
ORIGINAL PAPERS

Gender Differences In The Cause Of Low Back Pain In British Soldiers

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ABSTRACT

Objectives

To explore gender differences in the cause of low back pain in a population of military personnel who are expected to undertake high levels of sport, exercise and physical military training.

Methods

A prospective study of trained British soldiers, with symptomatic low back pain, referred to the Colchester Garrison Sports Injury and Rehabilitation Centre over a four year period.

Results

The study demonstrates that 928 (17.8%) of the 5214 referrals were for new cases of low back pain. The incidence of low back pain in female soldiers is higher than their male counterparts with an odds ratio of 3.17 (95% CI 2.31 – 4.35). There was a highly significant cross gender difference in low back pain caused by activities in the following categories: military physical training (OR 2.65, 95% CI 1.70 – 4.02), work or occupation (OR 2.49, 95% CI 1.56 – 3.87) and off-duty pursuits (OR 2.91, 95% CI 1.72 – 4.72). There was no cross gender difference in low back pain caused by sport, road traffic accidents or activities pre-dating military service.

Conclusions

Female soldiers are significantly more likely to suffer low back pain as a result of physical military training, their occupation, or off-duty activities. Sporting activities do not cause low back pain in women to a greater extent than men. By demonstrating the scale of the problem and by determining of the cause of injury, it should now be possible to propose methods of effective intervention to reduce injury, implement those interventions and audit effectiveness.

Keywords: Female, Military, Low Back Pain.

Introduction

Physical fitness is a fundamental requirement for every soldier in order to ensure that combat effectiveness, job performance, and

general health are maintained at optimal levels. It is recommended that a minimum of three to five, 40 – 60 minute periods of moderate to high intensity physical training take place each week. Much military physical fitness training is directed towards the completion of mandatory tests; the Basic Personal Fitness Assessment and the Basic and Advanced Combat Fitness Tests. These tests, whilst being mandatory once or twice a year, are used on a frequent and regular basis, by many units, as a means of physical training. Additional role-related fitness testing may be authorized as required.

The British Army, in response to equal opportunities legislation, has expanded the recruitment and career choices of women over the past ten years. Female soldiers currently account for 8% of the British Army and 13% of new recruits. Prior to 1994, female recruits were trained in single sex establishments, however wider integration was brought about by the creation of mixed sex Army Training Regiments. Initially, female recruits were allowed lower physical training standards, a policy known as “gender fair” training; however, it became apparent that many female soldiers were physically unable to do the job for which they had been selected. In 1998, the “gender fair” policy was replaced by a “gender free” policy in which standard tests were adopted for both sexes, and related to the proposed career path. On completion of basic training and specialist trade training, individuals are posted to Regular Army units. Both sexes are expected to undertake regular fitness training and assessment, only a minority of which is gender related. Physical training is directed by the Commanding Officer to meet the operational demands of the unit as a whole rather than the gender or trade of the individual. Despite low numbers of female soldiers, it has become apparent that they suffer a disproportionate number of injuries, and in particular low back pain(1). It is also apparent that there is no single cause or activity that results in injury.

Soldiers, once fully trained, undertake a wide range of activities that could result in injury. These include military physical training, but also include sport and work related activities. Other causes of low back pain, considered in this study, are road traffic accidents, off-duty pursuits (including non-sport recreational activities, off-duty accidents, pregnancy and childcare) and pre-existing

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(i.e. with a cause pre-dating military service).

Many studies originating in the United Kingdom, the United States of America, and other countries in Europe have documented and examined the trend of increased female training injuries. A criticism of this body of evidence is that many of the groups studied are either undergoing basic training (a short intense period aiming to achieve fitness and with little or no time for other activities), or with injuries of such severity that the condition is irremediable and incompatible with further military service. This study attempts to examine the effect of gender on the incidence and cause of low back pain in a serving military population that has completed Army recruit training.

Subjects and Methods

Colchester Garrison primary care facility and Sports Medicine and Rehabilitation Centre has enhanced capability to care for soldiers suffering from musculo-skeletal injuries, and encompasses the progression of the injured soldier from general practitioner, through physiotherapy, to rehabilitation and return to full fitness and duty.

The average population during the period of the study was 3555, comprising 3377 males and 178 females. Full details of subjects, methods and definitions of cause of injury are described by Strowbridge and Burgess (1,2).

