Greenbaum et al., 2003; Kaye, 1972; McGhee et al., 2018; Raispis et al., 1995; Spencer and Briffa, 2013). These studies, however, have been limited to either breast reduction candidates whereby the experience of musculoskeletal pain has been compared before and after the women have had breast tissue removed (Glatt et al., 1999; Gonzalez, 1993; Greenbaum et al., 2003; Raispis et al., 1995), qualitative research (BeLieu, 1994; Kaye, 1972) or studies conducted with small participant numbers (n = 22 Coltman et al., 2013; n = 53 McGhee et al., 2018; n = 51 Spencer and Briffa, 2013). Subsequently, previous research has either reported musculoskeletal pain among women with very large breast sizes (breast reduction candidates; Glatt et al., 1999; Gonzalez, 1993; Raispis et al., 1995) or compared differences in musculoskeletal pain between women with large and small breast sizes (Coltman et al., 2013; McGhee et al., 2018; Spencer and Briffa, 2013). No research has explored the prevalence of musculoskeletal pain across the breast size spectrum (small, medium, large and hypertrophic; Coltman et al., 2017c) in a large group of community-based women.

As the structure and function of the musculoskeletal system are inter-related, it is thought that increased musculoskeletal pain among women with large breasts reflects compromised function caused by structural changes to the musculoskeletal system. These structural changes are thought to occur primarily in the vertebral column (Findikcioglu et al., 2007; Findikcioglu et al., 2013; McGhee et al., 2013; McGhee et al., 2018; Letterman and Schurter, 1980) and are proposed to be a consequence of the weight of large breasts on the anterior torso shifting the centre of gravity of the breasts, and in turn the torso, forward (McGhee et al., 2018). This forward displacement of the torso centre of gravity is thought to result in an increased thoracic flexion torque and an increase in the thoracic kyphosis angle, which in turn lead to secondary changes in the cervical lordosis angle, increased tension in the neck extensor muscles and an altered scapula position (Findikcioglu et al., 2007; Findikcioglu et al., 2013; Letterman and Schurter, 1980; McGhee et al., 2013; McGhee et al., 2018; Schinkel-Ivy and Drake, 2016).

Radiological images have shown that women with large breasts (D cup bra size; n = 19) have a significantly greater thoracic kyphosis

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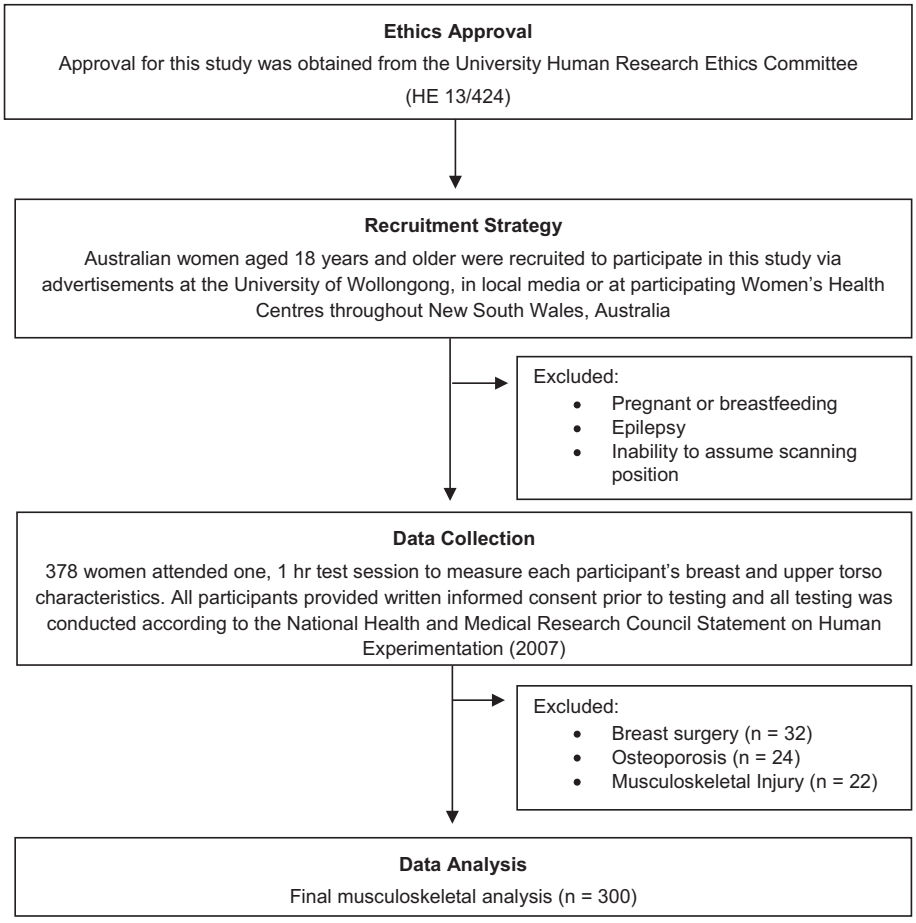

