Abstract

Aim: To compare the frequency and duration of low back pain (LBP) in the past 2 years in female hockey players, with two other groups of women with varying levels of physical activity.

Design: Questionnaire using fixed-response, 10-point Likert-scales, yes/no response and open comments.

Participants: 100 Victoria University Osteopathic Students, and 40 Melbourne Cricket Club Hockey Club hockey players.

Results: Although there was an overall pattern indicating the sedentary group suffered more LBP as a whole over the previous 24 hours, 6 and 12 months, the key questions regarding participants' experience with LBP, particularly frequency and duration of episodes (analysed via a chi-square test for relatedness) revealed no significant differences between groups. The active and hockey groups experienced LBP at a higher intensity when at its worst; participants from the hockey group experienced their average pain at a higher intensity. Groups were of similar weight, height and age; therefore these factors are discounted as influencing this study.

Conclusion: In all cases, sedentary participants experienced the greatest total amount of LBP; the hockey group experiencing the least. Hockey participants reported a higher intensity level of their worst and average episodes of LBP, with some evidence of longer duration of episodes

Introduction

There have been many studies investigating different aspects of low back pain (LBP) and the factors affecting it. These include physical activity[1]; lifestyle factors - including age, gender[1,2], obesity[2], daily exercise pattern and work-related physical activity; work setting[1]; smoking and body mass index[2]; and exercise lifestyles (various types of exercise participation)[3]. Others have studied the prevalence, severity and related disability of LBP in the Australian adult population[4].

There have also been studies investigating the type and frequency of injuries that occur with women's field hockey players[5,6,7], and the association of low back dysfunction in elite female hockey players[8]. However, there has not been a study to date that compares the incidence of LBP in females with either an active or sedentary lifestyle, with those who play hockey.

Although other studies have compared hockey players to sedentary people, what needed to be investigated was whether the differences found were simply due to the difference between an active and non-active lifestyle, or whether the differences related specifically to the biomechanical demands of hockey. Therefore, the aim of this study was to compare the frequency and duration of LBP in the past 2 years in female hockey players, with two other groups of women with varying levels of physical activity.

The major points investigated in this study were the frequency and duration of any LBP episodes experienced by women with different levels of physical activity: 1) high-level female hockey players with a high incidence of repetitive lumbar flexion/rotation movements – a known risk factor for LBP[9]; 2) Those that participate in regular physical activity that doesn't involve repetitive lumbar flexion/rotation for ≥3 sessions a week, for ≥30 minutes; and 3) those with a primarily sedentary lifestyle.

One investigation highlighted exercise as a major contributor to the experience of LBP, via a study comparing LBP in a group of athletes (track and field, cross-country skiing, soccer, ice-hockey, basketball, boxing, wrestling, weight-lifting and shooting) with a group of sedentary participants[3]. This study, which used a questionnaire to record responses, showed although the athletic group reported less LBP than the sedentary group, the former had a significantly higher incidence of sciatica.

Another study discovered that participants who exercise less often experience a higher incidence of LBP than those who regularly exercise[1]. This survey was based on an interview method of recording responses, and they also noted that participants with a high level of work-related physical activity experience a significant amount of LBP regardless of the type of work[1]. Therefore, based on results from these studies, it can be reported that exercise has the effect of lowering a person's expectation of experiencing LBP. However, there is not yet a distinction as to what degree of relief different exercise activities have on LBP.

A number of studies have concluded that exercise (regardless of type) may ease LBP, and prevent it from future occurance[10,11,12]. Regular exercise (including school children 'playing-time', adult leisure-time physical activity, and elite athletes from a variety of sports) can increase function in patients with LBP, may reduce the perception of pain intensity, and lessen excessive fear and concerns about LBP[10]. Long-term methods for reducing episodes of LBP in chronic LBP patients have included a variety of exercises – particularly strength exercises to the lumbar spine and abdominal muscles[11]. Flexibility in the low back area has also been identified as a key component to reducing low back syndrome, as it assists in maintaining "adequate anatomic capabilities", hence adequate muscle and posture balance[12]. These studies used a variety of methods to record data: including collation of data from patient files[10,11], and interviewing subjects[12].

There have been some studies conducted questioning young elite female hockey players about LBP. Through three different studies, LBP has been recognised as one of the most common injuries amongst field hockey players[5,6,8]. In these studies conducted on the Queensland Women's Hockey team, data was collected from medical files from the team's medical staff, and they identified that in the short term the low back is the most common area for chronic injuries, the second most common area for acute injuries, and in the long term LBP is the second most frequent injury to players[5,6]. With this in mind, it's important to understand the underlying mechanism involved in such high incidences.

Hockey involves a significant amount of time being spent in a trunk flexion position, with frequent high-velocity rotation movements. There's an increased chance of rupturing the lumbar disc fibers when rotation forces are combined with flexion through the lumbar spine, due to facet orientation[13]. With repeated combined flexion and high-velocity rotation movements of the lumbar spine, structures of the low back are stressed and it's left prone to injury[5].

One study concluded only 5% of hockey players regularly mobilised their low back in three different planes (flexion, extension and rotation), and their nervous system[8]. The results showed that 80% of players reported LBP, and two problematic areas were identified: players aren't performing adequate warm up techniques prior to playing, and players are ignorant of the correct technique for low back mobilisation. Perhaps if these issues can be addressed, the incidence of LBP would be reduced.

Another investigation on hockey and LBP was conducted on hockey players at the Australian Institute of Sport Hockey Unit, and investigated the frequency of LBP[7]. This too obtained a significant result with 100% of male participants, and 50% of women, experiencing LBP during the hockey season and all having had previous episodes of LBP. This study obtained data from collation of medical record on file at the AIS.

Although many studies in the past have used collation of medical records and interviewing techniques as a way of collecting data, in the case on this current study, it is

deemed most similar to the studies that have specifically investigated low back pain in sport -not injuries in general, or lifestyle factors and sport. Although lifestyle factor do play a part in this current study, a questionnaire was chosen as the method of data collection as it is deemed most appropriate as to the type of responses required in this study, and it allows for questioning along a specific guide (eg. Not open ended questions that may occur in interviewing).

The aim of this study was to compare the frequency and duration of LBP in the past 2 years in female hockey players, with two other groups of women with varying levels of physical activity

Method

Subjects

The hockey-playing subjects involved with this study were female volunteers from the Melbourne Cricket Club (MCC) Hockey Club women's division (n=31), who played at a competitive level of Pennant-B or higher in the Victorian Women's Hockey Association (VWHA) 2005 competition. The study also involved female students from Victoria University (VU), completing the sedentary and active groups. (n=51).

