

Changes in stress symptoms and their relationship to changes at work in 1981—1992 among elderly workers in municipal occupations

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Objectives This study evaluated perceived changes in stress symptoms and the relationship of these changes to work during an 11-year period.

Methods The sample consisted of municipal workers in different occupational groups who had remained in the same occupation during 1981—1992 (N = 924, 350 men and 574 women, 14.8% of the original sample in 1981). The age range was 44—51 years in 1981. Changes in the physical and mental stress symptoms and changes at work were analyzed with the aid of a structured questionnaire in 1981 and 1992.

Results The questionnaire surveys revealed that stress symptoms were markedly increased, especially aches and pain in the upper and lower limbs, but also respiratory and cardiovascular symptoms. Avoidance reactions, including sense of apathy in general and desire to stay at home in the morning, were the most increased psychological symptoms. The women experienced a greater increase in symptoms than the men. Changes in symptoms were associated with changes at work in that, in general, the more symptoms had increased, the more the work had also been changed.

Conclusions The results suggest that the impact of work on the functional capacity and symptoms of workers might start even earlier than the age of 45 years. This finding is of crucial importance when preventive measures and policies are being planned in regard to stress and physical and mental load at work. Results on the relationship of changes in cardiorespiratory symptoms and work tentatively suggest that, by developing job content and social support, even a positive impact on physical symptoms is possible.

Key terms aging, cardiovascular symptoms, change, follow-up study, health, mental load, municipal workers, musculoskeletal symptoms, physical load, stress reactions, work capacity.

With increasing age, the physical functional capacity and psychological and social competence of people change, and differences between persons increase (1—3). Health status, work conditions, the aging process, and factors connected with life-style influence the development of the functional and work capacity of workers. Changes are not unidirectional in different areas of human capabilities. As a response to changes in job demands and social interaction, both flexibility and continuous motivation to learn are needed. During mid-life, the questions of continuing to work and retirement also become more essential. Early exit from the labor market has been exceptionally high in Finland (4, 5). In all, both individual resources and social support at work are important for the well-being of elderly workers.

A 4-year follow-up among municipal workers in 1981—1985 (6, 7) led to the tentative conclusion that the physical and mental load experienced at work increases during the aging process. This increase can be a result of deterioration of health and work capacity and also aging as such. In addition, changes in work and the work environment can be both a threat and a challenge to the well-being and symptoms of workers. Research has shown it is difficult to use physical activity at work to improve physical functional capacity. However, social and psychological competence can be enhanced if the work allows enough autonomy and if the use of skills and personal development are possible. Prerequisites for such enhancement are a variety of tasks and sufficient training during the entire work career. The

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relationship between work performance and age is complicated, differing between types of job demands and work activities (8, 9).

The theoretical framework of this study was based on the stress-strain model (7), according to which continuous stress and strain at work can impair the mastery of tasks and predispose to disease (6). Changes at work have been shown to be especially stressful for elderly workers. However, individual coping mechanisms, a sense of coherence, and social support have a buffering impact on stress reactions and burn-out (10, 11). Strain symptoms and changes in work capacity and competence can, in turn, have an impact on how elderly workers evaluate their work. Even if work has not changed, it can be experienced as more stressful because the physical and mental resources of the workers have weakened, especially with respect to changes in physical load. On the other hand, when the mastery of tasks and competence increases, subjective evaluation of job demands and strain may turn to the positive direction.

In this study, changes in physical and mental stress symptoms were evaluated in 1981 and 1992 among municipal workers who had remained in the same occupation during the follow-up period. The basic question to be answered was whether the subjects had fewer, equally many, or more symptoms at the end of the follow-up as they did in the beginning. In addition, the relationship between changes experienced at work and stress symptoms was analyzed.

Subjects and methods

The detailed description of the study design, sample, data collection, construction of variables, and classification of occupations has been presented earlier (6, 7, 12, 13). Changes in the physical and mental stress symptoms and changes at work were evaluated through the use of a structured questionnaire filled out in 1981 and 1992. For this part of the follow-up, the sample consisted of municipal workers who had remained in the same occupation during 1981–1992 ($N = 924$, 350 men and 574 women, 14.8% of the original sample in 1981). Other groups of the study population were formed from those who had changed their occupation, moved to a part-time job, retired, died, or did not respond to the follow-up questionnaire. The age range was 44–51 years in 1981. The mean age of the women was 46.9 (SD 1.8) years and that of the men was 47.3 (SD 1.8) years in 1981.

Based on the AET method (7), the following cluster groups were formed according to the nature of the work: physically demanding work ($N = 311$, 33%), mixed physically and mentally demanding work ($N = 208$, 23%), and mentally demanding work ($N = 405$, 44%).

According to the stress-strain theory, long-term stress at work causes different types of symptoms and also pain, unpleasant feelings, or exceptional fatigue. Mental and physical symptoms of stress at work was evaluated in this study indirectly through the use of questions concerning different cardiorespiratory, musculoskeletal, and psychological symptoms. This indirect means of analyzing work load is commonly used because a direct measurement of the balance between job demands and worker characteristics has proved to be difficult.

The symptoms that were selected for the analysis were those which correlated with the deterioration of health and work ability during the follow-up period from 1981 to 1992 (14). The contents of the sum variables and their reliability in 1981 and 1992 are presented in table 1.

Questions dealing with strain and pain in the upper and lower back were also included in the questionnaire. Because these symptoms did not correlate strongly with death or disability in this study population, the results have been excluded. An exception from this selection

Table 1. Physical and mental stress symptoms in 1981 and 1992 and their reliability. Cronbach's alpha or Pearson's product-moment correlation.

