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## ORIGINAL RESEARCH

### Modifiable individual and work-related factors associated with neck pain in 740 office workers: a cross-sectional study

Q1 Xiaoqi Chen<sup>a,\*</sup>, Shaun O’Leary<sup>a,b</sup>, Venerina Johnston<sup>c</sup>

<sup>a</sup> University of Queensland, School of Health and Rehabilitation Sciences, Brisbane, Australia

<sup>b</sup> Queensland Health, Royal Brisbane and Women’s Hospital, Department of Physiotherapy, Brisbane, Australia

<sup>c</sup> The University of Queensland, RECOVER Injury Research Centre, Brisbane, Australia

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#### KEYWORDS

Neck pain;  
Office work;  
Risk factors

#### Abstract

**Background:** Office workers have the highest incidence of neck pain of all occupations. However, the relationship between symptoms and the risk factors is unclear.

**Objective:** To examine the relationship between self-reported neck pain with a comprehensive range of individual and work-related risk factors.

**Methods:** This study utilised a cross-sectional study design. Office workers with and without neck pain ( $n=763$ ) were recruited. Participants completed a survey which included a Pain Numerical Rating Scale (dependent variable), and measures of independent variables including demographic, individual, work-related factors, neck/shoulder muscle strength, endurance, and range of motion (ROM). The relationships between the independent and dependent variables were analysed in a logistic regression model.

**Results:** Neck pain was significantly associated with more senior occupational categories, working more than six hours per day on the computer, female sex, greater fear avoidance beliefs for work, greater psychological distress, and reduced cervical flexion ROM. The low severity of neck pain of the participants in this study may limit a robust determination of their association with the risk factor variables, but the studied sample is a realistic representation of the office worker population.

**Conclusion:** Several potentially modifiable individual and work-related factors were identified to be associated with the presence of self-reported neck pain in office workers. Future studies will be needed to investigate whether strategies to alter these modifiable risk factors translate to changes in neck pain.

\* Corresponding author at: Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Saint Lucia, Queensland 4072, Australia.

E-mail: [xiaoqi.chen@uq.net.au](mailto:xiaoqi.chen@uq.net.au) (X. Chen).

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Trial registration: ACTRN12612001154897 (<https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=363209>)

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## Background

Neck pain is a prevalent and chronic condition.<sup>1</sup> In the Global Burden of Disease 2010 study, neck pain was ranked fourth highest for years lived with disability, and 21st for overall burden of disease.<sup>2</sup> Neck pain is also a recurrent disorder with 60–80% of the working population experiencing another episode one year after the initial episode.<sup>3</sup> As such, the cost of neck pain is substantial to society<sup>4</sup> and to industry, where between 3 and 11% of lost-time claims were related to neck pain.<sup>5</sup> Within industry, office workers have the highest incidence of neck disorders at 34–49% a year.<sup>1,6–8</sup> There is also evidence that while the majority of workers who experience low severity neck pain may choose to remain at work rather than take sick leave,<sup>1,9</sup> they may be less productive at work.<sup>10,11</sup>

The risk factors associated with neck pain are multifactorial, and may be broadly categorised into individual (e.g. health behaviour, psychological distress) and work-related factors (e.g. computer hours per day at work, physical demand at work, job control).<sup>1</sup> Most studies have focused on the associations between a select number of risk factors and neck pain, rather than comprehensively including the individual and work-related factors.<sup>7,12–15</sup> Furthermore, when physical risk factors (such as neck/shoulder muscle strength/endurance and range of motion) were measured, the sample sizes were small and not specific to office workers.<sup>16–20</sup>

The purpose of this study was to explore the relationships between a comprehensive list of individual and work-related factors, and self-reported neck pain in a large population of office workers. We hypothesise that the presence of neck pain will have significant relationships with the individual and work-related factors. It is anticipated that the findings of this study will clarify our understanding of potentially modifiable risk factors that contribute to self-reported neck pain in office workers.

## Methods

### Study design and ethics

This study utilised the baseline data of a two-arm parallel prospective clustered randomised trial (ACTRN12612001154897) and followed the STROBE guidelines for reporting observational data.<sup>21</sup> All participants provided informed consent, and ethical approval was granted by the University of Queensland's Human Medical Research Ethics Committee (2012001318), Brisbane, Australia.

## Participants

Participants ( $n=763$ ) were recruited from 14 private and public organisations in Brisbane, Queensland, Australia from May 2013 to July 2015. The organisations were involved in various industries including mining, medical appliances, government, legal, and engineering. The sample size was based on the original randomised trial in which this study is nested.<sup>22</sup> Eligible participants were 18 years of age or older, and worked more than 30 h/week in predominantly sedentary office work (i.e. computer work). Participants were excluded if they were pregnant, suffered from specific pathologies (e.g. congenital cervical abnormalities, stenosis), inflammatory conditions (e.g. rheumatoid arthritis), or had a history of cervical spine surgery. Office workers with and without neck pain and neck disability were included to enable comparison.

## Outcome measures

The dependent variable, neck pain intensity, was evaluated with a ten-point Pain Numerical Rating Scale ranging from 0 (no pain) to nine (worst possible pain) during the last three months (on average).<sup>23</sup> A body map based on the Nordic questionnaire was used to identify the neck region.<sup>23</sup> Participants' age, sex and Body Mass Index (BMI) were included as covariates.

A series of physical measures were collected from all participants at the workplace. The order of testing of these measures was randomised between participants to avoid order effects. Inter and intra-rater reliability for the different assessors was determined with the order of testing of all reliability tests randomised.

Cervical range of motion (ROM) was assessed with a Cervical ROM (CROM) device (*CROM 3 from Performance Attainment Associates*) and included active cervical flexion, extension (Fig. 1A), and bilateral rotation (Fig. 1B). Participants were instructed to perform the ROM tests as far as they could and not past discomfort or pain. Each movement was repeated until three subsequent results of the same value were obtained and the mean recorded as the final score. This is a valid and reliable method for assessing CROM.<sup>24–27</sup>

Maximum isometric neck flexor (Fig. 1C) and extensor (Fig. 1D) muscle strength (kgf) and endurance (seconds) was recorded. Participants were seated with a digital dynamometer mounted onto a rigid arm adjusted to suit participant anthropometrics. Strength tests were repeated thrice with a thirty second rest period between repetitions. Endurance was evaluated with a sustained contraction at

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