

# Low-Back Pain in 40- to 47-Year-Old Men: Work History and Work Environment Factors

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The relationship of low-back pain (LBP) to work history and work environment factors was studied in a randomized sample of 940 men from 40 to 47 years of age. The life-time incidence of LBP was 61%, the prevalence 31%. In a univariate analysis ten of the variables studied were found to be correlated to the occurrence of LBP: less overtime work, diminished work satisfaction, decreased potential to influence the work situation, lesser demand on concentration, monotonous work, physically heavy work, a high degree of lifting, to a lesser degree sitting, and to a greater standing and walking work posture. When a covariance analysis was applied to these variables, only three had a direct association to LBP. They were less overtime work, monotonous work, and a high degree of lifting. [Key words: epidemiology, low-back pain, working conditions, work environment factors]

**L**OW-BACK PAIN (LBP) is responsible for an important loss of workdays in the industrialized part of the world. Over a ten-year period in Sweden (1960–1971) back pain was responsible for 12.5% of all sickness absence days. Of all available workdays 1% were lost each year because of back complaints, which means an average of 2.56 days for each working person yearly.<sup>18</sup> Similarly, in 40-year-old men low-back pain was the cause of 16% of all sickness absence days during the period of 1955–1976.<sup>34</sup> In Great Britain in 1969–1970, 3.6% of all workdays were lost because of LBP,<sup>6</sup> and in 1974, 1,011 days per 1,000 working persons were lost each year for the same reason.<sup>43</sup> Kelsey et al<sup>22</sup> reported that painful conditions in the back are the most common reason for a decreased work capacity and reduced leisure time activity in US subjects below the age of 45. The high incidence and prevalence of LBP has led to research on the importance of the type of work and work environment factors in the etiology and nature

of back conditions, as summarized by Anderson,<sup>1,2</sup> Andersson,<sup>4</sup> Swedish Work Environment Fund,<sup>5</sup> Brown,<sup>8</sup> Chaffin,<sup>13</sup> Rowe,<sup>31,32</sup> and Snook.<sup>33</sup> There are at present no convincing epidemiological data. Such data are needed not only to assess causation and risk factors but also to serve as a reference background for intervention and prevention programs.

A randomized sample of 40- to 47-year-old men has been studied in the city of Göteborg, Sweden with respect to the life time incidence and prevalence of LBP.<sup>35,36</sup> This study presents associations among LBP, work history, and working conditions.

## MATERIAL AND METHODS

A sample of 940 men from 40 to 47 years of age was randomly selected from the census register to represent the male population in that age group (18,612 individuals) in the city of Göteborg. By law the register must be kept up to date, and therefore changes in marital status or place of residence or deaths are recorded within a month after notification to the census register or to the tax authorities. The men in the sample were invited by mail to attend the survey examination, and a preliminary questionnaire was enclosed with the initial invitation. Those who did not attend the first interview and examination were again invited by letter. If the second letter was not answered, attempts were

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made to reach the subjects by telephone. The examinations were made in the evening after the end of the workday. Information about the occurrence of LBP,<sup>35</sup> other diseases and cardiovascular risk factors,<sup>37</sup> work history, and work environment factors were obtained by an interview. Standardized forms were used for data collection. Data about country of birth, nationality, marital status, income, profession, and previous sickness absence were collected from the census register and from the registers of the Public Health Insurance Office in Göteborg.<sup>36</sup>

Low-back pain (LBP) was defined as all conditions of pain, ache, stiffness, or fatigue localized to the lower back. Sciatica, defined as pain/ache radiating from the back and down one or both legs, or similar symptoms in the leg only, was also recorded.<sup>39</sup> All episodes of LBP were included. Patients with LBP were divided into two main groups: men who had had pain at some time in their lives (lifetime incidence group), and men with ongoing pain (prevalence group). The latter group comprised all men with current symptoms or problems occurring at least once a month.

The work history was covered by questions about the number of work changes in the last ten years and any overtime work during the last two years. Four different types of employment were differentiated: full time, part time, occasional, and none.