Fig. 1. Flow of participants through the present study and the exclusion criteria.

angle than women with small breasts (A cup bra size; n = 25; Findikcioglu et al., 2007). Thoracic kyphosis angle has also been found to significantly decrease post-operatively in women after breast reduction surgery when at least 1000 g of breast tissue has been removed (Findikcioglu et al., 2013). Similarly, McGhee et al. (2018) reported that community-based women with large breasts (mean bilateral breast volume: 2448 mL SD 849 mL, mean age: 45.9 years SD 9.9 years, n = 27, not currently seeking breast reduction surgery) had a greater thoracic kyphosis angle than women with small breasts (mean bilateral breast volume: 453 mL SD 151 mL, mean age: 43.8 years SD 10.9 years, n = 26), as well as greater upper torso musculoskeletal pain. Other researchers have compared women with small and large breasts who were either older (post-menopausal; 50–84 years; Spencer and Briffa, 2013) or younger (18–35 years; Coltman et al., 2013) than participants in the McGhee et al. (2018) study. These researchers found that participants with large breasts had greater thoracic pain than participants with small breasts, despite no difference in thoracic kyphosis angle (Coltman et al., 2013; Spencer and Briffa, 2013). The difference in findings among these studies is likely to be due to the region of pain assessed (thoracic versus upper torso), as well as confounding variables such as osteoporosis, which was not screened for by Spencer and Briffa (2013). However, another study of young women (18–26 years) found no association between thoracic pain and breast size when measured across a size spectrum (Wood et al., 2008). Therefore, although there is some evidence to suggest that an increased breast size can result in changes to the structure (thoracic kyphosis) and function (musculoskeletal pain) of the upper torso, further research is warranted to examine this relationship on a large cohort of women, across a range of ages and breast sizes, who are not currently seeking breast reduction surgery.

Increased thoracic kyphosis has also been found to limit the range-of-motion (RoM) of the shoulder complex (Crawford and Jull, 1993; Griegel-Morris et al., 1992; McGhee et al., 2018). Poor mobility in the upper thoracic spine has also been shown to be a predictor of neck and shoulder pain (Norlander and Nordgren, 1998; Perriman et al., 2012). It is therefore possible that the musculoskeletal pain suffered by women with large breasts is related to decreased mobility in the shoulder complex secondary to increased thoracic kyphosis (McGhee et al., 2018). Although the findings of the McGhee et al. (2018) study support this notion, the sample size was small (n = 53). Therefore, further research on a larger sample size is required to confirm these findings.

Breast shape and the relative location of the breasts on the trunk are also factors likely to be associated with musculoskeletal pain because these factors will affect loading on the chest wall (Spencer and Briffa, 2013). Both breasts shape and breast position can be affected by age related declines in the mechanical properties of the skin covering the breasts, such as skin thickness and elasticity (Coltman et al., 2017a). Breast ptosis has also been found to increase with increasing age and body mass index (BMI) and broader breasts have been found in women with a higher BMI (Brown et al., 1999). The effects of different breast shapes and breast positions on musculoskeletal pain, however, are yet to be investigated. It is important to understand which variables predict the experience of musculoskeletal pain in the upper torso because this knowledge can be used to develop evidence-based treatment and preventive strategies in order to minimise the musculoskeletal pain experienced by women, regardless of their breast size.

The purpose of this study was to identify whether physical factors associated with breast and upper torso structure and function, as well as physical factors previously shown to be associated with musculoskeletal pain (such as age, BMI and physical activity level; Goh et al., 1999;