Stress symptom	Reliability	
	1981	1992
Excess physical stress at work	0.78	0.83
Sweating caused by work		
Shortness of breath caused by work		
Increased heart rate caused by work		
Excess physical stress		
Psychosomatic symptoms	0.33	0.37
Stomach ache		
Dizziness		
Avoidance reactions	0.78	0.83
Desire to stay at home in the morning		
Apathy		
Wishing to stay away from work		
Musculoskeletal trouble at work		
Pain and ache in the upper limbs	0.74	0.72
Pain in fingers		
Pain in wrists		
Pain in arms		
Pain in elbows		
Pain in neck and shoulder		
Pain and ache in the lower extremities	0.69	0.71
Pain in thigh, knee and calves		
Pain in ankle or foot		
Pain that hinders walking		
Cardiorespiratory symptoms	0.63	0.60
Shortness of breath, pressure and pain in chest		
Chest pain that hinders walking		
Breathlessness that hinders walking		
Sleep disturbances	0.77	0.78
Difficulties in falling asleep		
Broken sleep at nights		
Awaking too early		
Mental resources	0.74	0.79
Enjoyment of daily tasks		
Active and alert		
Full of hope for the future		

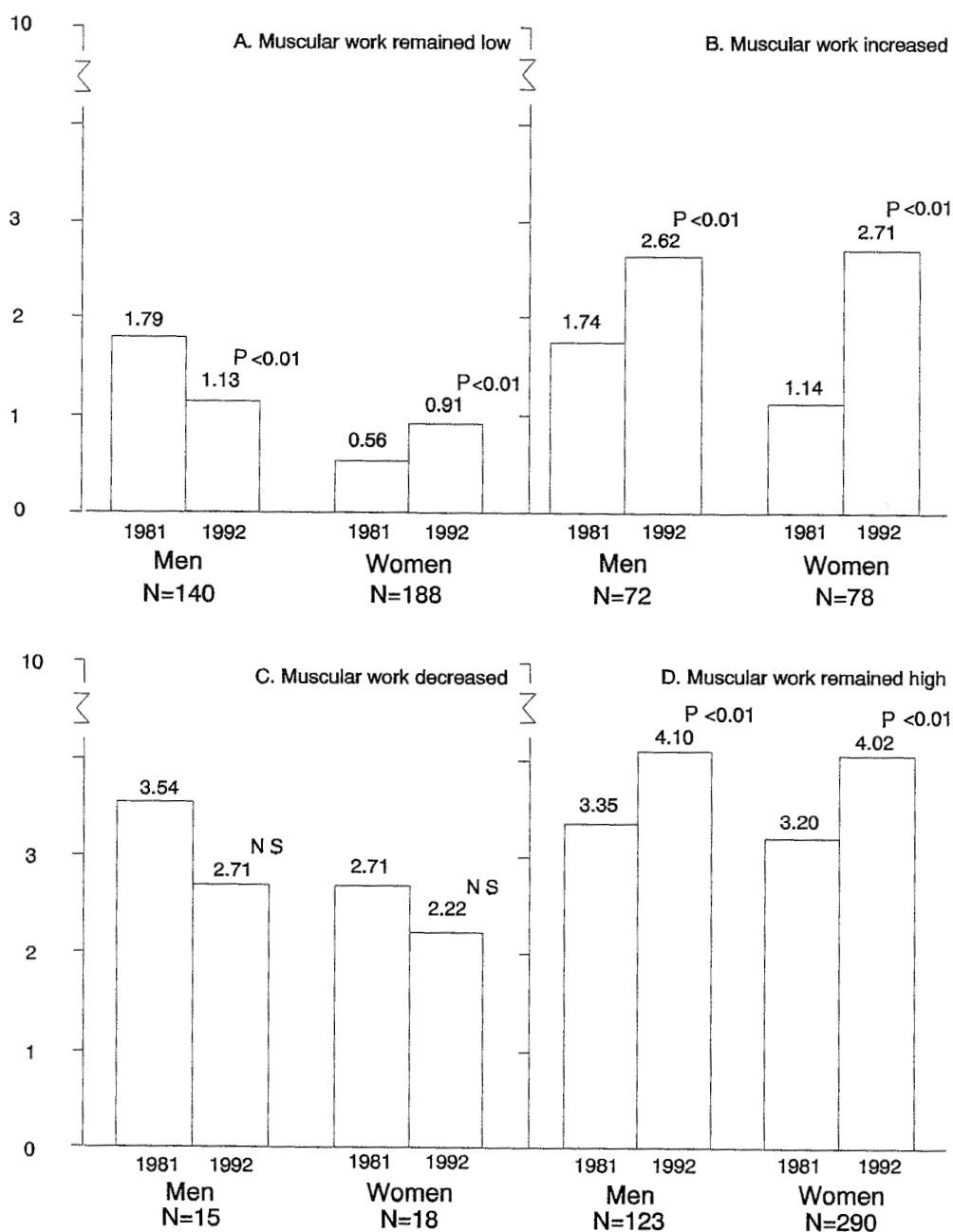


Figure 1. Mean excess physical stress at work among the men and women according to changes in muscular work from 1981 to 1992.

criterion was made for mental resources and memory functions because aging is expected to affect these variables (15).

Analysis of the level and direction of change

The level of physical and mental stress symptoms was analyzed using the changes in the means and percentages during 1981–1992. Symptoms may have increased, decreased, or remained the same during the study period. In the analysis of the direction of change, the median values of the sum variables in 1981 were

used as the anchor point. With the use of this 50% cut-off point in 1981 also as the cut-off point in 1992, the subjects were classified into the following 4 symptom categories: those that remained low in frequency (value in both measurements less or equal to the median in 1981) (A), those that had increased (in 1981 less or equal to the median, in 1992 higher than the median) (B), those that decreased (value in 1981 higher than the median, in 1992 less or equal to the median) (C), and those that remained high in frequency (higher than the median both in 1981 and 1992) (D).

The level and direction of change was analyzed by gender, work profile, and age.

Impact of work change on symptoms

The analysis of the relation of strain with stress symptoms, work, and aging was based on the following 2 hypotheses: (i) symptoms will increase with age, and (ii) stress factors at work and any changes in them affect the symptoms.

The analysis of changes in work and work load was based on a comparison of the means of symptoms in the 4 symptom categories, as shown in figure 1. The basic association between the physical job demands (muscular work) and symptoms of stress (excess physical stress at work) in 1981 and 1992 is illustrated by a comparison of the mean of the "remained high" category (D) with those of the "remained low" category in figure 1 (A). The impact of aging (11 years, without the possible impact of a change at work) is expressed in the increase in the means of the symptoms from 1981 to 1992 in the categories in which job demands did not change (type A "remained low" and D "remained high"). In addition to the impact of aging, increased job demands may also have affected the symptoms since the increase in category B from 1981 to 1992 was higher than for categories A and D (for which there was no impact from work change). The impact of reduced work load can be seen for category C, for which the means of the symptoms were lower in 1992 than in 1981.

The only exception from these directions is visible from the symptom means of the men in the group with low muscular work (category A).

