Scand J Work Environ Health 1978;4(1):54-58

<https://doi.org/10.5271/sjweh.2764>

Issue date: 1978

Symptoms and signs of degenerative back disease in concrete reinforcement workers.

by [Wickström G](#)

Key terms: [back](#); [back disease](#); [concrete reinforcement work](#); [concrete reinforcement worker](#); [degenerative back disease](#); [degenerative disease](#); [load](#)

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/149368

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

Symptoms and signs of degenerative back disease in concrete reinforcement workers

by GUSTAV WICKSTRÖM, M.D.¹

WICKSTRÖM, G. Symptoms and signs of degenerative back disease in concrete reinforcement workers. *Scand. j. work environ. & health* 4 (1978): suppl. 1, 54—58. Concrete reinforcement work causes great static loads on the back from the prolonged adoption of bent-double work postures during the tying of steel rods and from substantial dynamic loads during the lifting and pulling of rods from the stack. Subjective manifestations and objective signs of "degenerative back disease" are common in active reinforcement workers. An age- and sex-adjusted comparison of the findings was, however, possible only with one other occupational group, computer technicians, who also often work in awkward positions. A history of sciatica and pain during forward bending in a clinical examination were significantly more common in reinforcement workers than in computer technicians. This finding suggests an effect of reinforcement work on the back, but definite conclusions require further study.

Key words: back, concrete reinforcement worker, degenerative disease, load.

The occurrence of back diseases in the general population has been surveyed in several broad epidemiologic studies (2, 6, 7, 8, 13, 19) and has been found very common among both males and females of working age. Many of the back symptoms and syndromes are known to be associated with the process of lumbar disc degeneration and may be grouped together as manifestations of "degenerative back disease."

Investigations directed towards specific occupational groups have shown that hard physical work promotes the appearance of degenerative back disease (1, 3, 5, 9, 10, 14, 15, 17). Most attention has been directed towards mining, the adverse effects of which are evident from several reports, but excessive back morbidity has also been found in several other physically

demanding occupations. Even though the acceleration of the degenerative process in the lumbar spine from mechanical "wear and tear" is acknowledged by many authorities (10, 12, 27), the mechanism behind this effect has still not been clarified. Probably frequently repeated, slight injuries of the vertebral bodies and epiphyseal end-plates ultimately cause minor irreversible damage (4, 18, 26, 28).

Back symptoms, as well as sick leave and premature retirement due to back diseases, are common among Finnish construction workers. To clarify the nature and the frequency of back disorders, as well as their relation to work, one occupational group with an especially heavy back load, concrete reinforcement workers, was investigated at the Institute of Occupational Health in Helsinki.

The investigation was made up of an ergonomic analysis of the work and a cross-sectional clinical orthopedic study of

¹ Turku Regional Institute of Occupational Health, Turku, Finland.

active concrete reinforcement workers. The clinical study was directed towards the 336 male reinforcement workers in Uusimaa County under the age of 65 years; 295 men (88 %) attended the examinations. Their median age was 39 years, and their median work experience in concrete reinforcement was 12 years. The load on the back in reinforcement work (25), as well as the back symptoms and low-back pain syndromes (29), restriction and pain during forward bending (31), diminished trunk muscle performance capacity (21), and radiologically detectable lumbar disc degeneration (32) in concrete reinforcement workers have been reported in separate articles.

BACK LOADS IN REINFORCEMENT WORK

In the Finnish construction industry, the reinforcement of concrete is a clearly defined job, which consists of certain specified tasks, but even so the determination of the physical back loads in this occupation is cumbersome. Many of the tying tasks require working in forward-leaning or bent-double postures. During the tying of floor structures the bent-double posture is adopted 58 % of the total work time. The proportion of work time spent in the bent-double posture is several times higher in reinforcement work than in the repair of trucks and the transport of ore as reported by Rohmert and Schott (23). In addition to the great static loads on the back, also the dynamic loads are substantial in some tasks. Weights of more than 30 kg are handled about 15 % of the work time during the preparation of rods (25). A longer time of observation than available for this study would have been needed to establish, for example, the incidence of minor accidents, like slipping while pulling or carrying.