Work satisfaction was evaluated by a seven-graded scale from 1 = excellent, to 7 = not endurable. Questions about the individual's possibility to influence the work situation with respect to methods and tempo were also made. Demands on concentration and the occurrence of monotonous-boring work were each evaluated by a four-graded scale from 1 = no, to 4 = yes, too much.

The individual's opinion about the physical demand of his work was graded according to a four-graded scale from 1 = light, not demanding physically, to 4 = too heavy. Lifting was recorded as either seldom, quite often or very often. The work posture was evaluated by questions regarding for how long time of the workday the individual was sitting, standing, and walking. A four graded scale (0-2, 3-4, 5-6, and 7-8 hours daily, respectively) was used and a full workday was considered equivalent to 8 hours.

**Statistical Methods.** In the statistical analysis, data for the incidence and prevalence groups were compared with data for the men without low-back pain (LB-healthy). For most variables there were several alternatives in the questionnaires, and they were organized according to natural ordinal scales. Test for trend in contingency tables was used for comparison between groups.<sup>38</sup>  $P < 0.05$  was considered significant in two-sided tests.

When testing the correlation between two variables, it is often important to take the influence of other variables into account. To that purpose an analysis of covariance was performed. When two variables were found to be significantly correlated and both were significantly correlated to the occurrence of LBP,<sup>7</sup> a non-parametric partial correlation analysis was used to test the conditional correlation between LBP and one of

the variables when the value of the other variable was kept constant. The technique is similar to that suggested by Mantel.<sup>27</sup> The purpose of the described analysis was to investigate whether the correlation of one variable to LBP could be explained by the correlation of the other variable to LBP and by the individual correlation of the two variables. In the present study a more accurate approximation was used to determine the  $P$  values than that suggested by Mantel, namely the Edgeworth's expansion.<sup>14</sup> All tests made were two-sided.

## RESULTS

The participation rate in the investigation was 76%. The age distribution is given in Figure 1. The incidence of LBP was 61%, the prevalence 31% (Table 1).

There were no differences between the men with LBP (LBP-men) and the men without a history of low-back pain (LB-healthy) concerning the type of employment and the number of work changes. Overtime work was more uncommon among the men with LBP ( $P < 0.01$ ). The work tasks of the LBP-men demanded less concentration ( $P < 0.05$ ), and these men also thought that they had a decreased potential to influence their work situation with respect to methods and tempo ( $P < 0.01$ ). The LBP-men had diminished work satisfaction ( $P < 0.01$ ) and perceived their work as monotonous-boring to a higher degree ( $P < 0.001$ ) (Table 2). Physically heavy work was more common among the LBP-men ( $P < 0.001$ ), and lifting was more frequent ( $P < 0.001$ ) (Table 3). Sedentary work was less common, and consequently, the LBP-men stood or walked during a comparatively greater part of the workday than did the LB-healthy ( $P < 0.05$ ) (Table 4).

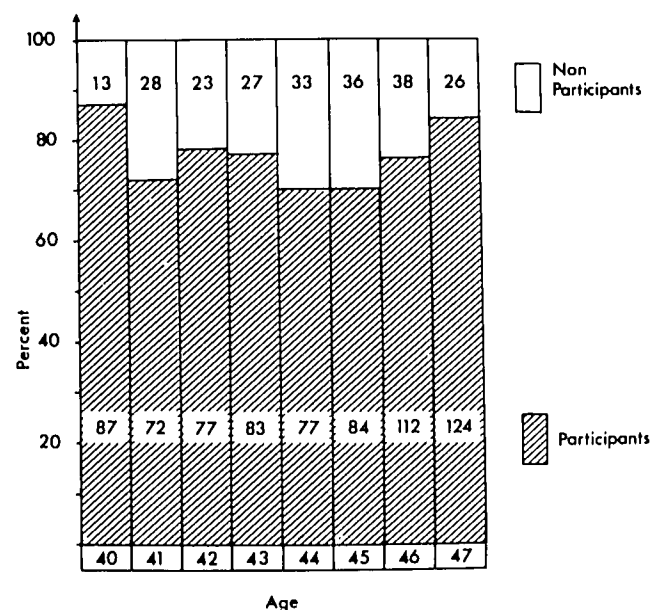


Fig 1. Age distribution of participants and nonparticipants. The number inside the columns denotes the absolute number of individuals.

