

# Physically Demanding Situations as Predictors of Disability Pensioning with Soft Tissue Rheumatism Among Persons 30–39 Years Old in Norway, 1981–90

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**ABSTRACT. Objective.** Physically demanding work is a predictor of disability pensioning with musculoskeletal diseases. Being a parent is probably also physically demanding. Having manual work and being a parent will be analyzed as possible predictors of becoming a disability pensioner with soft tissue rheumatism (DPSTR) after controlling for level of education, employment, number of hours worked, income, age, sex, and marital status.

**Methods.** In this prospective study based on census data of persons 30–39 years old in 1980, predictors of becoming DPSTR during the followup period 1981–90 were identified by logistic regression analysis.

**Results.** Manual work was a predictor for becoming DPSTR for both men and women, while being a parent was neither a risk factor nor a protective factor for becoming DPSTR. Being employed was a predictor of becoming DPSTR for married women, but a protective factor for unmarried women and all men. Low level of education and being married or divorced were predictors of becoming DPSTR for both men and women. Working part time and having low income were predictors of becoming DPSTR among men.

**Conclusion.** Physically demanding employment, but not a physically demanding private life, predicts becoming DPSTR. This may reflect that factors concerning a patient's private life are not taken into account when evaluating whether or not a disability pension should be granted, at least not for patients with uncertain medical conditions. (J Rheumatol 2002;29:1760–6)

## Key Indexing Terms:

DISABILITY PENSION      SOFT TISSUE RHEUMATISM      MANUAL WORK  
PARENTHOOD      PROSPECTIVE STUDY      MULTIVARIATE LOGISTIC REGRESSION

Physically demanding work is reported to predict disability pensioning for rheumatoid arthritis (RA)<sup>1–3</sup> and osteoarthritis (OA)<sup>4,5</sup>, as well as musculoskeletal diseases in general<sup>4,6–10</sup>. For patients with OA this prediction might reflect that physically demanding work may cause OA<sup>11–13</sup>. No such causal effect is found for RA<sup>14,15</sup>, and the higher probability of disability pensioning among persons with manual work<sup>16</sup> is probably due to difficulties for persons with RA to remain employed in a physically demanding job.

Soft tissue rheumatism is a separate category in the classification of musculoskeletal diseases; it comprised 12.0% of all new female and 2.1% of all new male disability pensioners in Norway in 1990<sup>17</sup>. Among new disability pensioners under age 40 years, soft tissue rheumatism comprised more than one-third of all musculoskeletal

diseases for women and one-tenth for men<sup>17</sup>. Since 1987 this category in the Norwegian version of International Classification of Diseases-9 (ICD-9) has included fibromyalgia (FM), which is probably the most frequent disease in the category. The nature of FM is poorly understood. Nevertheless, several risk factors<sup>18–32</sup> have been suggested. As for other musculoskeletal diseases, physically demanding work may be the most important predictor of disability pensioning.

Disability pensioning for RA and OA increases in incidence with increasing age. In contrast, for soft tissue rheumatism differences between age groups are small<sup>17</sup>. The high probability of becoming a disability pensioner with FM among young women has been discussed in Norway and has been assumed to be related to maternal duties combined with employment<sup>33,34</sup>. Work aspirations seem to change among female patients with biomedically undefined pain, and family considerations had strong impact on this change<sup>35</sup>. Female patients with FM seem to have more children than general population controls<sup>36</sup>. Although being a parent apparently is not taken into account in the evaluation of an application for a disability pension<sup>37</sup>, other physical demands besides those associated with employment might influence the probability of becoming a disability pensioner with soft tissue rheumatism (DPSTR). This might be true, in

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*Supported by the Norwegian Research Council and the Norwegian Ministry of Health and Social Affairs.*

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*Submitted July 24, 2001; revision accepted February 22, 2002.*

particular in Norway, where the disability pension is available to all residents, not just the employed.

Disability pensions with soft tissue rheumatism are frequent in age groups in which parenthood is common, i.e., 30 to 39 years. Thus, we analyzed the associations between employment, type of work, parenthood, and marital status and DPSTR in this age group, with the aim of identifying which physical demands are the strongest predictor of becoming DPSTR. Since manual work is strongly correlated with other possible predictors of disability pensioning, such as level of education and income, these factors were controlled for in the analysis.

## MATERIALS AND METHODS

**Subjects.** In Norway a public disability pension is granted to any resident between age 16 and 66 years whose working capacity is judged to be permanently reduced by at least 50% because of illness, injury, or defect. Work capacity should be assessed after termination of medical treatment, vocational training, education, or other appropriate attempts at rehabilitation. The applicant will usually also have received sickness benefits for one year and have undergone at least one year of rehabilitation before a disability pension may be granted. There are no alternative schemes to the public disability pension for early retirement for persons 30–39 years old.

Our material includes the total population of residents in Norway registered as 30 to 39 years old in the 1980 Census. Data from the National Insurance Administration (NIA) identified both persons who were disability pensioners at the census in 1980, who were excluded from the analysis, and those who were granted a public disability pension during the followup period 1981 to 1990. Persons who did not survive the year the pension was granted were not included in the NIA data.

Pensioners can be granted a reduced disability pension according to degree of incapacity (50–90%). Of new DPSTR in this study, 36.8% of males and 50.4% of females held a reduced disability pension. All the new disability pensioners with a main diagnosis of soft tissue rheumatism, with both a reduced and a full disability pension, were included as cases.

The age group 30 to 39 years was chosen, since living together with at least one child under the age of 18 years is common in this age group. Among younger persons a rather large proportion of men and women with high education have not yet become parents. Some children of parents older than 39 years may have left their childhood home.

The information on marital status from the NIA register was compared to the information on type of family in the census, and persons with inconsistent information were excluded (21,292 persons, 3.8%). The discrepancy is probably due to a time lag between registrations made by NIA and the census.

The described population of 30- to 39-year-old residents in Norway included 275,388 men and 268,606 women, of which 196 men and 2155 women became a DPSTR during the period 1981 to 1990. At the time of the census 92.4% of the men were employed and 66.6% of the women, i.e., 254,494 men and 178,935 women. Of the employed residents, 164 men and 1446 women became DPSTR during the period 1981–1990. During this period 13,980 men (5%) and 18,123 women (7%) either died or became a disability pensioner with a diagnosis other than STR and were excluded from the analyses of predictors. Those persons without information on length of education (2% of the remaining data material) were also excluded. The numbers of subjects included in logistic regression analyses of the employed are 239,980 men and 165,909 women, of which 154 men and 1419 women became DPSTR during the period 1981 to 1990. The corresponding numbers for the unemployed are 15,680 men and 79,163 women, of which 29 men and 681 women became DPSTR.

**Measures.** A disability pension is applied for at the local insurance office, and requires a health certificate from the applicant's physician. The local

insurance office then judges whether the patient meets criteria for a disability pension<sup>38</sup>. If the local insurance office questions the diagnosis or the extent of reduced work capacity, it can ask for an examination by a specialist or can have the patient examined by a physician employed by the NIA.

The illnesses, injuries, and defects described in the health certificates are classified by the NIA according to the ICD-7 for the period of 1981–1982, ICD-8 for 1983 to 1986, and ICD-9 for 1987 to 1990. The diagnoses registered according to ICD-8 have been recoded to ICD-9 codes by the NIA. The codes 7222, 7261, 7263, and 7270–7279 in ICD-7 and the code 729 in ICD-9 identified soft tissue rheumatism. The decision on which codes to include as the corresponding diagnoses in the 2 revisions of ICD was taken by one of the authors (TB).

The information used as predictor variables was obtained from the 1980 Census, administered by Statistics Norway. The variables included marital status, type of family, duration of education, income, number of hours worked the previous year, and occupation. Marital status was classified as never married, married, widow(er), divorced, or separated; the last 3 categories were recoded into "previously married."

The census variable "type of family" included the categories single, married without child, married with child, single mother, and single father. The child had to be living in the same household as the parent and be under the age of 18 to be counted as "with child." The categories "married with child," "single mother," and "single father" were collapsed into "being a parent." The persons being registered as single, or married without children were recoded into "childless."

Duration of education was recorded as number of years. Income was defined as the individual's occupational income before tax, based on ordinary public tax assessment data for personal taxpayers from the year of the census. The variable "number of hours worked the previous year" was dichotomized as part time (< 1300 h) and full time. Persons that had given information about number of hours worked and their occupation were classified as employed. Persons reported to be non-employed and those without information on occupation or number of hours worked were classified as non-employed.

Occupation, coded according to Nordic Classification of Occupations<sup>39</sup>, was recoded into 3 groups: manual workers (both skilled and unskilled laborers), e.g., farmers, machine operators, and craftsmen; routine non-manual workers, e.g., salesmen and secretaries; and professionals, e.g., school teachers and lawyers<sup>40</sup>. The group manual workers is the most likely to have the most physically demanding work, with more lifting and bending than the 2 other groups<sup>41</sup>.

Personal identification numbers were removed from the data before being released for research.

**Analysis.** Cumulative incidence for the followup period was calculated with a 95% confidence interval based on the total number of persons 30 to 39 years old without a disability pension at the start of the followup period.

Logistic regression was chosen as the tool of analysis. Odds ratios can be interpreted as an approximate relative risk when the events are rare (< 10%). To avoid the problem of censored data, persons dying or becoming a disability pensioner with any main diagnosis other than soft tissue rheumatism were excluded from the logistic regression analyses<sup>42</sup>.

The risk associated with one predictor variable may depend on the level of a third variable. Interaction effects between the predictor variables were tested with all the variables in the model and one interaction term at a time. For instance, one set of analyses included consecutively the interaction terms between employment and each of the other variables, sex, marital status, being a parent, education, type of work, part time/full time work, and income. Re-analyses stratified by employment were performed whenever a significant interaction effect between employment and any other variable was detected. Corresponding procedures were followed for the other variables until all variables were tested for significant interaction terms with the remaining variables.

Analyses with education entered as a continuous variable were compared with analyses in which education was entered as a dummy vari-

able. This comparison showed no nonlinear effect of education, implying that education could be entered as a single, continuous variable without loss of information.

## RESULTS

In this prospective study, data on the total population of persons age 30 to 39 years without a disability pension in Norway were included. The cumulative incidences of becoming DPSTR for employed persons 30 to 39 years old are presented in Table 1. Manual work appears to predict becoming DPSTR for both men and women, and being a parent at first also appeared to predict DPSTR among women. However, when a multivariate logistic regression analysis was performed, manual work remained a predictor for becoming DPSTR, while the effect of being a parent disappeared (Table 2). For both men and women manual work is a predictor of becoming DPSTR, but low level of education seems to be more important (Table 2). For men low level of income ( $p = 0.000$ ) and part time work ( $p = 0.000$ ) also predicted DPSTR, but these variables are neither risk factors nor protective factors for women (Table 2).

When including both men and women in the same analysis, female sex appears to be the most important predictor, with an odds ratio of 13.85 (95% CI 11.39-16.85). Only the factors income and number of hours worked had significantly different effect on becoming DPSTR for employed men and women.

The 10 year cumulative incidence of becoming DPSTR for the total population age 30 to 39 years without a disability pension is presented in Table 3. Being a parent might be a predictor for becoming DPSTR for women, but being employed is probably not a predictor for becoming DPSTR for men or women (Table 3). However, for the total population there was a significant difference between men and women regarding the effect of employment on becoming DPSTR ( $p = 0.000$ ). The analyses were rerun with data stratified by sex. There was also a significant difference in the effect of employment between married and not married women ( $p = 0.002$ ). The analyses were rerun for women, stratified by married and not married.

Being a parent did not prove to predict becoming DPSTR

Table 1. Cumulative incidences (with 95% confidence interval) of becoming a disability pensioner with soft tissue rheumatism during 10 years of followup among employed men and women 30–39 years old at the census of 1980 in Norway, by age, marital status, being a parent, education, type of work, number of hours worked, and income.

	N	Men		N	Women	
		Cumulative Incidence per 1000	95% CI		Cumulative Incidence per 1000	95% CI
Total	254,494	0.64	0.55–0.74	178,935	8.08	7.67–8.50
Age, yrs						
30–34	137,785	0.55	0.43–0.68	93,506	6.00	5.48–6.47
35–39	116,709	0.75	0.60–0.91	85,429	10.38	9.70–11.06
Marital status						
Never married	26,007	0.58	0.29–0.87	16,021	3.62	2.69–4.55
Married	212,312	0.62	0.51–0.72	145,985	8.04	7.58–8.49
Previously married	16,175	1.11	0.60–1.63	16,929	12.70	11.01–14.39
Being a parent						
No	53,765	0.73	0.50–0.95	24,931	5.54	4.61–6.46
Yes	200,729	0.62	0.51–0.73	154,004	8.49	8.04–8.95
Education, yrs						
Unknown	4111	2.19	0.76–3.62	2702	8.88	5.34–12.43
7	21,273	1.88	1.30–2.46	11,143	21.00	18.34–23.66
8–12	165,461	0.68	0.55–0.80	131,596	8.71	8.21–9.21
≥ 13	63,649	0.05	0.00–0.10	33,494	1.25	0.87–1.63
Type of work						
Professional	95,346	0.14	0.06–0.21	52,761	2.50	2.08–2.93
Routine non-manual	36,207	0.41	0.20–0.62	91,399	8.65	8.05–9.26
Manual	122,941	1.11	0.92–1.29	34,775	15.04	13.76–16.32
No. of hours worked						
Part time	29,879	1.35	0.93–1.77	111,688	7.45	6.80–8.10
Full time	224,879	0.55	0.45–0.65	67,247	8.46	7.92–9.00
Income*						
Under median	127,328	0.96	0.79–1.13	89,481	9.04	8.42–9.66
Over median	127,166	0.33	0.23–0.43	89,454	7.12	6.57–7.67

\* For men: median Norwegian Kroner 95,900; mean Kroner 101,162; standard deviation Kroner 45,117.  
For women: median Kroner 45,800; mean Kroner 49,202; standard deviation Kroner 29,935.

Table 2. Adjusted odds ratios (OR) for becoming a disability pensioner with soft tissue rheumatism during 1981–90, adjusted for all the variables in the model for 30–39 year old employed persons in 1980 in Norway.

	Men		Women	
	OR	95% CI	OR	95% CI
Age (per year)	1.07	1.01–1.14	1.10	1.08–1.12
Marital status				
Never married	1.00		1.00	
Married	1.27	0.68–2.36	1.52	1.14–2.02
Previously married	1.62	0.80–3.30	2.48	1.82–3.37
Being a parent				
No	1.00		1.00	
Yes	0.87	0.51–1.49	0.93	0.82–1.21
Education (per year)	0.71	0.63–0.79	0.68	0.65–0.71
Type of work				
Professional	1.00		1.00	
Routine non-manual	1.61	0.72–3.59	1.31	1.08–1.60
Manual	2.82	1.46–5.45	1.86	1.50–2.31
Number of hours worked				
Full time	1.00		1.00	
Part time	2.09	1.42–3.06	1.01	0.89–1.14
Income (per Kroner 10,000)	0.92	0.87–0.97	1.02	1.00–1.03

in a logistic regression analysis of men and women in the total population without a disability pension, 30 to 39 years old (Table 4). However, employment appears to predict becoming DPSTR for married women 30 to 39 years old, but is a protective factor for becoming DPSTR for unmarried women and all men (Table 4). The strongest predictor of becoming DPSTR for both men and women seems to be low level of education (Table 4).

## DISCUSSION

Diseases classified with ICD-9 code 729 are all soft tissue rheumatism, or diffuse musculoskeletal pain syndromes, with no known cause for the pain. The diseases classified by NIA as ICD-9 code 729 include other diseases in addition to FM, although probably far less frequent than FM. FM was registered as a separate diagnosis in ICD-9 in Norway in 1987, while the suggestion on classification criteria for FM

Table 3. Cumulative incidences (with 95% confidence interval) of becoming a disability pensioner with soft tissue rheumatism during 10 years of followup for the total population of men and women 30–39 years old at the census 1980 in Norway, by age, marital status, being a parent, education, and employment.

	Men			Women		
	N	Cumulative Incidence per 1000	95% CI	N	Cumulative Incidence per 1000	95% CI
Total	275,388	0.71	0.61–0.81	268,606	8.03	7.70–8.37
Age, yrs						
30–34	149,250	0.60	0.48–0.73	147,027	6.35	5.94–6.75
35–39	126,138	0.84	0.68–1.00	121,579	10.08	9.51–10.64
Marital status						
Never married	30,965	0.48	0.24–0.73	18,933	3.86	2.97–4.74
Married	224,161	0.70	0.59–0.81	226,093	7.78	7.41–8.14
Previously married	20,262	1.18	0.71–1.66	23,580	13.83	12.33–15.32
Being a parent						
No	63,339	0.76	0.54–0.97	28,922	5.67	4.81–6.54
Yes	212,049	0.70	0.59–0.81	239,684	8.32	7.96–8.68
Education, yrs						
Unknown	6270	1.91	0.83–3.00	5847	9.24	6.78–11.69
7	24,612	2.03	1.47–2.59	19,471	20.03	18.06–22.00
8–12	177,990	0.73	0.60–0.86	202,317	8.22	7.83–8.61
≥ 13 years	66,516	0.01	0.00–0.01	40,971	1.25	0.90–1.59
Employment						
No	20,894	1.53	1.00–2.01	89,671	7.94	7.36–8.52
Yes	254,494	0.64	0.55–0.74	178,935	8.08	7.67–8.50

Table 4. Adjusted odds ratios (OR) for becoming a disability pensioner with soft tissue rheumatism during 1981–90, for 30–39 year old married women, not married women, and men in 1980 in Norway. Adjusted for the variables in the model.

	Women				Men	
	OR	Married 95% CI	Not Married OR	95% CI	OR	95% CI
Age (per year)	1.07	1.05–1.09	1.13	1.09–1.17	1.06	1.00–1.12
Marital status						
Never married	—		1.00		1.00	
Married	—		—		1.88	0.86–4.13
Previously married	—		2.27	1.71–3.02	2.09	0.99–4.39
Being a parent						
No	1.00		1.00		1.00	
Yes	0.96	0.77–1.19	1.20	0.91–1.60	0.72	0.42–1.23
Education (per year)	0.63	0.61–0.66	0.71	0.67–0.76	0.63	0.57–0.69
Employment						
No	1.00		1.00		1.00	
Yes	1.26	1.14–1.40	0.76	0.61–0.95	0.44	0.29–0.67

from the American College of Rheumatology was not published until 1990<sup>43</sup>. Caution should be taken regarding this heterogeneity of the end-point variable.

Disability pensioners dying the same year the disability pension was granted were not included in the register, which could result in an underestimation of the incidence of DPSTR. The general mortality among persons 30 to 39 years old is very low, and soft tissue rheumatism is not considered a fatal disease, so this underestimation should be of little importance.

The number of persons excluded from analyses due to censoring that will cause attrition bias comprises only 5% of men and 7% of women. Inconsistent information on type of family applies to about 4% of all subjects. Both may cause a very slight underestimation of the effects of the various factors included in the analyses, but should be of minor importance.

Statistics Norway conducts Norwegian censuses and edits the census data. This ensures high quality data. However, the persons registered as non-employed in this study were not only persons without paid work wanting paid work, but also persons without paid work not wanting paid work, i.e., students and housewives. As the number of involuntary unemployed persons increased markedly from 1983 in Norway, our data on employment, registered in 1980, are not suitable for a very precise estimation of the impact of unemployment on becoming DPSTR. Moreover, for women the number of employed women in all age groups has increased during the 1980s<sup>44</sup>, possibly underestimating the effect of employment for women in this study.

FM is known to be much more frequent among women than men<sup>36,45</sup>, and the large odds ratio of female sex on becoming DPSTR reflects this fact. In addition, becoming a disability pensioner with a musculoskeletal disease is also more frequent among women than men, especially in younger age groups, such as the one studied here<sup>17</sup>.

Physically demanding work seems to be a predictor for becoming DPSTR for both men and women, when high physical demands are assessed as manual work and low physical demands are assessed as professional work. There are probably occupations among the manual and the routine non-manual occupations that are less physically demanding than a professional occupation, but overall manual workers have more physically demanding work than professionals.

The physical demands are probably greater when working full time than working part time, but part time work is a predictor of DPSTR for men. The non-employed without children probably have the least physically demanding situation, but still have the higher probability of becoming DPSTR among men and non-married women. Working full time seems to be the norm for men, and part time work might be chosen by those with poor health<sup>46</sup>.

For both men and women, those married and previously married have a higher probability of becoming DPSTR. The demands of housework are normally less for men than for women, and the relatively high probability for married men of becoming DPSTR may imply that physical demands outside employment do not add to the probability of becoming DPSTR. Likewise, the physical demands from housework are probably similar for never married and previously married regardless of sex, but the previously married have a higher probability of becoming DPSTR among both men and women. The higher probability of becoming DPSTR among married and, in particular, previously married people, may reflect that they more often are suffering from FM<sup>36</sup>.

A disability pension is granted if the work capacity is permanently reduced by at least 50%, and only some hundreds of persons exit the disability pensioning scheme each year from reasons other than death and old age pension<sup>17</sup>. Parenthood may be physically demanding in the period when children are small, but this is not a permanent

situation. The presence of children or of problems related to being a parent may therefore not qualify a person for disability pensioning. In addition, including children up to age 18 years might hide the fact that having children who are at an especially demanding age will increase the probability of becoming DPSTR. The higher risk of becoming DPSTR among employed versus among non-employed married women might be explained by the fact that the employed married women can more easily document that their working capacity is reduced by at least 50%. For housewives, disability is assessed in relation to housework they are capable of doing. As long as they are capable of doing 50% of all housework, they do not meet the requirement for becoming a disability pensioner.

Income does not seem to be a predictor of becoming DPSTR for women, probably a consequence of female health being more dependent on family income than on the woman's own income<sup>47</sup>. Compensation rate might be considered an incentive to become a disability pensioner, and a stronger incentive for men than women<sup>48</sup>, which might explain that low income is a predictor of becoming DPSTR for men. In Norway the disability pension is calculated on the basis of the yearly occupational income during a period of 40 years in which the pensioner has been or will be resident in the country. For men and women with an average income, the compensation rate is about 60%, and for persons with relatively high income (mostly men), the compensation rate is about 50%. Some persons with no or very low income receive the minimum pension, and their income may increase when they become a disability pensioner. In 1990 this applied to 11% of new male disability pensioners 30 to 39 years of age and to 36% of new female disability pensioners<sup>17</sup>. Still, for women, the size of the amount of the disability pension may be an incentive for becoming a disability pensioner, but not how much this amount compensates of their previous occupational income<sup>49</sup>. The presence of the alternative income might be important in the decision of becoming a disability pensioner<sup>50</sup>.

Poor health is associated with manual work<sup>51,52</sup>, which may also explain why manual work is a predictor of DPSTR. However, there might be other characteristics of these occupations, i.e., incompatibility between a person's physical abilities and the physical demands of the work, that might lead to the necessity of applying for a disability pension<sup>48,53</sup>. Men working part time may be men with poor health, or they may already have been diagnosed with soft tissue rheumatism. Low income and other assets are associated with poor health<sup>52,54</sup>. The effect of income in this study might have been lower if also other financial assets could have been included in the analysis.

Low level of education seems to be the most important predictor of becoming DPSTR. This is in line with previous studies on becoming a disability pensioner with various

musculoskeletal diseases<sup>5,16</sup>, and probably reflects the well documented association between poor health and low level of education<sup>55</sup>. However, there might be a number of reasons for this association<sup>56</sup>. This study confirms that education has a separate effect after controlling for various other factors associated with low level of education, such as manual work and low income.

Being granted a disability pension should depend on the documentation of reduced work capacity. Other factors should not be taken into account. This study suggests that physical demands unrelated to the person's employment do not affect the probability of becoming a DPSTR in Norway, while factors associated with both employment and low level of health, like low income and education, seem to be important predictors.

#### ACKNOWLEDGMENT

The National Insurance Administration and Statistics Norway supplied the data. We thank Per Magnus, The National Institute of Public Health, for initiating the project, and Hein Stigum for statistical advice.

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