Recruitment

The recruitment of hockey players involved posters displayed around the Melbourne High School Hockey Pavilion (located at Melbourne High School), and for Osteopathic students at the Flinders Lane VU campus, advertising this study and asking

for the recruitment of volunteers (contact details were provided if any person was interested in being involved with this study). Details of the study including the aim, inclusion and exclusion criteria were advertised on posters.

If students or players were interested in being a part of the study and met criteria, they were asked to contact the organisers, were given details of a meeting time, and were then given a questionnaire to complete - an adapted version of the survey used by Walker, Reinhold and William[4] - regarding their experience with LBP. They then returned it to a designated area where it was placed in a collection box.

Inclusion/Exclusion Criteria

Inclusion criteria specific to hockey players: they must have been competing in the VWHA 2005 competition season, and aged between 18 and 40 years.

Exclusion criteria specific to hockey players: being currently injured, currently suffering from LBP (so as to exclude current injury), and pregnancy in the past two years.

Inclusion criteria specific to Osteopathic students: to be selected into the active group - participants must have been undergoing three or more sessions of physical activity per week, lasting thirty minutes or longer (so as to utilise their aerobic system[13]). Participants involved in regular activities which include repeated flexion/rotation, such as

golf, were excluded. To be selected into the sedentary group, participants must not have been involved in regular sporting/physical activity. All participants must have been aged between 18 and 40 years.

Exclusion criteria specific to Osteopathic students participants: current injury, currently suffering from LBP (so as to exclude current injury), pregnancy in the past two years, and involvement in regular activity that involves flexion/rotation of the spine.

Once all criteria were met, participants were then included in the study. The participants from MCC were invited to complete the questionnaire regarding their experience with LBP at two meetings post-training.

After data collection, the major questions of investigation regarding participants' experience with LBP in their lifetime, frequency, and duration of LBP episodes in the past two years were analysed using a chi-square test for relatedness. The chi-square test was used for these particular questions as they were considered the key questions in relation to the aims of the study. The data from all other questions was collected and collated using descriptive statistics (frequency data). Data analysis was carried out using SPSS for Windows software.

An adapted version of the survey used by Walker et al[4] was used as the questionnaire. The authors of this questionnaire were contacted and there were no

copyright issues to be addressed. A modified version of this questionnaire was utilised as it gave the participant a clear definition of the low back area, asked specific questions regarding frequency and duration of LBP episodes, and had been piloted and pre-tested on VU Osteopathic students, as described below. Participants were provided with a diagram of a mannequin that defined the low back as a shaded area between the last rib and gluteal folds. Questions regarding the participants' demographic were asked, as were direct questions regarding the participants' experience with LBP.

Prior to commencement of the study, a pilot test (sample questionnaire) of the adapted questionnaire was completed on a population of ten VU female students, in order to establish face validity of the survey. These results were collated, and necessary amendments were made to the survey (in particular grammar and spelling errors, and some questions that were deemed irrelevant to the survey were removed).

Results

In total, 140 questionnaires were handed out to the three groups of participants, 100 to Osteopathic Students, 40 to hockey participants. The questionnaire response rates were as follows: Osteopathic students 51% (n=51), hockey group (HG) 77.5% (n=31). After allocation of groups from the Osteopathic students, sample sizes were: active group (AG) - n=33, and sedentary group (SG) - n=18.

Participants' age, weight and height were all similar –the mean age of all three groups being within four years of each other (AG 23.1, std dev. 3.2 years; SG 23.2, std dev. 4.0 years; HG 27.4, std dev. 6.8 years). Mass was also similar (AG 63.2kg, std dev 8.9kg; SG 61.9kg, std dev 10.2kg; HG 62.9kg, std dev 8.2kg), as were participants' height (AG 167.9cm, std dev 6.2cm; SG 166.3cm, std dev 7.0cm; HG 167.7cm, std dev 6.1cm). Because the demographic particulars of the groups were so similar, mass, height and age cannot be factored in as variables influencing LBP in this study.

With regards to groups having ever experienced LBP in their lifetime, the SG reported the highest level of having ever experienced LBP (94%), closely followed by the AG (85%) and the HG (74%).

A chi-square test for relatedness was performed on the results for questions 18 & 20 (see appendix for questionnaire), which were considered to be the key questions of the survey.

Question 20 asked "How many individual episodes of low back pain have you had in the past 2 years?" Respondents answered with a range of numbers from 0 to 20. For all answers (0, 1, 2, 4, 15, 20) the chi-square test showed insignificant results for all groups (x^2=14, 34) 14.395, p = 0.421). The answers for question 20 of the survey regarding the frequency of episodes of LBP experienced in the past 2 years did not yield any significant results; therefore further study into this area could be considered in the future.

Question 18 asked "For any low back pain episode experienced in the past 2 years, on average, how long has your pain lasted?" After analysis via chi-square test, the group of participants responding with 'days' revealed an insignificant result, with a significance level well above the alpha level of 0.05 (x^2=(2, 43) 0.326, p=0.850). The group responding with 'weeks' also showed insignificant differences (x^2 = (2, 14) 1.00, p=0.607). The group responding with 'months' also showed insignificant differences (x^2= (2, 8) 2.0, p=0.157). Therefore with regards to the frequency of any episodes of LBP experienced, no significant difference between groups was found.

In response to questions regarding the frequency of the participants' experiences with LBP, there were no significant differences between the three groups in response to the question "Have you had low back pain in the past 24 hours". Concerning LBP experienced in the past month, the SG had the highest "yes" response (72%), while the AG and HG had a positive response of 55% and 42% respectively.

In response to the question "Have you had low back pain in the past 6 months?", again the SG had the strongest positive association to LBP experience (83%). The AG responded with 73% stating "yes", and the HG with 61%.

When considering their experience with LBP in the past 12 months, it was again the SG that had the highest affirming response, with 83% answering "yes". Seventy-three percent of participants from the AG also responded with "yes"', as did 65% of HG.

From the responses to these questions regarding the participants' experiences with LBP over various periods of time, it becomes clear that the SG experienced the most LBP

overall within the past twenty-four hours, six and twelve months. The AG experienced the second highest amount of LBP, and the HG experienced the least over these periods of time. While statistical analysis was not performed on these figures as these were not key questions of this study, the raw numbers suggest a higher likelihood of significance for this question.

This current study asked questions regarding the intensity of any LBP experienced by participants within the past two years. In response to the question "In the past 6 months, how intense was your worst low back pain rated on a 0 -10 scale, where 0 is 'no pain at all' and 10 is 'pain as bad as could be'?", both the AG and HG had similarly high mean levels of intensity (5.3 – std dev 2.6; and 5.4 – std dev 2.5), while the SG had a lower level of mean intensity, of 4.2 (std dev 2.2).