In addition to the variables presented in figure 1, 4 sum variables were selected for this analysis, 2 for symptoms (cardiorespiratory symptoms, motivational reactions) and 2 for work (work postures, possibilities for development at work).

The significance of the differences was tested with paired 2-dimensional t-tests.

Results

Changes in the level of symptoms

The physical and mental stress symptoms had increased markedly from 1981 to 1992 in all the symptom groups (table 2). The greatest changes occurred for pain in the lower limbs, both among the men and the women. In 1992, more than half of the respondents suffered from this type of pain, and it hindered walking for a third of the subjects.

Pain in the upper limbs and cardiorespiratory symptoms also increased markedly. The women had more upper limb pain than the men (table 2). Half of the women in 1992 and every third in 1981 occasionally or continuously had pain in their fingers. These symptoms increased also among the men.

In 1981, 1% of the subjects reported that they could not manage their full-time work because of musculoskeletal symptoms. In 1992, 7% of the men and 6% of the women felt this way.

Shortness of breath, pressure in the chest, difficulty in breathing, and chest pain were experienced by half of the subjects in 1981 and by two-thirds in 1992. About 10% felt that chest pain hindered walking in 1992. Difficulty in breathing affected more women than men during walking. Every 4th woman and every 5th man had slowed their walking rhythm at least sometimes.

Avoidance reactions also increased significantly (table 2). Unwillingness to go to work in the morning was experienced at least rather often by 5% of the women in 1981 and 17% in 1992. Among the men the increase in the prevalence of this symptom was from 6% to 18%.

Six percent of the women had difficulties in falling asleep in 1981, compared with 13% in 1992. Interrupted sleep had also increased in the 11 years of follow-up, and awaking too early was experienced by 9% of the women in 1981 and 20% in 1992. The respective shares for the men were 11% and 25%. Difficulties with memory were felt rather often or often by 17% of the men in 1981 and 30% in 1992; of the women 17% and 25%, respectively, had the same problem.

Table 2. Physical and mental stress symptoms in 1981 and 1992 among the men (N = 350) and women (N = 574).

Variable	Men					Women				
	1981		1992		P-value ^a	1981		1992		P-value ^a
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Men										
Excess physical stress at work	2.00	1.95	2.55	2.23	< 0.01	2.04	2.05	2.77	2.32	< 0.01
Psychosomatic symptoms	2.36	1.70	2.93	1.94	< 0.01	2.73	1.87	3.21	2.03	< 0.01
Avoidance reactions	2.37	1.71	3.57	2.10	< 0.01	2.71	1.61	3.51	2.10	< 0.01
Pain and ache in the upper limbs	1.22	1.41	1.92	1.84	< 0.01	1.90	1.82	2.48	2.20	< 0.01
Pain and ache in the lower limbs	0.93	1.67	3.37	2.46	< 0.01	1.34	1.97	3.65	2.51	< 0.01
Cardiorespiratory symptoms	0.89	1.34	1.49	1.77	< 0.01	1.08	1.37	1.51	1.78	< 0.01

^a Comparison between 1981 and 1992, paired t-test.

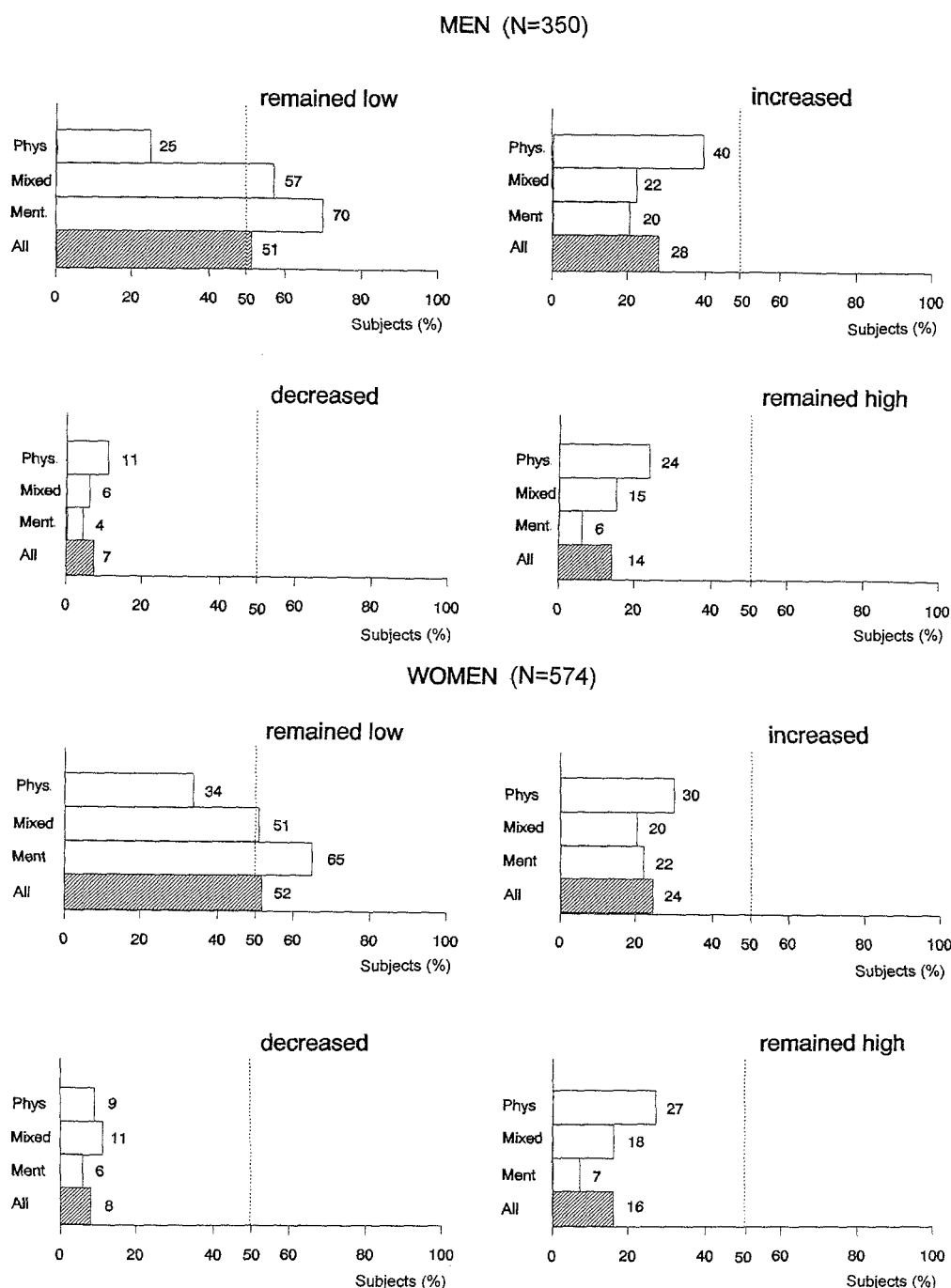


Figure 2. Changes in musculoskeletal symptoms in 1981 and 1992 by gender and work content. (Phys = physical work, Mixed = mixed physical and mental work, Ment = mental work)