Table 1. Incidence and Prevalence of Low-Back Pain (LBP)

LBP	Subjects	
	N	%
No	276	38.6
Incidence	438	61.6
Prevalence	225	31.4

Table 5 summarizes the ten variables found to be associated with LBP in the univariate analysis.

To investigate whether the ten variables had a direct or an indirect association with LBP an analysis of covariance was performed. The result was that only three of the variables—less overtime work ( $P < 0.01$ ), more monotonous work ( $P < 0.001$ ), and a higher degree of lifting ( $P < 0.001$ )—were directly associated with LBP. The correlation between the other variables and LBP could be explained by covariance with one or several of the directly associated factors.

## DISCUSSION

The method and conduction of the investigation and an analysis of the nonparticipants have been discussed in two other papers.<sup>35,36</sup> In the nonparticipation group more men with blue-collar work were found, and the men in this group belonged to comparatively lower social classes than the men in the participation group.<sup>36</sup> Since the sample is cross-sectional, it is impossible to make etiologic conclusions in a strict scientific sense. An analysis of etiological factors requires, by definition, an experimental approach. A cross-sectional sample, is however, often the only available source of information.

Table 2. Variables Describing Monotonous Work and Work Satisfaction in Men Without LBP and in the Incidence and the Prevalence Groups

	LBP					
	No LBP		Incidence Group		Prevalence Group	
	N	%	N	%	N	%
<i>Monotony</i>						
No	228	82.6	296	67.6	146	64.9
Somewhat	38	13.8	105	24.0	55	24.4
Absolutely	2	0.7	20	4.6	15	6.7
Unacceptable	0	—	5	1.1	4	1.8
Unknown	8	2.9	12	2.7	5	2.2
Total	276	100.0	438	100.0	225	100.0
<i>Work satisfaction</i>						
Extremely good	68	24.6	86	19.6	41	18.2
Very good	103	37.4	140	32.0	66	29.4
Good	85	30.8	155	35.4	80	35.7
Not so good	12	4.3	38	8.7	30	13.3
Bad	0	—	4	0.9	1	0.4
Very bad	0	—	2	0.5	1	0.4
Not endurable	0	—	1	0.2	1	0.4
Unknown	8	2.9	12	2.7	5	2.2
Total	276	100.0	438	100.0	225	100.0

Table 3. Variables Describing the Physical Heaviness of the Work and the Frequency of Lifting in Men without LBP and in the Incidence and the Prevalence Groups

	LBP					
	No LBP		Incidence group		Prevalence group	
	N	%	N	%	N	%
<i>Physical heaviness</i>						
Light	134	48.6	160	36.5	80	35.6
Moderate	119	43.0	201	45.9	104	46.2
Heavy	14	5.1	57	13.0	31	13.8
Too heavy	0	—	9	2.1	6	2.7
Unknown	9	3.3	11	2.5	4	1.7
Total	276	100.0	438	100.0	225	100.0
<i>Lifting</i>						
Rarely	194	70.2	243	55.5	119	52.9
Quite often	55	20.0	113	25.8	57	25.3
Very often	17	6.2	72	16.4	44	19.6
Unknown	10	3.6	10	2.3	5	2.2
Total	276	100.0	438	100.0	225	100.0

The life-time incidence rate of LBP corresponds well to the results of previous studies.<sup>3,10,19,20,30,40</sup> No difference was found in the type of employment between men with an men without LBP: almost all were full-time employees. If women had been included in the survey, an increased number of part-time or half-time working individuals would have been expected. Part-time work among men is quite uncommon in Sweden and is almost always associated with health factors.<sup>44</sup> The proportion of men without employment or work was about the same in all groups.