In response to the question "In the past 6 months, on average, how intense was your (usual) low back pain, rated on a 0 – 10 scale, where 0 is 'no pain at all' and 10 is 'pain as bad as could be'?", participants from the HG responded with the highest level of intensity of 4.1 (std dev 2.3), with the AG reporting 3.5 (std dev. 2.0) and the SG 2.7 (std dev 1.6).

When investigating the participants' involvement with known LBP risk factors (eg. maintaining a fixed posture, frequent bending and twisting of the low back, heavy physical work, vibration to your whole body, heavy lifting and forceful movements[14]), results from this study show that participants from the SG were involved in all forms of activities listed the least often. The HG had the highest response for three out of five of

the categories, with the AG having the highest response rate for the remaining two categories. In all cases, when the HG had the highest response, this was followed by the AG responding second highest; and when the AG responded with the highest response rate, the HG responded with the second highest response.

When it came to knowing the original cause of LBP, the majority of each group (active 61%, sedentary 61% and hockey 48%) claimed to know what the cause was. The most common reason for onset for the HG was sports injury (52%), with poor posture being the second most common reason (16%). Both the AG and SG reported poor posture was the most common reason for onset (27% and 47% respectively), with sports injury being the next common for the AG (12%), and 'the type of job done at work' and 'other – not specified' (12% for both) the next most common reason for the SG.

When asked "In the past 2 weeks have you had any low back pain that has required you to seek treatment?" all groups reported with a majority of "no" responses (77% - active; 67% - sedentary and 54% hockey). When asked what type of treatment each group had sought previously, the most popular modalities for the AG and SG were osteopathy (n=25 and n=13) and massage for the HG (n=18). However there was bias as all participants from both the AG and SG were Osteopathic students.

In this study, with regards to having a known family history of LBP (that is knowing a first degree relative with a history of LBP not related to an injury), the AG

displayed a positive association with 36% of participants having a family history of LBP, 39% of the SG, and 55% of the HG.

This study also investigated links between participants' experiences with LBP and their occupational activities. The categories of the occupations in this study were as follows: Sedentary–involves mainly sitting or standing without carrying heavy items; active – involves mainly walking or carrying of some heavy items; torsional – involves mainly carrying heavy items and frequent bending and lifting[15]. Of the AG and SG, 100% of participants were full-time students (as specified by the inclusion criteria). Classification as a full-time student equates to a sedentary occupation (as the majority of the daily activities involve sitting for long periods –e.g. when studying or sitting in a lecture). From the HG, after allocation of the participants' specific occupations into categories, 64% of those were involved in a sedentary job. Therefore as all participants from the AG and SG were involved in a sedentary occupation, as were over half of the hockey participants, occupational status cannot be incorporated as a factor involved in LBP in this study. However, the fact that most participants were largely sedentary most of the time may have been a factor in the lack of statistical significance of some findings.

This study revealed that 65% of participants from the HG experienced their first attack or episode of LBP greater than twelve months ago, as did 61% of participants from the AG. Forty-four per cent of the SG first experienced LBP within the past twelve months.

From the 3 groups, when responding to the question "What is the longest time your low back pain has lasted in the past 2 years?", the SG responded with 66% stating their pain lasted days, the AG responded with 36% of participants stating their LBP also lasted days (with 21% responding with months). Thirty-eight per cent of the HG responded with weeks, and 33% with days. These figures suggest that those participants with a sedentary lifestyle can expect their longest episode of LBP to last days; those with an active lifestyle can also expect their pain episode to last days; and those that play hockey can expect their LBP to last weeks. Although chi-square test findings regarding duration were insignificant, the raw data does lend some credence to the suggestion that repeated flexion/rotation may be an aggravating factor in LBP.

Of the three groups of participants in this study, the group of hockey participants expressed the most concern when addressing their fear of LBP impairing their life, or capacity to work in the future (50%). For both the AG and SG, over three quarters of participants expressed no concern regarding their LBP and the future.

Discussion

This study aimed to compare the frequency and duration of LBP in the past 2 years in female hockey players, with two other groups of women with varying levels of physical activity, and hence determine whether exercise in general has a beneficial effect on LBP, or whether exercise involving repeated flexion/rotation movements actually exacerbates participants' experiences with LBP.

In all three groups, the majority of participants had all experienced LBP at some stage in their lifetime, with the sedentary group having the highest rate. When analysing the data of LBP experienced over certain periods of time (the past twenty-four hours, six and twelve months), in all cases the sedentary group experienced the most LBP. The active group experienced the second highest amount of LBP over these periods, and the hockey group the least.

Regarding participants' experience of LBP intensity over the past six months, the hockey and active groups experienced similarly high values for the "worst" LBP experienced. The hockey group responded with the highest level of intensity for the "usual" episode of LBP. The sedentary group reported the lowest average mean value for both the "worst" and "usual"' cases of LBP.

The results from questions regarding participants' experience of "worst" and "average" intensity of LBP from this study suggested that the active and hockey groups

experienced LBP at a higher intensity when at its worst, and participants from the hockey group experienced their average LBP at a higher intensity when compared to the other groups. These results do not support the findings of other authors[16]. Jacob et al demonstrated a relationship between different sporting/physical activity levels and LBP[16]. Their investigation involved participants who were both involved, and not involved, in a variety of sporting activities. Results concluded that those from the non-sporting groups reported experiencing LBP at a higher level of severity when compared to the sporting group. Jacob et al[16] was investigating a variety of sporting activities, which may account for the difference in findings, when compared to a study such as this, involving a population of solely hockey players.

Other authors have compared the incidence of LBP in athletic and sedentary male subjects, and reported the athletic group experiencing less LBP than the sedentary group[3]. The outcome of their study was the athletic group reported less LBP than the sedentary group, yet the athletic group had a significantly higher incidence of physician-diagnosed sciatica. This current study investigated the participants' experiences with LBP within certain periods of time in the past. Although sciatica was not investigated, with regards to LBP, this study revealed a similar result to Videman et al[3], with both of the exercise groups (active group and hockey group) overall experiencing less LBP.

Lindgren and Maguire[8] conducted a study on hockey players at the Australian Institute of Sport Hockey Unit, investigating the frequency of LBP. One hundred per cent

of male participants and 50% of women who experienced LBP during the hockey season at the time of study had had previous episodes of LBP. This result is consistent with the results from this current study; the majority (74%) of the hockey group had experienced LBP at some stage in their life. As such a high proportion of participants from both studies have experienced LBP, this suggests that LBP is a common occurrence throughout the hockey playing population, at both a national and club level. A similar study in the future involving a larger population size might help further prove this point.