In the analysis of the means of the symptom variables, no differences in the increase in symptoms were found when the comparisons were made according to the nature of the work or age.

Direction of changes in symptoms

Excess physical stress at work increased among 20% of the men and women and decreased among 6% of them.

Among the men, the variable showed the highest increase in mixed physical and mental work (30%) and, among the women, the increase was the most common (26%) in mental work. In the beginning of the follow-up, excess physical stress was the highest in physically demanding work, and this finding prevailed throughout the 11-year follow-up.

Every fifth person experienced an increase in psychosomatic symptoms, and every tenth showed a de-

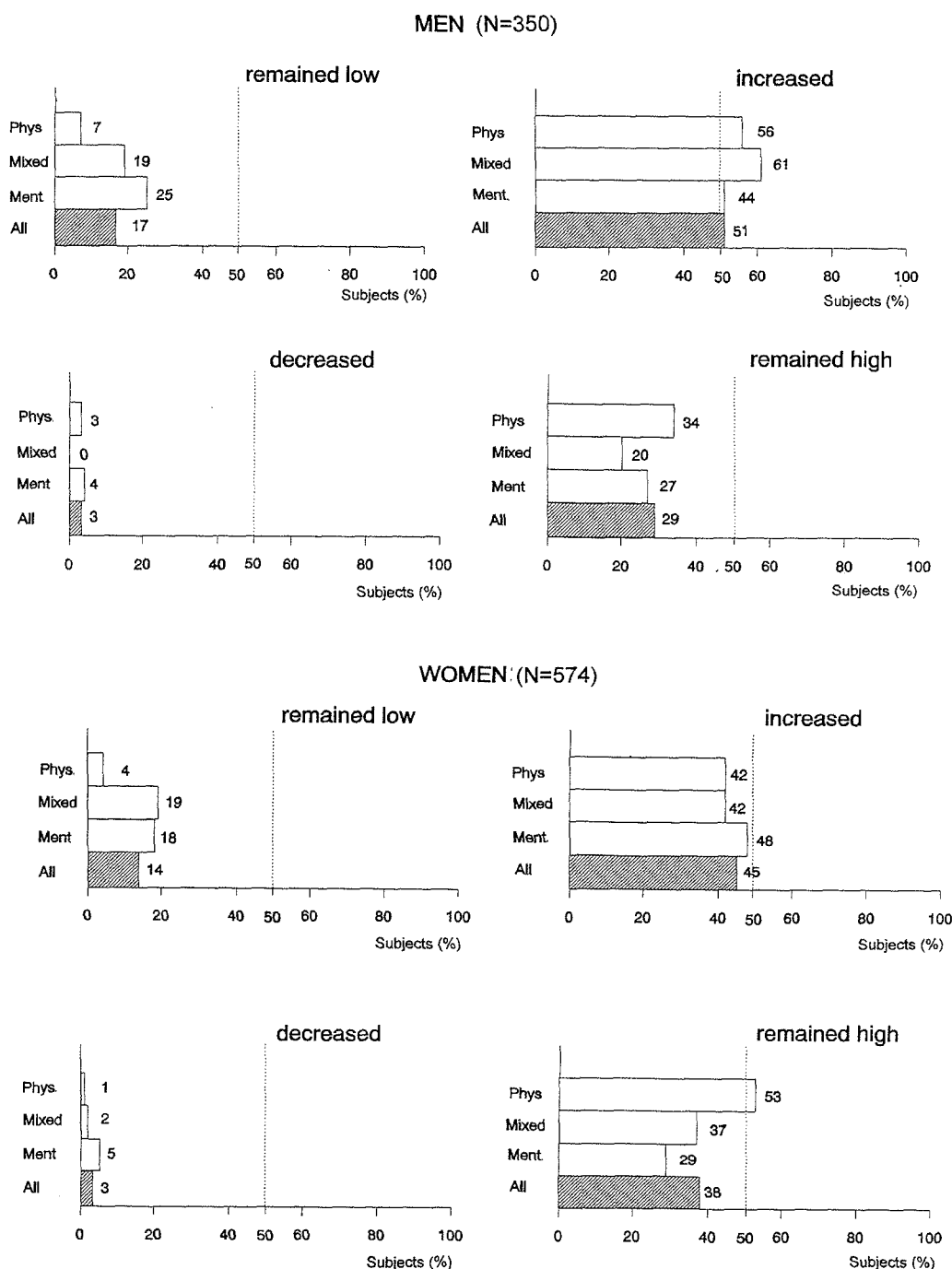


Figure 3. Changes in pain and aches in the lower limbs in 1981 and 1992 by gender and work content. (Phys = physical work, Mixed = mixed physical and mental work, Ment = mental work)

crease. These symptoms were more frequent in physically demanding work. Avoidance reactions (desire to stay at home in the morning, apathy, and wishing to stay away from work) increased more often than they decreased among both the men (30% versus 4%) and the women (27% versus 11%). These changes were not connected with the nature of the work.

Twenty-eight percent of the men and 24% of the women felt that musculoskeletal problems hindered their

work more often, especially in physical work, for which the starting point was already worse than in the other groups (figure 2). Pain and aches in the upper and lower limbs had increased among 32% of the women and 43% of the men. The increase was, however, more marked in the lower-limb area (figure 3). A total of 51% of the men and 45% of the women experienced these symptoms more often than earlier, almost independently of the nature of the work.

