

NONOCCUPATIONAL PHYSICAL ACTIVITY AND THE PREVALENCE OF LOW BACK PAIN IN AN INDUSTRIAL POPULATION

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ABSTRACT

STUDY DESIGN: A cross-sectional study using baseline interview data from a prospective cohort study of manual materials handling jobs in Utah, Texas, and Wisconsin. **OBJECTIVES:** To determine whether non-occupational physical activity is associated with the 1-month period prevalence of low back pain (LBP) in a working population. **BACKGROUND:** The largest prior cohort study failed to show that a measure of physical fitness (VO₂Max) was protective for the development of low back pain (Battie, et al. 1989). **METHODS:** A baseline questionnaire, structured interview and physical exam were used to obtain information from 739 participants regarding their self-reported non-occupational physical activity habits, potential confounders and their experience of LBP. A multivariate logistic regression was performed using presence or absence of any form of physical activity as the exposure and LBP in the prior month with a pain rating of 3 or greater on a scale of 0 to 10 in the right lumbar, left lumbar and paraspinal areas of the low back as the outcome measure. Confounders controlled included age, sex, BMI, tobacco use and job satisfaction. **RESULTS:** Of the 739 participants, 71% of them had physical activity outside of work in some capacity. Of those who did not have physical activity outside of work, odds ratios (OR) and 95% confidence intervals (95% CI) after controlling for the above mentioned confounders for low back areas were as follows: left lumbar pain OR=1.81 (95% CI 1.15-2.83), right lumbar pain OR=1.46 (95% CI 0.91-2.34), lumbar paraspinal pain OR=1.60 (95% CI 1.10-2.34), any of the 3 areas OR=1.71 (95% CI 1.20-1.44). **CONCLUSION:** There is a statistically significant relationship between lack of self reported physical activity outside of work and prevalence of LBP in this cross-sectional study. Weaknesses of this study included those typical of a cross sectional design, and that physical activity was self reported. Strengths include a large sample size and the multi-center design.

INTRODUCTION

Low back pain continues to be a common and expensive health complaint in the occupational setting. It is known to be the most expensive industrial injury claim in the U.S. and the most common cause of disability in people under the age of 45 (Bigos 1999). It has been estimated that the annual cost to industry secondary to lost productivity from LBP is \$28 billion (Rizzo,

Abbott et al. 1998). The annual healthcare costs attributed to LBP in the general population are estimated to be between \$35-\$50 billion (Atlas and Deyo 2001).

Given the high prevalence and expense of this condition, a search for modifiable risk factors should be considered a priority. Moderate physical activity such as walking has a wide range of health benefits and is an increasingly accepted treatment for chronic LBP (Hayden, van Tulder et al. 2005). The largest prior industrial prospective cohort study failed to show that a measure of physical fitness (VO₂max) was protective for the development of LBP (Battie, Bigos et al. 1989). The current paper presents the results of a cross-sectional study examining the relationship between non-occupational exercise and the 1-month period prevalence of LBP in a working population using baseline enrollment data from an ongoing industrial prospective cohort study.