Potocka[12] has identified that one of the best ways to avoid back pain is by strengthening the muscles of the back, as well as flexibility in the low back area being a key component to reducing LBP. Carpenter and Nelson[17] noted low back strengthening programs as being beneficial for chronic LBP patients in showing relief of back pain and symptoms.

This current study revealed that participants that had an active lifestyle were likely to participate in exercise that involves some form of core stability work (Eg. Pilates, Swiss ball exercises and yoga), or stretching, and this may have had an effect on their experience with LBP. Of all three groups of participants, the sedentary group showed the highest level of having ever experienced LBP in their lifetime (94%), closely followed by the active group (85%) and the hockey group (74%). Therefore, the theory that exercise, particularly core stability and stretching exercises, reduces the incidence of LBP[12], has been supported to some degree in this study, although the overall percentage of participants who have suffered from LBP remained high for each group.

Results of the hockey group from this study are supported by the theory identified by Videman et al[3]; athletes are prone to experiencing accelerated degenerative changes (as seen on Magnetic Resonance Images) of their lumbar spines; in particular, athletes involved in power sports. The results from this current study suggest that hockey players are more likely to experience LBP at a higher intensity during a back pain episode. These factors may be an issue when investigating participants' future fears of LBP.

From this current study, it became apparent that the hockey players were the most concerned about their fear of LBP impairing their life or capacity to work in the future. The lack of anxiety for future attacks of LBP by the active group is supported by the theory proposed by Rainville[10]; exercise can increase function in the patients' low back, and that regular exercise may reduce the perception of pain, reducing the experience of LBP, and lessening excessive fear and concerns regarding LBP.

Matsui et al[14] reported that workers involved in handling heavy materials, performing repetitive weight lifting or involved in a bending posture have been shown to experience LBP more frequently than those that are not regularly involved in these activities. These actions, known stressors of the low back area[9], are also similar to the movements involved in playing hockey (eg. lumbar flexion and rotation). Therefore, one would assume that hockey playing participants would also be affected by LBP more frequently than the other two groups of this study. However, this current study revealed that participants with a sedentary lifestyle were more likely to experience an episode of

LBP in the past twenty-four hours, six and twelve months, than the active and hockey groups, though the hockey group did tend to have higher intensity episodes when LBP did occur.

This study revealed that those involved in a sedentary lifestyle were likely to experience LBP more frequently than the other two groups, which are regularly involved in physical activity. These findings are inconsistent with that of Matsui et al[14], and this may be accounted for as physical activity was not a factor in their study. The types of physical activity that the participants from this current study were involved in included back strengthening exercises and flexibility (which have been shown to improve one's experience with low back pain[12]), which may have been a factor in decreasing the frequency of the participants' back pain episodes. Thus, to gain a comparable result, a future study investigating LBP and the involvement of known aggravating factors should have a constant factor of any exercise involvement – especially that of lumbar stabilisation and flexibility.

In this investigation, the majority of participants from both the active and sedentary groups did not have a family history of LBP (that is, knowing a first degree relative with a history of LBP not related to an injury), nor did half of the participants from the hockey group. These findings are not consistent with that of Simmons et al[19] and Matsui et al[18]. Matsui et al[18] noted that there may be a genetic factor and familial predisposition that results in the development of lumbar disc herniation; Simmons et al[19] noted that patients with degenerative disc disease were more than twice as likely to have

a family history, compared to those without. The differences in results between studies may be accounted for as this current study had a much smaller sample size that was affected by LBP when compared with other authors[18,19]. In order to establish if the findings from this current study are accurate, a future study investigating similar aspects of LBP should incorporate a sample size which is comparable to that of Simmons et al[19] and Matsui et al[18].

There was no significant difference found when analysed by chi-square testing, in relation to frequency or duration of LBP episodes between the three groups. However, two possible reasons may be identified for this. The first is the relatively young age of the participants in this study. It is a documented fact that the incidence of LBP increases with age[4], and a study of older participants at different levels of activity may produce different results. The second factor to consider is that the majority of the participants, whatever their activity level, had sedentary occupations when not actively exercising. While this allowed concentration on activity levels as a variable, it is possible that the generally sedentary lifestyle of most participants influenced the outcome.

One study conducted by Matsui et al revealed that the average age of the first attack of LBP in those with a family history of LBP was younger than those without[18]. In this current study all three groups of participants had a similar mean age (within four years of one another), and showed a similar family history trend. The majority of participants from the hockey group (65%) experienced their initial episode of LBP

greater than twelve months ago; this group had the strongest association with a family history of LBP (55%). The majority of the sedentary group experienced their first episode of LBP within the past twelve months, and had a weak association with a family history (39%). The results from this study agree with those of Matsui[18], and suggest that the stronger the family history of LBP, the earlier the first episode of LBP is likely to occur.

Conclusion

When investigating whether there was a link between activity levels (high-level female hockey player participants with a high incidence of repetitive lumbar flexion/rotation movements; women who participate in regular physical activity that does not involve repetitive lumbar flexion/rotation; and women with a primarily sedentary lifestyle;) and LBP, in all cases, the sedentary group experienced the most frequent LBP, with the hockey group experiencing the least. However, the group of hockey participants reported a higher intensity level of their "worst" and "average" episodes of LBP, with some evidence of longer duration of episodes. Although major statistical significance was not found in relation to frequency and duration, possibly due to average age and other factors, enough evidence was found in relation to factors such as average severity of

episodes to warrant further investigation into whether there is a link between activity levels and the duration and frequency of LBP episodes.

References

1. Nourbakhsh M, Moussavi S, Salavati M. Effects of Lifestyle and Work-Related Physical Activity on the Degree of Lumbar Lordosis and Chronic Low Back Pain in a Middle East Population. *Journal of Spinal Disorder*. 2001; 14; 4: 283–292

2. Leboeuf C, Kyvik K, Bruun N. Low Back Pain and Lifestyle. Part II – Obesity. *Spine.* 1999; 24; 8: 779–784

3. Videman T, Sarna S, Battié M, Koskinen S, Gill K, Paananen H, Gibbons L. The Long-Term Effects of Physical Loading and Exercise Lifestyles on Back-Related Symptoms, Disability, and Spinal Pathology Among Men. *Spine.* 1995; 20; 6: 699–709

4. Walker Bruce F., Reinhold Muller, William Grant D Low Back Pain in Australian Adults. Prevalence and Associated Disability *Journal of Manipulative and Physiological Therapeutics.* 2004; 27; 4: 238-44