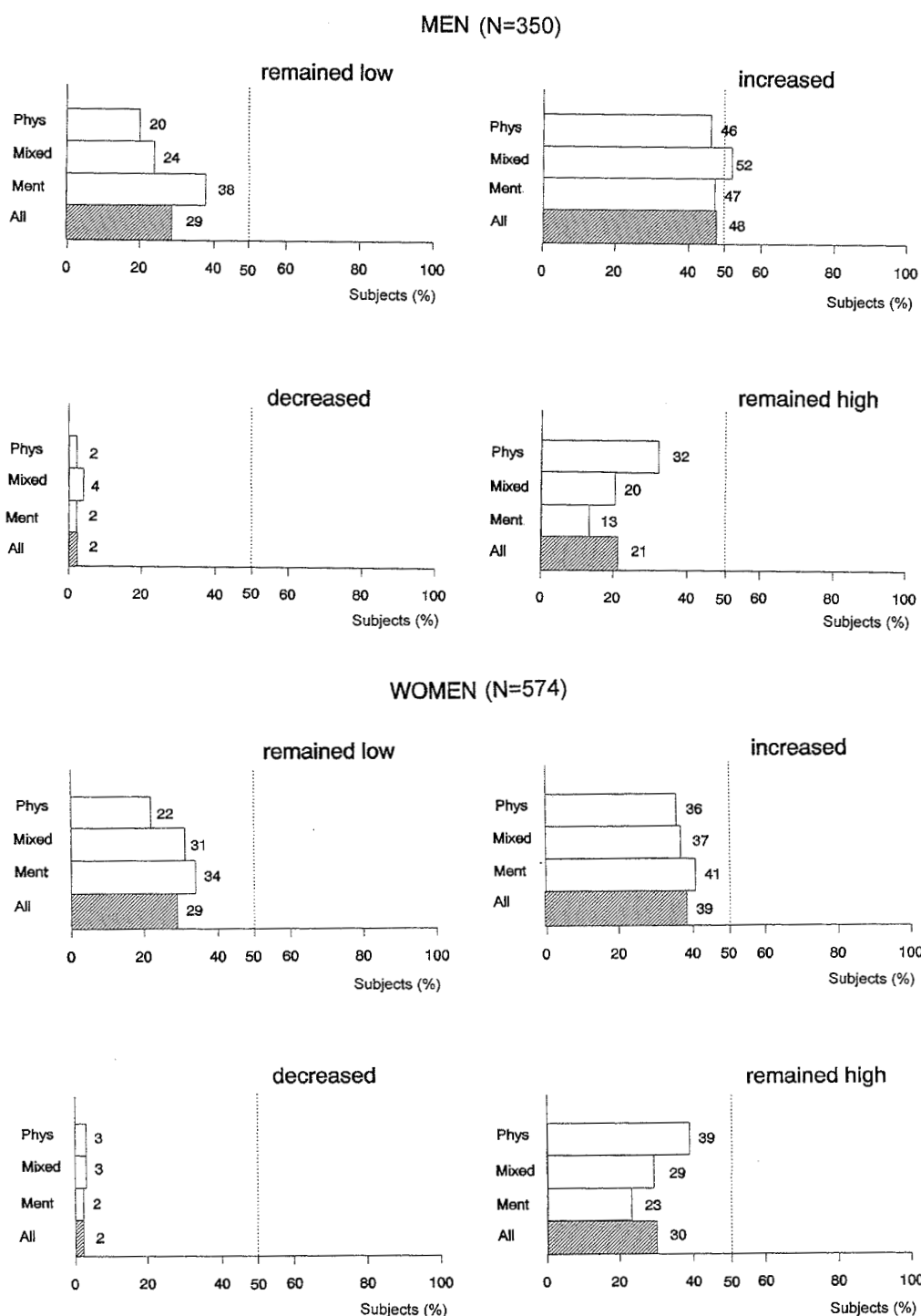


Figure 4. Changes in cardiorespiratory symptoms in 1981 and 1992 by gender and work content- (Phys = physical work, Mixed = mixed physical and mental work, Ment = mental work)

Cardiorespiratory symptoms also increased in all types of work, more among the men (48%) than the women (39%) however (figure 4). These symptoms correlated with the work content, being the most frequent in physical tasks and the least frequent in mental tasks.

Mental resources (enjoys daily tasks, is active and alert, full of hope for the future) increased more among the men than the women (9% and 5%, respectively). However, the women (41%) more often found than the men (30%) that their mental resources remained high during