METHODS

Subjects

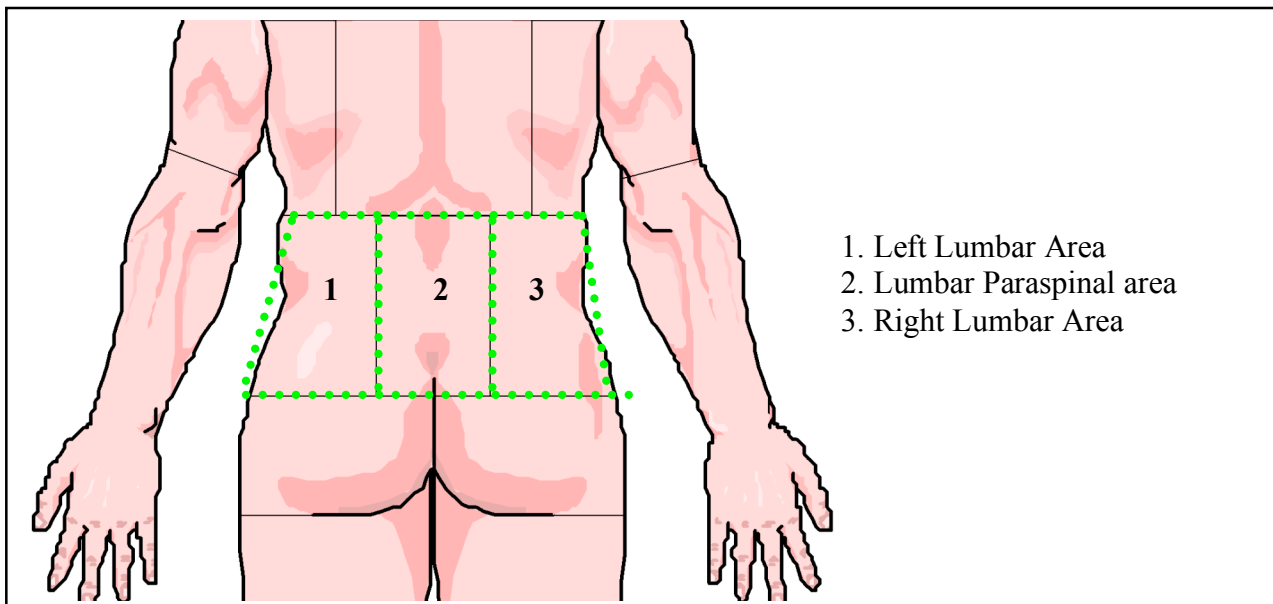
A total of 739 participants from 30 diverse manufacturing entities in Wisconsin, Utah, and Texas were enrolled in an occupational prospective cohort study examining low back pain. The participants worked in a broad range of industrial practices representing industries including electric motor manufacturing, airbag manufacturing, printing, distribution, food processing, generator manufacturing, electric light manufacturing, small motor manufacturing and cabinetry manufacturing.

Data Collection

All participants completed a laptop-administered questionnaire to ascertain information on demographics, personal habits and hobbies and psychosocial factors. Anthropometric data, including range of motion, blood pressure, heart rate, height and weight were measured.

Each subject underwent a structured interview administered by laptop which included a sectioned body diagram to identify neck, upper and lower back pain. An occupational medicine resident or an occupational or physical therapist conducted this interview. Participants were questioned regarding presence of pain, aches and/or burning in the low back currently or in the past month. If pain was present during that time period they were asked to rate the pain on a scale ranging from 0 (no pain) to 10 (highest amount of pain). They were then asked to point out on the sectioned body diagram where the pain was located. If the pain was rated 3 or higher and if it was located in the areas labeled left lumbar, right lumbar, or lumbar immediately paraspinal, the response was considered positive. (Please see Figure 1 for body diagram)

Figure 1. Body Diagram for Low Back Pain Areas.



The three sections in the lumbar region above correspond to left lumbar, lumbar paraspinal, and right lumbar areas respectively.

Interview Criteria for Exercise

Participants were asked multiple questions regarding physical activity in the questionnaire. For the purpose of this study, two were chosen to be analyzed. The first inquired whether they “walked on a regular basis at least twice per month outside of work”. The second question asked, “Do you do any other exercise outside of work (for example, bicycling, basketball, skiing, or swimming) at least twice a month?”. An answer of “yes” to either or both of these questions was considered a positive response.

Statistical Analysis

The data were analyzed in SAS 9.1 (Cary, North Carolina, USA). Findings related to low back pain were grouped into four distinct categories. The first group consisted of those reporting pain currently or in the previous month in the left lumbar area. The second group consisted of those reporting pain in the lumbar paraspinal area during the same time period. The third group consisted of those reporting pain currently or in the past month in the right lumbar area. The last group consisted of a combination of any of the three groups. Logistic regression was used to evaluate absence of non-occupational physical activity as a potential risk factor while controlling for age, gender, BMI, tobacco use and job satisfaction. Odds ratios (OR) and 95% Confidence Intervals (95% CI) are reported.

RESULTS

The demographics of the study population are summarized in Table 1. Overall the population was 35% female with an average age of 38. The average BMI was 29.3 kg/m², which is classified in the “overweight” category. Roughly half of the participants were lifelong non-smokers.