5. Freke M, Dalgleish M. Injuries in Women's Hockey: Part One. *Sport Health*. 1994; 12; 1: 41–42

6. Freke M, Dalgleish M. Injuries in Women's Field Hockey: Part Two – On Tour. *Sport Health*. 1994; 12; 3: 44–46

7. Freke M, Dalgleish M. Incidence of Low Back Dysfunction in Young Elite Female Field Hockey Players. *Sport Health*. 1994; 12; 2: 32–33

8. Lindgren S, Maguire K. Survey of field hockey injuries. *Sports Science and Medicine Quarterly* 1985; 1; 3: 7–12

9. Brukner Peter, Khan Karim, Clinical Sports Medicine – Revised Second Edition, Australia: McGraw-Hill; 2001, p.330-59

10. Rainville J. Exercise as a treatment for chronic low back pain. *Spine Journal.* 2004; 4; 1: 106–15

11. Liddle S, Baxter G, Gracey J. Exercise and chronic low back pain: what works? *Pain.* 2004; 107: 176–190

12. Potocka D. Do Not Be Afraid of Back Exercises - Fitness Communication. *The ACHPER National Journal.* 1985; 74

13. Norkin Cynthia C, Levangie Pamela K, Joint Structure and Function – 2nd Edition, USA: F. A. Davis Company; 1992, p. 125-177

14. Matsui H, Maeda A, Tsuji H, Naruse Y. Risk Indicators of Low Back Pain Among Workers In Japan: Association Of Familial and Physical Factors With Low Back Pain. *Spine.* 1997; 22; 11: 1242–1247

15. Dorland's Illustrated Medical Dictionary – 29th Edition, Philadelphia: W. B. Saunders Company; 2000

16. Jacob T, Baras M, Zeev A, Epstein L. Physical Activities and Low Back Pain: A Community- Based Study. *Medicine and Science in Sports and Exercise*. 2004; 36; 1: 9-15

17. Carpenter D, Nelson B. Low Back Strengthening for the Prevention and Treatment of Low Back Pain. *Medicine and Science in Sports and Exercise.* 1999; 31; 1: 18–24

18. Matsui H, Kanamori M, Ishihara H, Yudoh K, Naruse Y, Tsuji H. Familial Predisposition for Lumbar Degenerative Disc Disease: A Case-Control Study. *Spine.* 1998; 23; 9: 1029–1034

19. Simmons E D, Guntunpalli M, Kowlaski J, Braun F, Seidel T. Familial Predisposition for Degenerative Disc Disease: A Case-Control Study. *Spine.* 1996; 21; 13: 1527–1529

Table 1: Mean and Standard Deviation Results

	Active Group		Sedentary Group		Hockey Players	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
1. What is your age?	23.1 yrs	3.2 yrs	23.2 yrs	4.0 yrs	27.4 yrs	6.8 yrs
2. How tall are you?	167.9cm	6.2	166.3cm	7.0cm	167.7cm	6.1cm
3. How much do you weigh?	63.2kg	8.9kg	61.9kg	10.2kg	62.9kg	8.2kg
12. On average to what degree throughout your life have you been physically fit, on a scale of 0-10?	7.2	1.5	2.7	0.7	7.3	1.1
13. On average, how many sessions of exercise do you participate in per week?	4.2	1.5	1.5	0.8	3.9	1.5

	Active Group		**Sedentary Group**		**Hockey Players**	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
25. In the past 6 months, how intense was your worst low back pain rated on a 0-10 scale where 0 is "no pain at all" and 10 is "pain as bad as could be"?	5.3	2.6	4.2	2.2	5.4	2.5
26. In the past 6 months, on average, how intense was your (usual) low back pain, rated on the 0-10 scale, where 0 is "no pain" and 10 is "pain as bad as could be"? (That is, your usual pain at times you were experiencing pain.)	3.5	2.0	2.7	1.6	4.1	2.3

	Active Group		Sedentary Group		Hockey Players	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
28. In the past 6 months, how much has this pain interfered with your daily activities? (Interference rated on the 0-10 scale where 0 is "no interference at all" and 10 is "unable to carry on activities".)	1.7	1.5	1.4	1.0	2.4	1.7
29. In the past 6 months how much has this pain changed your ability to take part in recreational, social and family activities where 0 is "no change at all" and 10 is "extreme change"?	1.3	1.2	0.9	0.6	2.4	1.7
30. In the past 6 months how much has this pain changed your ability to work, where 0 is "no change" and 10 is extreme change?	1.3	0.9	1.2	0.9	2.1	1.9

Table 2: Hockey Group Responses

4. On average over the past 5 years how do you consider your weight has been?	*Acceptable* 81% (25)	*Overweight* 13% (4)	*Don't recall* 3% (1)	*No Response* 3% (1)	
5. What is your present employment status?	*Full time* 58% (18)	*Part time* 10% (3)	*Looking after home/family* 3% (1)	*Student* 26% (8)	*No Response* 3% (1)
8. Have you ever been pregnant?	*Yes* 3% (1)	*No* 94% (29)	*No Response* 3% (1)		
9. How many times have you been pregnant?	*3* 3% (1)	*No Response* 97% (30)			
10. How many children have you given birth to?	*3* 3% (1)	*No Response* 97% (30)			
11. In general, would you say that your health is:	*Excellent* 32% (10)	*Very good* 58% (18)	*Good* 10% (3)		
14. On average, how long do your exercise sessions last?	*30-45 minutes* 23% (7)	*46-60 minutes* 55% (17)	*61- 90 minutes* 19% (6)	*>90 minutes* 3% (1)	
17. When was your first attack or episode of low back pain?	*Within the past 12 months* 3% (1)	*Greater than 12 months ago* 65% (20)	*Don't recall* 10% (3)	*No response* 22% (7)	
19. What is the longest time your low back pain has lasted in the past 2 years?	*Days* 33% (10)	*Weeks* 38% (12)	*Months* 3% (1)	*No Response* 26% (8)	
21. Do you have low back pain every day?	*Yes* 10% (3)	*No* 64% (20)	*No response* 26% (8)		
22. Have you had low back	*Yes*	*No*	*No response*		

pain in the past 24 hours?	19% (6)		58% (18)	23% (7)
23. Have you had low back pain in the past month?	*Yes* 42% (13)		*No* 35% (11)	*No response* 23% (7)
24. Have you had low back pain in the past 6 months?	*Yes* 61% (19)	*No* 13% (4)	*Don't recall* 3% (1)	*No response* 23% (7)
27. About how many days in the last 6 months have you been kept from your usual activities (work, school or housework) because of low back pain?	*None* 33% (10)	*Days* 22% (7)	*Weeks* 3% (1)	*No Response* 42% (13)
31. In the past 6 months did you seek health care for low back pain?	*Yes* 39% (12)	*No* 29% (9)	*Don't recall* 3% (1)	*No response* 29% (9)
32. Have you had low back pain in the past 12 months?	*Yes* 65% (20)	*No* 13% (4)		*No response* 23% (7)
33. Has your low back pain ever lasted for more than 6 months?	*Yes* 10% (3)	*No* 67% (21)		*No response* 23% (7)
34. In the past 2 weeks have you had any low back pain that has required you to seek treatment?	*Yes* 23% (7)	*No* 54% (17)		*No response* 23% (7)