During the last 30 years technological development in the construction industry has affected concrete reinforcement work in two ways. The introduction of electrically powered machines for cutting and bending thick rods has diminished the loads on the arms and the back in preparation tasks, and the introduction of pre-

fabricated concrete elements has somewhat changed the proportion of the tying tasks on the building site (11). Despite these changes in reinforcement work the loads on the back of the workers have not changed much. Measurements of present back loads are largely representative also of the physical loads in reinforcement work during the previous 30 years and can thus be used for comparison with the clinical orthopedic findings among the workers.

ORTHOPEDIC FINDINGS

Two hundred and ninety-five active male concrete reinforcement workers, aged 19—64 years, were investigated. The orthopedic data were gathered by interview, clinical examination and radiological examination.

In the interview on previous back pain syndromes and present back symptoms, a history of sciatica was reported by 42 % of the reinforcement workers, and a history of lumbago by 33 %. Half of those with a history of sciatica had also experienced lumbago; two-thirds of those who reported a history of lumbago had also had sciatica. Back symptoms during an ordinary workday were reported as follows: ache 51 %, fatigue 47 %, stiffness 41 % and sharp pain 13 % (29).

On clinical examination restriction of lumbar flexion was found in 38 % of the men and pain during forward bending in 19 %. A history of sciatica was more common in the men with restriction during forward bending ($p < 0.05$) and in the men with pain during forward bending ($p < 0.001$) than in the men without (31).

The relation found between restricted forward bending and previous sciatica is in accordance with the earlier observation that trunk stiffness is a residual sign of previous incapacitating low-back pain (24).

Clinical examination of the dynamic performance capacity of the trunk muscles showed both back and abdominal muscle capacity to be reduced in 24 % of the men, straight abdominal muscle capacity alone to be reduced in 18 %, and back muscle capacity alone to be reduced in 4 %. Diminished back muscle performance capacity was associated with a history of

sciatica ($p < 0.001$) and diminished performance capacity of the straight abdominal muscles with a history of lumbago ($p < 0.02$) after adjustment for age (21). An association between previous low-back pain syndromes and clinically observed reduction of trunk muscle strength has been noticed by Rowe (24), who considered weakness of abdominal muscles a residual sign of previous incapacitating low-back pain.

Radiologically detectable lumbar disc degeneration was found in 44 % of the men. It was classified as light in 12 %, as moderate in 23 %, and as severe in 9 %. Lumbar disc degeneration showed an association to both a history of lumbago ($p < 0.01$) and a history of sciatica ($p < 0.001$) after adjustment for age. When disc degeneration was compared to reports of stiffness, fatigue, ache, and sharp pain in the back during an ordinary workday, no statistically significant associations were found (32).

The finding that radiologically detectable lumbar disc degeneration was more common in the workers with a history of lumbago and sciatica than in those without is in agreement with the results of Hult (10), who found lumbar disc degeneration to be somewhat more common in persons with a history of low-back trouble than in persons without. The lack of association between radiologically detectable lumbar disc degeneration and present back symptoms has earlier been established by Lawrence et al. (16).

Restricted lumbar flexion, diminished dynamic performance capacity of the back muscles, and radiologically detectable lumbar disc degeneration are — to a slight or moderate degree — associated with a history of sciatica. A history of sciatica, again, is known to imply increased risk for future back disorders (24). On this basis the aforementioned orthopedic findings can be used in preemployment examinations for occupations especially demanding for the back. At the present stage of knowledge no single pathological finding, or even a combination of findings, can be considered an absolute contraindication for employment in heavy work, but each finding indicates some degree of unsuitability.

RELATION BETWEEN WORK EXPERIENCE AND ORTHOPEDIC FINDINGS

When the occurrence of symptoms and signs of back disease were compared to length of reinforcement work, no statistically significant associations were found after adjustment for age. Thus no confirmation of the hypothesis that reinforcement work increases the occurrence of back disorders was obtained in this analysis. On the other hand this result does not rule out possible effects of reinforcement work, as the men entering reinforcement work nearly always came from other physically heavy occupations in agriculture, forestry, or the construction industry. The older they were on entering reinforcement work, the longer experience they had in some other physically demanding job. The fact that the occurrences of pathological findings were not significantly related to the age-adjusted experience in reinforcement work implies that a possible effect of reinforcement work is not greater than that of other physically strenuous occupations, but it does not imply that reinforcement work may not affect the back more than physically lighter occupations.

Selection of concrete reinforcement workers according to level of health influences the occurrences of pathological findings in active workers. The selection takes place both before entering, and while in, the occupation. Reinforcement work is known to be a physically demanding job (30), and men with a history of back disorders or physically weak individuals are less likely to consider entering the trade. As concrete reinforcement work is among the best paid jobs in the construction industry, an established reinforcement worker is unlikely to give up his trade unless he has no other choice. The men who leave the occupation mostly retire because of disabling heart or back disease (22).

To evaluate the possible effects of reinforcement work on the back, the results from the present study were compared to those from a similar study on another occupational group, computer technicians (20). The technicians were also engaged in work which involved awkward postures, often demanding for the back, but their

work was done indoors and the dynamic loads were lighter than in reinforcement work. An age- and sex-adjusted comparison between the two groups could be made for a history of low-back pain syndromes, restriction and pain during forward bending, and diminished dynamic trunk muscle performance capacity, while the occurrence of present back symptoms and radiological signs of lumbar disc degeneration could not be compared because these data were not available for the computer technicians.

A history of sciatica and pain during forward bending were somewhat more common among reinforcement workers than among computer technicians. The incidences of stiffness, fatigue, and ache during an ordinary workday were high among reinforcement workers, but the significance of this finding remains obscure as the levels cannot be compared to other populations. More definite conclusions regarding the effect of reinforcement work on the back will be drawn on the basis of the results from a 5-year follow-up study of these workers, which also includes a reference group of construction painters; these data have already been gathered but have not yet been analyzed.

As concrete reinforcement work obviously puts considerable loads on the lumbar spine, the possibilities to make the trade lighter through improvements in technology and work organization should be thoroughly investigated and put into practice. Applicants with a higher than usual risk for back disorders should be directed towards other occupations. Reinforcement workers who are repeatedly disabled because of back disorders should be actively treated; those who are prepared to change occupations should be helped to do so through rehabilitation services.

REFERENCES

1. BILLENKAMP, G. Körperliche Belastung und Spondylosis deformans. *Fortschr. Röntgenstr.* 116 (1972):2, 211—216.
2. BREMNER, J. M., LAWRENCE, J. S. and MIALI, W. E. Degenerative joint disease in a Jamaican rural population. *Ann. rheum. dis.* 27 (1968) 326—332.
3. CAPLAN, P. S., FREEDMAN, L. M. J. and CONNELLY, T. P. Degenerative joint disease of the lumbar spine in coal miners — A clinical and X-ray study. *Arthritis rheum.* 9 (1966) 693—702.
4. CHAFFIN, D. B. and PARK, K. S. A longitudinal study of low-back pain as associated with occupational weight lifting factors. *Am. ind. hyg. assoc. j.* 34 (1973) 513—525.
5. GANTENBERG, R. Die Bedeutung deformierender Prozesse der Wirbelsäule unter besonderer Berücksichtigung der Verhältnisse bei den Bergleuten. *Fortschr. Röntgenstr.* 39 (1929) 650—656.
6. GYNTELBERG, F. One year incidence of low back pain among male residents of Copenhagen aged 40—59. *Dan. med. bull.* 21 (1974) 30—36.
7. HIRSCH, C., JONSSON, B. and LEWIN, T. Low-back symptoms in a Swedish female population. *Clin. orthop.* (1969):63, 171—176.
8. HORAL, J. The clinical appearance of low back disorders in the City of Gothenburg, Sweden. *Acta orthop. scand. suppl.* 118 (1969) 73 p.
9. HULT, L. The Munkfors investigation. *Acta orthop. scand. suppl.* 16 (1954) 76 p.
10. HULT, L. Cervical, dorsal and lumbar spinal syndromes. *Acta orthop. scand. suppl.* 17 (1954) 102 p.
11. HYVÖNEN, K. Keskusraudoittamon toteutamisestä työkset Tampereella (Diplomityö). Tampereen Teknillinen Korkeakoulu, Tampere 1973. 93 p.
12. KELLGREN, J. H. and LAWRENCE, J. S. Rheumatism in miners: Part II. X-ray study. *Br. j. ind. med.* 9 (1952) 197—207.
13. KELLGREN, J. H. and LAWRENCE, J. S. Osteo-arthritis and disk degeneration in an urban population. *Ann. rheum. dis.* 17 (1958) 388—397.
14. LAWRENCE, J. S. Disc degeneration: Its frequency and relationship to symptoms. *Ann. rheum. dis.* 28 (1969) 121—138.
15. LAWRENCE, J. S. and AITKEN-SWAN, J. Rheumatism in miners: Part I. Rheumatic complaints. *Br. j. ind. med.* 9 (1952) 1—12.
16. LAWRENCE, J. S., BREMNER, J. M. and BIER, F. Osteo-arthritis: Prevalence in the population and relationship between symptoms and X-ray changes. *Ann. rheum. dis.* 25 (1966) 1—24.
17. LINNAM, A. T. *Lumbo sacralis radiculitis in brimstone miners in Estonia* (in Russian). Tartu State University, Tallin 1967. 30 p.
18. MEHNERT, E. Degenerative Veränderungen durch statische Fehlbelastung bei den Einlegerinnen der Baumwollspinnereien — eine vermeidbare Schädigung der Wirbelsäule. *Dtsch. Gesundheitswes.* 24 (1969) 1716—1721.
19. NAGI, S. Z., RILEY, L. E. and NEWBY, L. G. A social epidemiology of back pain in a general population. *J. chron. dis.* 26 (1973) 769—779.
20. NUMMI, J., JÄRVINEN, T. and KOSKELA, A. *Liikunnan merkitys selkä- ja polvivai-*

- vojen ehkäisyssä (Työolosuhteet 9). Institute of Occupational Health, Helsinki 1977. 24 p.
21. NUMMI, J., JÄRVINEN, T., STAMBEJ, U. and WICKSTRÖM, G. Diminished dynamic performance capacity of back and abdominal muscles in concrete reinforcement workers. *Scand. j. work environ. & health* (1978): suppl. 1, 39—46.
  22. RAKENNUSALAN TYÖELÄKEKASSA. *Rakennusalan työeläkekassan toimintakertomus vuodelta 1972*. Helsinki 1973. 26 p.
  23. ROHMERT, W. and SCHOTT, R. Körperstellungen in Fertigungs-, Kfz-Reparatur- und Bergbau-Betrieben. *Int. Arch. Arbeits-med.* 32 (1974) 149—165.
  24. ROWE, M. L. Low back pain in industry. *J. occup. med.* 11 (1969) 161—169.
  25. SAARI, J. and WICKSTRÖM, G. Load on back in concrete reinforcement work. *Scand. j. work environ. health* 4 (1978): suppl. 1, 13—19.
  26. SCHMORL, G. Über Knorpelknöten an den Wirbelbandscheiben. *Fortschr. Röntgenstr.* 38 (1928) 265—279.
  27. SCHMORL, G. and JUNGHANN, H. *The human spine in health and disease* (2nd Am. ed.). Grune and Stratton, New York, N.Y. 1971. 504 p.
  28. TROUP, J. D. G. Relation of lumbar spine disorders to heavy manual work and lifting. *Lancet* 1 (1965): 7390, 857—861.
  29. WICKSTRÖM, G., HÄNNINEN, K., LEHTINEN, M. and RIIHIMÄKI, H. Previous back syndromes and present back symptoms in concrete reinforcement workers. *Scand. j. work environ. & health* 4 (1978): suppl. 1, 20—28.
  30. WICKSTRÖM, G. and KAUPPINEN-TOROPAINEN, K. *Rakennusalan työtekijöiden työolot ja terveydentila; kyselytutkimus* (Työterveyslaitoksen tutkimuksia no. 91). Institute of Occupational Health, Helsinki 1974. 154 p.
  31. WICKSTRÖM, G., NUMMI, J. and NURMINEN, M. Restriction and pain during forward bending in concrete reinforcement workers. *Scand. j. work environ. & health* 4 (1978): suppl. 1, 29—38.
  32. WIKERI, M., NUMMI, J., RIIHIMÄKI, H., and WICKSTRÖM, G. Radiologically detectable lumbar disc degeneration in concrete reinforcement workers. *Scand. j. work environ. & health* 4 (1978): suppl. 1, 47—53.