Table 1. Demographic characteristics of the study population (n=739)

Variable	Mean	Standard Deviation
Age	38 years	11.9 years
Body Mass Index	29.3 kg/m ²	6.3 kg/m ²
	N	(Percent of Total)
Gender		
Female	244	(34.5)
Male	463	(65.5)
Exercise		
Yes	525	(71.0)
No	214	(29.0)
Job Satisfaction		
Dissatisfied	31	(4.3)
Neither	466	(64.5)
Satisfied	225	(31.2)
Tobacco Use		
Lifelong Non-Smokers	388	(53.6)
Former Smokers	172	(23.8)
Current Smokers	164	(22.6)

Table 2 summarizes the frequency data for pain, rated 3 or greater on a scale of 0 to 10, in the four categories of low back pain.

Table 2. Frequency data for the four categories of low back pain.

Category	N	(Percent of Population)
Left Lumbar Pain	101	(13.7)
Lumbar Paraspinal pain	177	(23.9)
Right Lumbar Pain	98	(13.3)
Any Lumbar Pain	230	(31.1)

Table 3 summarizes the univariate logistic regression analysis of the relationship between non-occupational physical activity and the prevalence of each of the 4 categories of low back pain (LBP). Odds ratios (OR) and 95% confidence intervals (95% CI) are given.

Table 3. Non-occupational physical activity and 4 categories of LBP (unadjusted)

Reported Activity	Area of Pain OR (95% CI)			
	Left Lumbar	Right Lumbar	Paraspinal	Any Area
+Exercise	0.54(0.34-0.84)	0.68(0.43-1.08)	0.59(0.42-0.88)	0.58(0.41-0.82)

Table 4 summarizes the multivariate logistic regression analysis of the relationship between non-occupational physical activity and prevalence of low back pain, controlling for age, sex, BMI, tobacco use, and job satisfaction. Odds ratios (OR) and 95% confidence intervals (95% CI) are given.

Table 4. Non-occupational physical activity and 4 categories of LBP (adjusted for age, sex, BMI, tobacco use, and job satisfaction)

Reported Activity	Area of Pain OR (95%CI)			
	Left Lumbar	Right Lumbar	Paraspinal	Any Area
+Exercise	0.55(0.35-0.87)	0.69(0.43-1.10)	0.63(0.43-0.91)	0.59(0.41-0.83)

DISCUSSION

After adjusting for the possible confounders of age, sex, BMI, job satisfaction and tobacco use, this study found a statistically significant relationship between self-reported non-occupational exercise and the 1-month period prevalence of LBP in a working population. When the category of generalized LBP was broken down into locations in the lumbar region, the left lumbar and paraspinal areas were statistically significant while the right lumbar area was not.

It is unclear how to interpret the lack of statistical significance in the right lumbar region. The odds ratios for that area are comparable to the significant values in the other 3 categories of LBP. The confidence intervals in the region were close to being significant. There may not have been enough statistical power to detect an effect in that region; however this result does not provide clinically useful information.

A weakness of the current study is the potential for recall bias given that the criteria for exercise were self-reported answers to the laptop questionnaire. Further information describing the type

of exercise and quantifying the time per week spent doing physical activity was collected at the time of enrollment but was not used in this analysis. Other weaknesses include those associated with the cross-sectional design, namely that a cause and effect relationship cannot be established given the use of prevalence of LBP in this working population.

A strength of this study is the large sample size, with a prevalence of LBP that approximates that found in other investigations in both working and community settings. The demographic characteristics of the study participants approximate those found in the U.S. in general and argue for the ability to generalize the findings to a broader population. Finally, the multi-center design of the study should provide the ability to apply these findings to populations in multiple different work settings.

Future research on this topic should include a prospective cohort design to attempt to establish whether there is a direct relationship between exercise and LBP. Objectively quantifying the amount of exercise performed and describing the type of exercise and effort involved would also be helpful. Finally, an attempt to establish a dose-response relationship between exercise and LBP should be made if there is evidence to support a direct relationship between these two variables.

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