35. Have you ever had to change jobs or duties because of low back pain?	*Yes* 6% (2)		*No* 67% (21)		*No response* 27% (8)	
36. Do you fear low back pain could impair your capacity to work or significantly impair your life in the future?	*Yes* 23% (7)		*No* 50% (16)		*No response* 27% (8)	
37. How long ago was your last episode of low back pain?	*Days* 32% (10)	*Weeks* 13% (4)	*Months* 19% (6)	*Years* 6% (2)	*Don't recall* 3% (1)	*No Response* 27% (8)
38. Have you any idea what originally caused your low back pain?	*Yes* 48% (15)		*No* 29% (9)		*No response* 23% (7)	
41. Have you ever attended a hospital casualty department for low back pain?	*Yes* 3% (1)	*No* 74% (23)			*No response* 23% (7)	
42. Have you ever been admitted to a hospital for more than one day for low back pain?	*No* 77% (24)			*No response* 23% (7)		
43. Have you ever had spinal surgery for low back pain?	*Yes* 0	*No* 77% (24)			*No response* 23% (7)	
45. Does a close family member have a history of low back pain not related to an injury?	*Yes* 55% (17)			*No* 45% (14)		

Table 3: Active Group Responses

4. On average over the past 5 years how do you consider your weight has been?	*Acceptable* 67% (22)		*Underweight* 3% (1)		*Overweight* 30% (10)	
5. What is your present employment status?	*Student* 97% (32)			*Question not answered correctly* 3% (1)		
8. Have you ever been pregnant?	*No* 100% (33)					
11. In general, would you say that your health is:	*Excellent* 28% (9)	*Very good* 36% (12)	*Good* 33% (11)	*Fair* 3% (1)		
14. On average, how long do your exercise sessions last?	*30-45 minutes* 49% (16)	*46-60 minutes* 45% (15)	*61- 90 minutes* 3% (1)	*>90 minutes* 3% (1)		
17. When was your first attack or episode of low back pain?	*Within the past 12 months* 18% (6)	*Greater than 12 months ago* 61% (20)	*Don't recall* 9% (3)	*No response* 12% (4)		
19. What is the longest time your low back pain has lasted in the past 2 years?	*Days* 36% (12)	*Weeks* 15% (5)	*Months* 21% (7)	*Years* 3% (1)	*Don't Recall* 6% (2)	*No Response* 19% (6)
21. Do you have low back pain every day?	*Yes* 3% (1)		*No* 85% (28)		*No response* 12% (4)	

22. Have you had low back pain in the past 24 hours?	*Yes* 24% (8)	*No* 64% (21)		*No response* 12% (4)
23. Have you had low back pain in the past month?	*Yes* 55% (18)	*No* 33% (11)		*No response* 12% (4)
24. Have you had low back pain in the past 6 months?	*Yes* 73% (24)	*No* 15% (5)		*No response* 12% (4)
27. About how many days in the last 6 months have you been kept from your usual activities (work, school or housework) because of low back pain?	*None* 55% (18)	*Days* 12% (4)	*Don't Recall* 9% (3)	*No response* 24% (8)
31. In the past 6 months did you seek health care for low back pain?	*Yes* 55% (18)	*No* 21% (7)		*No response* 24% (8)
32. Have you had low back pain in the past 12 months?	*Yes* 73% (24)	*No* 12% (4)		*No response* 15% (5)
33. Has your low back pain ever lasted for more than 6 months?	*Yes* 12% (4)	*No* 73% (24)		*No response* 15% (5)
34. In the past 2 weeks have you had any low back pain that has required you to seek treatment?	*Yes* 18% (6)	*No* 67% (22)		*No response* 15% (5)

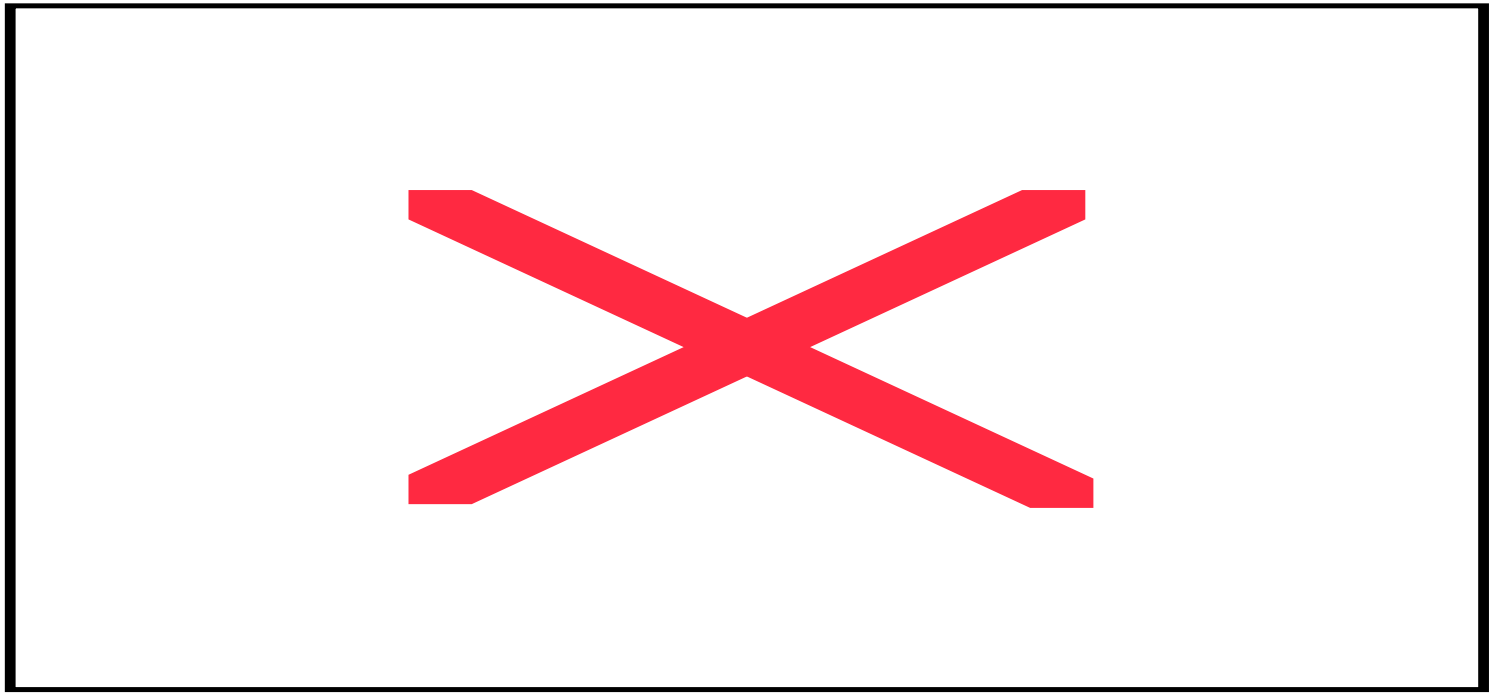
35. Have you ever had to change jobs or duties because of low back pain?	*Yes* 3% (1)		*No* 82% (27)		*No response* 15% (5)	
36. Do you fear low back pain could impair your capacity to work or significantly impair your life in the future?	*Yes* 9% (3)		*No* 76% (25)		*No response* 15% (5)	
37. How long ago was your last episode of low back pain?	*Days* 27% (9)	*Weeks* 24% (8)	*Months* 21% (7)	*Years* 9% (3)	*Don't recall* 3% (1)	*No response* 16% (5)
38. Have you any idea what originally caused your low back pain?	*Yes* 61% (20)		*No* 24% (8)		*No response* 15% (5)	
41. Have you ever attended a hospital casualty department for low back pain?	*No* 88% (29)			*No response* 12% (4)		
42. Have you ever been admitted to a hospital for more than one day for low back pain?	*No* 88% (29)			*No response* 12% (4)		
43. Have you ever had spinal surgery for low back pain?	*No* 88% (29)			*No response* 12% (4)		
45. Does a close family member have a history of low back pain not related to an injury?	*Yes* 36% (12)	*No* 58% (19)	*Don't recall* 3% (1)	*No Response* 3% (1)		