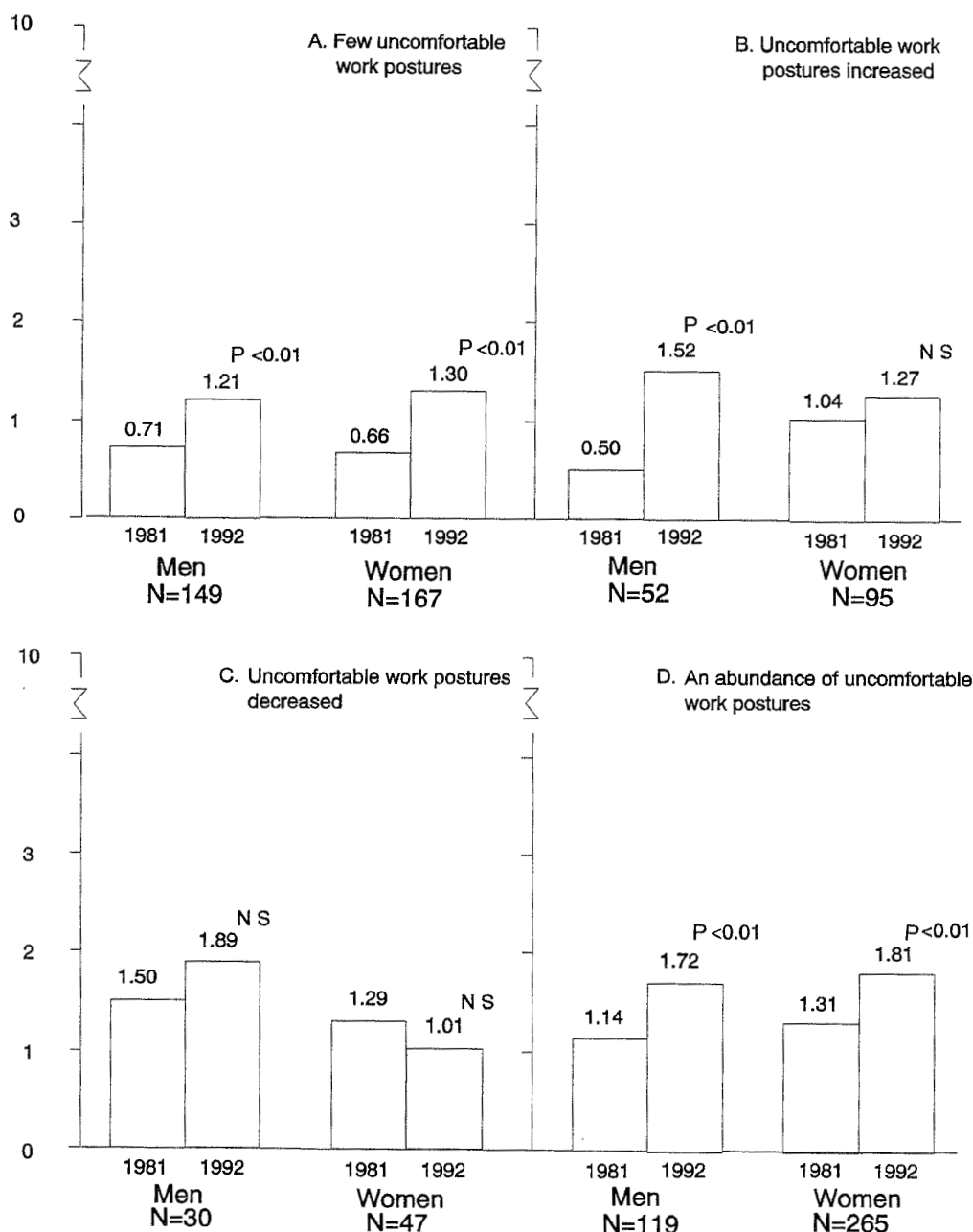


Figure 5. Means of the cardiorespiratory symptoms in 1981 and 1992 according to changes in uncomfortable work postures from 1981 and 1992, as calculated by paired t-tests.

the follow-up. In physical work, mental resources were less frequent than in the other groups.

Relationship between changes at work and symptoms

Among the men who had more awkward work postures than earlier (category B), the cardiorespiratory symptoms had increased more than among those whose work postures had become better (category C) (figure 5).

Among the women in category C, the symptoms had even decreased. Cardiorespiratory symptoms increased systematically ($P < 0.01$) in the groups for which awkward work postures had remained low or high during the follow-up period (categories A and D).

This kind of relationship was not as evident between the changes in cardiorespiratory symptoms and possibilities for development at work (figure 6). In all the men's groups, the symptoms increased statistically sig-

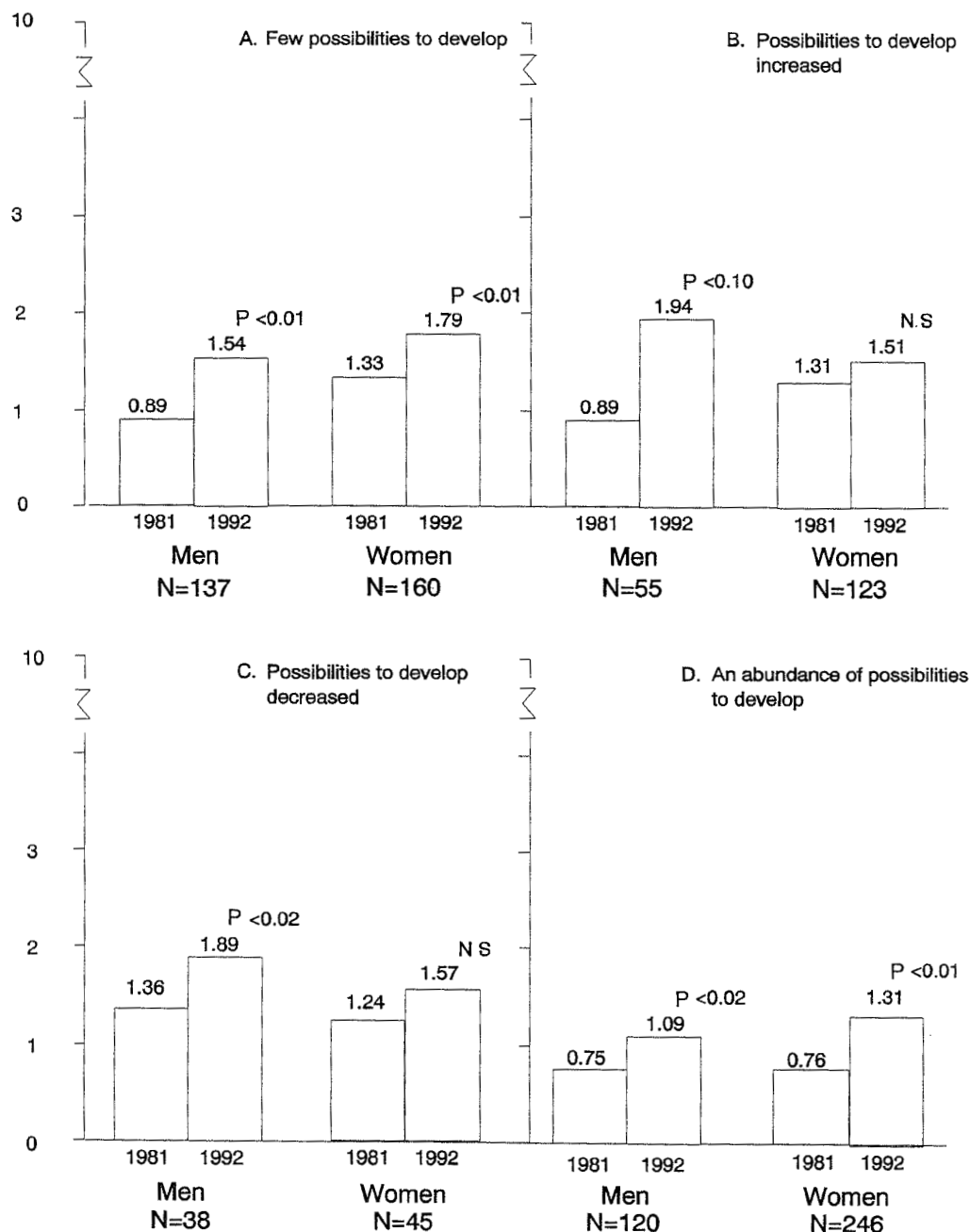


Figure 6. Means of the cardiorespiratory symptoms in 1981 and 1992 according to changes in possibilities for development from 1981 and 1992, as calculated by paired t-tests.

nificantly. Among the women, the increase was lowest for those whose possibilities to develop at work had improved.