The finding of less overtime work among the LBP-men both in the univariate and in the covariance analysis can be explained as a direct effect of the occurrence of LBP.

The LBP-men had less frequently a sitting work posture than the LB-healthy. This is in agreement with observations made by Bergquist-Ullman and Larsson.<sup>9</sup> Westrin<sup>41,42</sup> found that the work of subjects sicklisted because of LBP more often required changes in body posture than the work of the subjects in a control group. Magora<sup>25</sup> found that, independent of the type of work, both those who sat or stood either often or seldom had a higher incidence of low-back pain. The associations of less frequent sitting and LBP in the present study was dependent on covariation with other factors, however, as found in the covariance analysis.

Studies of the correlation between physically heavy work and LBP are frequent in the literature.<sup>4,9,11,12,13,17,20,21,23,24,39</sup> In the present study heavy physical work when analysed by the univariate method was found to be strongly associated with the occurrence of LBP. It must be remembered that the determination of the heaviness of work was subjective and therefore can be influenced by the professional experience and the personal fitness of the individual. The result is consistent with the finding that the highest incidence of LBP in this study was found in men who

Table 4. Working Postures in Men without LBP (n = 276) and in the Incidence Group (n = 438)

Work Posture	Subject Group	Hours a Day in a Working Posture							
		0-2		2-4		4-6		6-8	
		N	%	N	%	N	%	N	%
Standing	Healthy	143	51.8	58	21.0	32	11.6	33	12.0
	LBP	204	46.5	80	18.3	58	13.2	83	19.0
Walking	Healthy	148	53.6	67	24.3	29	10.5	22	8.0
	LBP	214	48.8	100	22.8	52	11.9	59	13.5
Sitting	Healthy	103	37.4	60	21.7	52	18.8	51	18.5
	LBP	193	44.3	102	23.3	61	13.9	69	15.8

performed physically heavy work.<sup>36</sup> Also in the univariate analysis a correlation was found between lifting and LBP. This is in agreement with many previous studies.<sup>4,9,11,13,16,17,19,20</sup> Magora<sup>25</sup> found no such correlation but evaluated the frequency of lifting only. Bergqvist-Ullman and Larsson<sup>9</sup> found no definite correlation between duration of LBP and lifting, while duration of sickness absence caused by LBP was strongly influenced. In the analysis of covariance only lifting remained directly associated with LBP, while for heavy physical work a trend was found. The results support that questions about lifting should always be included when the purpose of a study is to investigate physical work load.

The LBP-men more often had monotonous-boring work, and their work demanded less concentration. The association of monotony with LBP remained in the analysis of covariance. Bergqvist-Ullman and Larsson<sup>9</sup> found that when present, both monotony and less demand on concentration prolonged the duration of the pain period and the sickness absence period in LBP. Work can be monotonous either in a physical or a psychological sense or both. From the way the question was given in the present study, monotony should be interpreted as primarily a psychological variable.

The finding of diminished work satisfaction among the LBP men is in agreement with Westrin's<sup>41,42</sup> and Magora's<sup>26</sup> findings but not with those of Dehlin and

Lindberg.<sup>15</sup> Bergqvist-Ullman and Larsson<sup>9</sup> found in patients with acute lumbago, an increased duration of both the pain period and the sickness absence period, when the subjects were dissatisfied with their work. According to Taylor<sup>38</sup> sickness absence, irrespective of diagnosis, is increased in subjects with work dissatisfaction. In the analysis of covariance, however, work dissatisfaction did not remain directly associated with LBP.

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Table 5. Summary of Variables that in the Univariate Analysis were Found to be Associated with the Occurrence of LBP

Variable	P-Value
Less overtime work (previous 2 y.)	†
Diminished work satisfaction	†
Decreased potential to influence the work situation	†
Less demand on concentration	*
More monotonous-boring work	‡
More physically demanding work	‡
More lifting	‡
Less sedentary work	*
More walking at work	*
More standing at work	*

\* =  $P < 0.05$ ; † =  $P < 0.01$ ; ‡ =  $P < 0.001$ .

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