Low back pain was defined as pain, muscle tension or stiffness located below the costal margin, and above the inferior gluteal folds, with or without leg pain (3). Proven fractures as a result of trauma, for example following an unsuccessful parachute landing, were not included in the study, being classified as traumatic fractures rather than low back pain. During the first assessment, the physiotherapist also elicited the cause of, or the activity resulting in, back pain.

A number of patients were referred for the same condition on more than one occasion. The data shows the rate of attendance expressed as cases per 1000 per month for each cause of low back pain, for first referrals, in the male and female groups.

Statistical analysis of the results was performed using the Chi-square test. Odds ratio and 95% confidence intervals were calculated using EpiInfo v 6.04 produced by the Centres for Disease Control and Prevention (CDC), USA and the World Health Organisation (WHO), Geneva, Switzerland.

Results

During the four-year period between 1st June 1998 and 31st May 2002, 5214 referrals were made from primary care to the Sports Injury and Rehabilitation Centre. Low back pain was the primary diagnosis in 21.3% of referrals (993 males and 120 females). These cases represented both first and subsequent referrals for episodic back pain. The incidence of low back pain, expressed as cases per 1000 of the practice population per month was 6.13 for male soldiers and 14.04 for female soldiers. The female : male odds ratio was 4.97 (95% CI 3.57 – 5.98, $p < 0.0001$).

In order to ascertain the true incidence of low back pain, first referrals only were analysed leaving a total of 928, or 17.8% of new cases (837 males and 91 females). The incidence of low back pain, expressed as cases per 1000 of the practice population per month was 5.15 for male soldiers and 10.65 for female soldiers. The female: male odds ratio was 3.17 (95% CI 2.31 – 4.35, $p < 0.0001$) (Table 1).

Female patients were more likely to attribute their symptoms of low back pain to military training (F:M OR 2.65, $p < 0.0001$), work (F:M OR 2.49, $p < 0.0001$) and off-duty pursuits (F:M OR 2.57, $p < 0.0001$). There was no statistical cross gender difference in low back pain caused by sport, road traffic accidents or pre-dating military service.

Discussion

Low back pain is of major importance in both civilian and military populations, the one year prevalence in soldiers being as high as 53% (4). In the British Army, as many as 11% of working days lost are due solely to low back pain (5).

Table 1. Causes of Low Back Pain in Male and Female Soldiers (First Referrals). All rates expressed as cases / 1000 / month.

Cause	Male n=3377		Female n=178		Female:Male OR	95% CI	p
	Number	Rate	Number	Rate			
Military Training	249	1.54	31	3.63	2.65	1.70 - 4.02	<0.0001
Work	226	1.39	27	3.16	2.49	1.56 - 3.87	<0.0001
Off-Duty Pursuits	156	0.96	22	2.57	2.91	1.72 - 4.72	<0.0001
Sport	145	0.89	8	0.94	1.05	0.44 - 2.17	0.89
Pre-existing	33	0.2	1	0.12	0.57	0.01 - 3.46	0.58
RTA	28	0.17	2	0.23	1.36	0.16 - 5.46	0.67
Overall	837	5.15	91	10.65	3.17	2.31 – 4.35	<0.0001

Many studies (6-11) have demonstrated the fact that females, who undertake recruit training for the Armed Services of the United States of America suffer from approximately double the rate of musculo-skeletal injury than their male counterparts. The majority of these studies have been performed on young, previously unfit recruits undergoing high intensity recruit training. Other studies have focused on injuries of such severity that they are incompatible with future military service (12,13). The bulk of the British Army falls outside these populations. In the British Army, the rate of female personnel discharged for medical reasons rose tenfold between 1992 and 1996 (14). Gemmel (12) has noted that the rise has continued since the introduction of gender free training in 1998, and that the cross gender (Female:Male) odds ratio for low back pain has doubled from 4.8 to 9.7. Little research has been performed on the injuries, major and minor, sustained by ordinary soldiers during physical exercise, sport, work, and other normal activities.

Military training, in this study, is identified as being the cause of 249 cases of low back pain in male soldiers (1.54/1000/month or 1.85% per annum) and 31 cases in female soldiers (3.63/1000/month or 4.36% per annum). Military training in the widest sense of the term includes activities such as fitness training, marching, drill, weapon handling, equipment handling, specialist trade training, and the acquisition of command and leadership skills. In the context of this study, only the training that includes physical exercise was considered, much of which is directed towards mandatory fitness tests. The basic personal fitness assessment includes basic tests of running, sit-ups and press-ups. The basic combat fitness test is a 12.8km march with a 25kg load, whilst the advanced combat fitness test consists of a loaded speed march and a series of representative military tasks, many of which involve lifting and carrying. Women have a significantly higher incidence of time loss injury than men, and there is a strong and consistent association between total amounts of exercise and higher rates of injury in military populations (15). This may be explained by biomechanical differences and the onset of fatigue at lower performance levels (13). A study by Hill *et al* (16) linked gender related injury with specific military training methods, whilst a study on fully trained British soldiers (1) indicated that low back pain and injuries to the hip, thigh and lower leg were more common in female soldiers.

Work related low back pain accounted for 226 male cases (1.39/1000/month) and 27 female cases (3.16/1000/month). It was the second highest cause of low back pain after physical military training. Work related, or occupational, low back pain, has been extensively researched in the general

population in order to demonstrate and correct risk factors specifically within the workplace (17-19). Risk factors have been identified as female gender, lifting of weights of more than 10kg, flexion and rotation of the trunk whilst lifting, whole body vibration, prolonged sitting in a vehicle and an uncomfortable working position. The results of specific research into work related disability related to occupational low back pain in soldiers have tended to mirror and confirm civilian findings. Risk factors have been identified as female gender, age, infrequent aerobic exercise, longer length of service, higher levels of daily work worries, no support from others, higher levels of ergonomic exposure, stressful work and greater perceived effort at work (20-22). Lower levels of innovation, involvement and line management support were associated with symptom severity. Soldiers who experience back pain causing reduced activity levels and absence from work showed a significantly increased risk of problems at the age of 40 years (23).

Female soldiers were more likely to cite off-duty activities as the cause of their low back pain (2.57/1000/month) than male colleagues (0.96/1000/month). This category includes conditions occurring due to activities off duty but excluding sport or road traffic accident. It includes injuries sustained from pastimes and hobbies (for example gardening), domestic activities (for example lifting furniture or children) or under the influence of alcohol. Back pain in pregnancy is included in this group.

This study indicated that there is no gender difference in low back pain caused by sporting activity in this population. This result is supported by the literature. Kannus *et al* (24) found an equal proportion (9%) of low back pain between the sexes in athletes, whilst Sallis *et al* (25) found no statistically significant gender differences in injury rates between men and women. Pre-existing conditions are those that are considered to pre-date military service whatever the original cause. The number of soldiers stating that their low back pain pre-dated military service was extremely small for both sexes and there was no statistical difference between the groups. Road traffic accidents resulted in the smallest number of cases of low back pain with no statistical difference between the sexes. Injuries to the neck or cervical spine were most commonly encountered following an accident; these injuries have not been included in this study.

Jones and Knapik (26) in their paper on surveillance, research and prevention in physical training and exercise-related injuries stated that the prevention of injuries sustained whilst developing and maintaining high levels of fitness is an important factor in reducing the loss to operational effectiveness. Injury control requires five steps; surveillance

to determine the scale of the problem, determination of the cause of injury, studies to ascertain if the proposed method of intervention is effective, implementation of the intervention and audit of effectiveness. Kaufman *et al* (27) also stated that “a systematic process of prevention should be initiated starting with routine surveillance to identify high-risk populations for the purpose of prioritising research and prevention. Properly planned interventions should then be implemented with the expectation of dramatically reduced lost work/training time, attrition, and medical costs, while increasing military readiness”.

This study identifies that female soldiers are significantly more likely to suffer with low back pain as a result of physical military training, their occupation, or off-duty pursuits. Sport itself does not cause low back pain in women to a greater extent than in men. These findings, on a military population tend to reflect those found in the civilian population, and injuries caused by off-duty activities are difficult to control by an employer. However, further research should be conducted into the specific factors that cause back pain and injury during physical military training; in particular into manual handling and carrying of significant loads by female soldiers and whether simple interventions such as assisted lifting may be of benefit.

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