Avoidance reactions were more common among those who had awkward work postures more than the average (figure 7). Among the men, the changes in avoidance reactions had no association with changes in posture; the reactions increased with age. Among the women, on the other hand, those with improved work postures (category C) experienced fairly few avoidance re-

actions, and these types of reaction had not increased during the follow-up period.

Avoidance reactions were clearly associated with the possibilities to develop at work (figure 8). Among those with minor possibilities (remained low or decreased during the follow-up, categories A and C), avoidance reactions were more frequent and increased more than among those with many possibilities to develop (category D). However, avoidance reactions increased statistically significantly in all the categories.

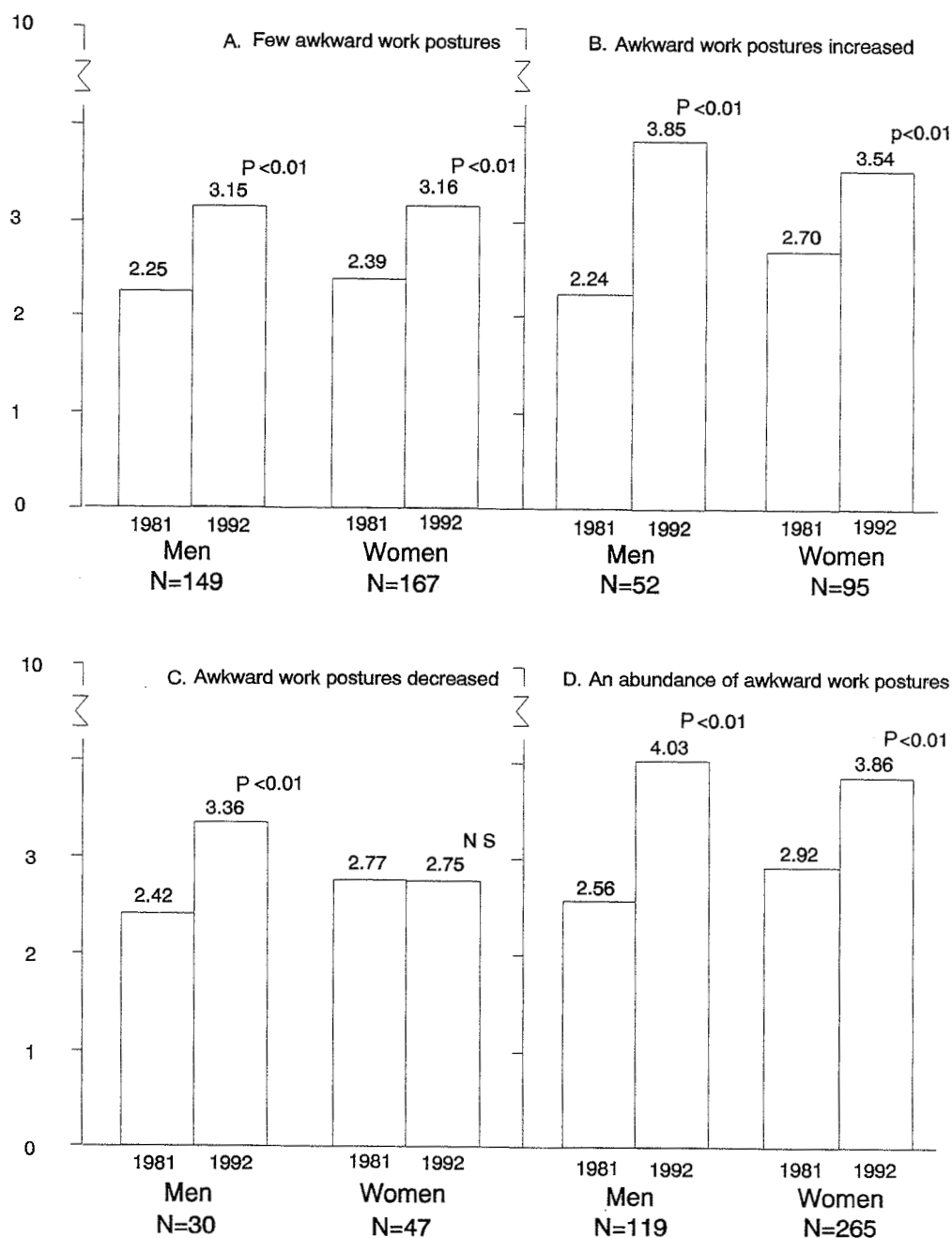


Figure 7. Means of the avoidance reactions in 1981 and 1992 according to the changes in awkward work postures from 1981 and 1992, as calculated by paired t-tests.

Discussion

The questionnaire surveys in 1981 and 1992 revealed that, among the municipal workers who had remained in the same occupation during the 11-year period ($N = 924$), stress symptoms were markedly increased. This trend could be seen especially for aches and pain in the upper and lower limbs, but also for respiratory and cardiovascular symptoms. Motivational reactions, including sense of apathy in general and a desire to stay at home in the

morning, were the psychological symptoms that had increased the most. The women experienced a greater increase in these symptoms than the men did. The changes in the symptoms were associated with changes at work. In general, the more the symptoms had increased, the more also the work had changed.

The target group in this study was positively selected from the whole study population of aging municipal workers on the basis of health, or at least on the basis of work capacity, because none of them had retired due to

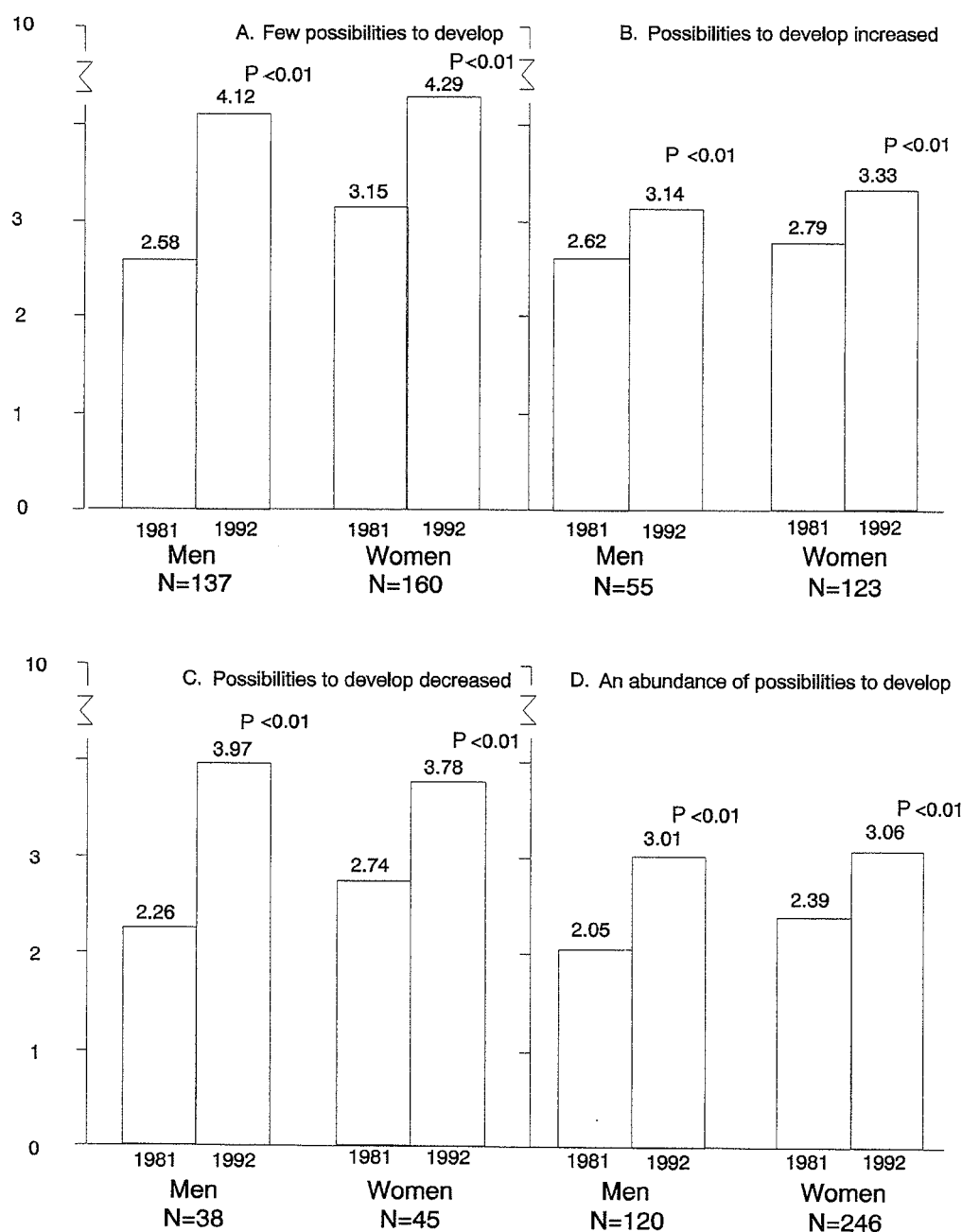


Figure 8. Avoidance reactions, means in 1981 and 1992, according to changes in possibilities to develop from 1981 and 1992, as calculated by paired t-tests.

disability or some other reason during the follow-up period.

Avoidance reactions like wishing to stay away from work or a desire to stay at home in the morning can be associated with thoughts of retirement. A study based on the interviews of the Finnish labor force in the age range of 35 to 64 years revealed that preconditions to continue work up to retirement were connected, among other things, with an improvement in work content and leadership styles (5).

The results of this study also confirmed the generally known age-related problems with memory function and sleeping difficulties and therefore supported the validity of the questions on symptoms, which were based on subjective evaluations of the aging workers themselves. With increasing age, the level of aspiration regarding health and well-being may decrease. This possibility may lead to discrepancies between subjective evaluations and clinical findings. Furthermore, when subjects evaluate their symptoms, the relationship with job demands may

be overemphasized. This possibility may partly explain the finding that the perceived changes at work were greater than those estimated by observation (12, 16). Moreover, the origins of the symptoms may not have been work-related at all. For comments on other problems related to measuring changes see reference 12.

Results on the relationship of changes in cardiorespiratory symptoms with work suggest that, by developing job content and social support, it is possible to attain a positive impact, even on physical symptoms. This phenomenon in turn can affect the possibilities to continue to work rather than retiring early. The results agree with those of earlier studies on the significance of social support (11, 17). Respiratory and cardiovascular symptoms increased in all types of work and therefore reflected the impact of aging. The symptoms were greatest in physical work. Due to the selection of subjects and lower retirement ages in the physical and mixed physical and mental types of work, workers doing mental work were over-represented in the study group. The proportion of subjects on disability pension or of those who died during the follow-up period was highest for those who were in physically demanding work in 1981.

The physical load of aging workers can be adjusted by decreasing the amount of muscular work and the use of strength at work. Such corrective changes in physical work may be even more effective "in real life" than what is shown in figure 1 (category C) because the pure impact of age on physical load is assumed to be as high for all four types of change, regardless of the work content.

The results also showed that increasing possibilities to influence work and also improvement in job content affect stress symptoms at work. For the women, these variables may even have a positive impact on cardiorespiratory symptoms. This finding is especially important because, among the female workers, the increase in mental load and dissatisfaction with the work breaks was higher than among the men (12). Women in the municipal sector often work in occupations demanding social skills in human-related tasks.

The increase in stress symptoms was connected both with aging and with changes at work. The symptoms increased relatively more (18–260%) than the work load factors did (growth 0–17%) (12). This finding confirms that aging has more impact on symptoms than on perceived changes in work load. However, within the narrow age range of the subjects — 44–51 years in the beginning in 1981 — age did not correlate with the increase in symptoms or with the evaluation of the work. In another part of the municipal study, measured functional capacity changed similarly in all three types of work during the 11-year follow-up period (Nygård et al, unpublished manuscript). This agreement leads to the tentative conclusion that the deleterious effect of work on the functional capacity and symptoms of workers may

start even earlier than the age of 45 years. This finding is of crucial importance when preventive measures and policies regarding stress and physical and mental load at work are being planned.

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