Table 4: Sedentary Participant Responses

4. On average over the past 5 years how do you consider your weight has been?	*Acceptable* 72% (13)			*Overweight* 28% (5)		
5. What is your present employment status?	*Student* 100% (18)					
8. Have you ever been pregnant?	*No* 100% (18)					
11. In general, would you say that your health is:	*Very good* 39% (7)		*Good* 50% (9)		*Fair* 11% (2)	
14. On average, how long do your exercise sessions last?	*0* 11% (2)	*<30 minutes* 17% (3)	*30-45 minutes* 11% (2)	*46-60 minutes* 44% (8)	*61- 90 minutes* 11% (2)	*No Response* 6% (1)
17. When was your first attack or episode of low back pain?	*Within the past 12 months* 44% (8)		*Greater than 12 months ago* 39% (7)	*Don't recall* 11% (2)	*No response* 6% (1)	
19. What is the longest time your low back pain has lasted in the past 2 years?	*Days* 66% (12)		*Weeks* 22% (4)	*Years* 6% (1)	*No Response* 6% (1)	
21. Do you have low back pain every day?	*Yes* 11% (2)		*No* 83% (15)	*No response* 6% (1)		
22. Have you had low back pain in the past 24 hours?	*Yes* 33% (6)		*No* 61% (11)	*No response* 6% (1)		
23. Have you had low back pain in the past month?	*Yes* 72% (13)		*No* 22% (4)	*No response* 6% (1)		

24. Have you had low back pain in the past 6 months?	*Yes* 83% (15)	*No* 11% (2)	*No response* 6% (1)	
27. About how many days in the last 6 months have you been kept from your usual activities (work, school or housework) because of low back pain?	*None* 88% (16)	*Days* 6% (1)	*No Response* 6% (1)	
31. In the past 6 months did you seek health care for low back pain?	*Yes* 44% (8)	*No* 50% (9)	*No response* 6% (1)	
32. Have you had low back pain in the past 12 months?	*Yes* 83% (15)	*No* 6% (1)	*Don't recall* 6% (1)	*No response* 6% (1)
33. Has your low back pain ever lasted for more than 6 months?	*Yes* 11% (2)	*No* 83% (15)	*No response* 6% (1)	
34. In the past 2 weeks have you had any low back pain that has required you to seek treatment?	*Yes* 17% (3)	*No* 77% (14)	*No response* 6% (1)	
35. Have you ever had to change jobs or duties because of low back pain?	*No* 94% (17)	*No response* 6% (1)		

36. Do you fear low back pain could impair your capacity to work or significantly impair your life in the future?	*Yes* 17% (3)		*No* 77% (14)		*No response* 6% (1)
37. How long ago was your last episode of low back pain?	*Days* 44% (8)	*Weeks* 22% (4)	*Years* 11% (2)	*Don't recall* 17% (3)	*Question not answered correctly* 6% (1)
38. Have you any idea what originally caused your low back pain?	*Yes* 61% (11)		*No* 33% (6)		*No response* 6% (1)
41. Have you ever attended a hospital casualty department for low back pain?	*No* 94% (17)			*No response* 6% (1)	
42. Have you ever been admitted to a hospital for more than one day for low back pain?	*Yes* 6% (1)		*No* 88% (16)		*No response* 6% (1)
43. Have you ever had spinal surgery for low back pain?	*No* 94% (17)			*No response* 6% (1)	
45. Does a close family member have a history of low back pain not related to an injury?	*Yes* 39% (7)		*No* 55% (10)		*Don't recall* 6% (1)



No. on Graph	1	2	3	4	5	6	7	8	9	10
Type of Activity	Hockey	Run/Jog	Walk	Weights	Cycling	Swimming	Basketball	Aerobics	Pilates	Rock climbing

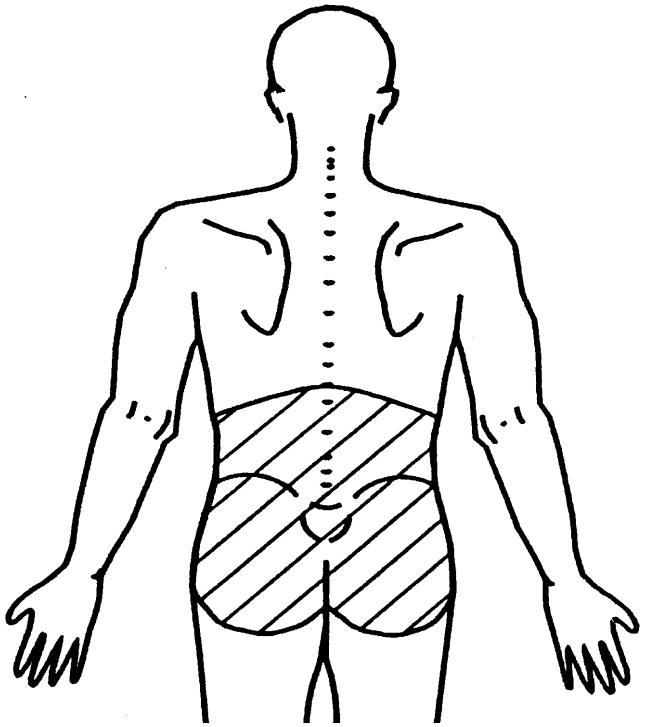
No. on Graph	11	12	13	14	15	16	17	18	19	20
Type of Activity	Strength & Conditioning Training	Stepper	Boxing Circuit	Cardio (Unspecified)	Yoga	Sprinting	Soccer	Cross Training	Swiss Ball Exercises	Jumping

No. on Graph	21	22	23	24	25	26	27	28	29	30
Type of Activity	Power walking	Throwing	Resistance training	Stretching	Strength training	Golf	Netball	Dance	Spin class	No response

LOW BACK PAIN SURVEY

For those with and without low back pain

Please look at the diagram below; for the purposes of this survey the shaded area represents the *low back.*



Please complete the relevant sections:

1. What is your age?	**Years**	
2. How tall are you?		**Centimetres**
		Feet & inches
		Don't know
3. How much do you weigh?		**Kilograms**
		Don't know
4. On average over the past 5 years do you consider your weight has been: Please tick one box		**Acceptable**
		Underweight
		Overweight
		Don't recall
5. What is your present employment status? Tick one box which best describes you		**Full time**
		Part time
		Unemployed
		Looking after home or family
		Student
		Retired
		Not working because of health reasons

6. If you are working, what is your main occupation?
Please Print:_____

11. In general, would you say that your health is:		**Excellent**
		Very good
		Good
		Fair
		Poor
		Don't know

12. On average, to what degree, throughout your life, have you been physically fit?

Circle:

Totally unfit									**Extremely fit**
1	2	3	4	5	6	7	8	9	10

	Sessions
13. On average, how many sessions of exercise do you participate in per week?	

	Minutes
14. On average, how long do these exercise sessions last?	

15. Please describe the sport/types of activity that you are involved in during these exercise sessions (Eg. Running, lifting weights).

_____

_____

_____

	Yes	**No**	**Don't Recall**
16. In your lifetime have you ever experienced low back pain? That			

18. For any low back pain episode experienced in the past 2 years, on average, how long has your low back pain lasted? Place a number in one of the boxes.		**Days**
		Weeks
		Months
		Years
		Don't recall

19. What is the longest time your low back pain has lasted in the past 2 years? Place a number in one of the boxes.		**Days**
		Weeks
		Months
		Years
		Don't recall

For the following question 20, an "episode" of low back pain means <u>any low back pain starting after a pain-free period of 3 months or more.</u>
Using this definition:

	Number	**Don't Recall**
20. How many individual episodes of low back pain have you had in the past 2 years?		

	Yes	**No**	**Don't Recall**
21. Do you have low back pain every day?			
22. Have you had low back pain in the past 24 hours?			
23. Have you had low back pain in the past month?			
24. Have had low back pain in the past 6 months? *If 'yes' continue on to question 25.* *If 'no' please proceed to question 32 on page 6.*			

26. In the past 6 months, on average, how intense was your (usual) low back pain rated on the 1-10 scale, where 0 is “no pain" at all and 10 is "pain as bad as could be"? (That is, your usual pain at times you were experiencing pain).

No pain									**Pain as bad as could be**
1	2	3	4	5	6	7	8	9	10

27. About how many days in the last 6 months have you been kept from your usual activities (work, school, or housework) because of low back pain pain?

If none missed, place 0.

	Number of days
	Number of weeks
	Number of months
	Number of years
	Don’t recall

28. In the past 6 months, how much has this pain interfered with your daily activities? Please rate the interference on the 1-10 scale where 0 is "no interference" at all and 10 is "unable to carry on activities"?

No Interference									**Unable to carry on activities**
1	2	3	4	5	6	7	8	9	10

29. In the past 6 months, how much has this pain changed your ability to take part in recreational, social and family activities where 0 is "no change" at all and 10 is "extreme change"?

No Change									**Extreme Change**
1	2	3	4	5	6	7	8	9	10

	Yes	No	Don't Recall
32. Have you had low back pain in the past 12 months?			
33. Has your low back pain ever lasted for more than 6 months?			
34. In the past 2 weeks have you had any low back pain that has required you to seek treatment?			
35. Have you ever had to change jobs or duties because of low back pain?			
36. Do you fear low back pain could impair your capacity to work or significantly impair your life in the future?			

37. How long ago was your last episode of low back pain?		**Days**
		Weeks
		Months
		Years
		Don't recall

	Yes	No
38. Have you any idea what originally caused your low back pain?		

If 'yes' go on to question 39.
If 'no' proceed to question 40 on page 7.

39. What do you think caused your low back pain?
Please tick the boxes that apply; you may tick more than one:

• An accident/injury at home or work	
• A motor vehicle accident	
• A fall	
• Sports injury	
• The type of job done at work	
• The work I did at home	

40. What types of treatment(s) have you previously received for low back pain?
(You may tick more than one)

• Osteopathy	
• Physiotherapy	
• Chiropractic	
• Prescribed medication	
• Non-prescription medication	
• Back exercises/stretching	
• Back injections	
• Spinal manipulation or adjustment	
• Mobilisation	
• Massage	
• Traction	
• Bed rest	
• Brace or corset	
• Electrical therapy (eg TENS)	
• Ultrasound	
• Pain management counselling	
• Back education classes	
• Acupuncture	
• Surgery/operation	
• Nerve cutting or burning	

Other (describe):_____

	Yes	No
41. Have you ever attended a hospital casualty department for low back pain?		
42. Have you ever been admitted to a hospital for more than one day for low back pain?		
43. Have you ever had spinal surgery for low back pain?		

	Yes	No	Don't Recall
45. Does a close family member have a history of low back pain not related to an injury (only mother, father, brothers, sisters or children)			
If yes, who has had low back pain? Please circle:	**Mother** **Father** **Brother(s)** **Sister(s)** **Children**		

Thank you for your time in completing this survey

If you have any comments about this survey please write them below: