

CERVICO-BRACHIAL DISORDERS IN DENTISTS

A Comparison between Two Kinds of Physiotherapeutic Interventions

Britta-Jena Rundcrantz, Birgitta Johnsson, Ulrich Moritz and Gertrud Roxendal

From the Department of Physical Therapy, Box 5134, S-22005 Lund, Sweden

ABSTRACT. We have evaluated two kinds of physiotherapy treatment for dentists with occupational cervico-brachial disorders. Group A received treatment with a psychosomatic approach and individual ergonomic instruction and group B received ergonomic instruction only. A reduction of the cervico-brachial disorders after the intervention was observed in both groups. In group A there was a significant decrease of pain and discomfort in the neck ($p < 0.05$), and a significant improvement was also found concerning the experience of well-being ($p < 0.05$). Five weeks after the intervention the feeling of self-confidence had increased significantly in group A ($p < 0.05$). Both groups of dentists experienced that their control over the work had decreased ($p < 0.01$ in group A and $p < 0.05$ in group B). In group B it was also found that the dentists' confidence in the future had decreased, compared with the answers given a year before.

Key words: cervical pain, dentists, psychosocial problems, psychosomatic problems, physiotherapy, ergonomics.

Considerable research has been performed to prevent musculoskeletal disorders. Dentists and dental nurses with special training in ergonomics have instructed and helped the dental service staff with various ergonomic problems, and also physiotherapists have been asked to handle their ergonomic problems (22). In spite of these measures, the prevalence of pain and discomfort among dentists is still remarkably high. In an investigation comprising 359 dentists in Malmö in Southern Sweden it was found that 72% reported cervico-brachial disorders during the past year (16).

In an investigation concerning cervico-brachial disorders among dentists was found differences in the way of working between dentists with and those without pain and discomfort in the neck and shoulders (17). Significant differences were found, for example, with respect to the use of a wedge cushion to improve the direct view into the mouth during the work. Further, it was shown that dentists with cervico-brachial disorders when working kept their head bent sideways

and/or rotated, to a greater extent than those without symptoms.

Dentists with cervico-brachial pain and discomfort compared with those without, experienced less satisfaction with their psychosocial work environment, and less personal harmony, e.g. less self-confidence, reported more anxiety and had less trust in the future. Furthermore, they had poorer psychosomatic health compared to those without pain and discomfort, and could suffer, for example, from insomnia, palpitation of the heart and stomach trouble (18).

It has been shown that patients with pain and discomfort in the neck, receiving physiotherapy combined with information about psychosomatic reactions, reported less pain after the therapeutic intervention compared with a group of patients who received physiotherapy only (19). Through the discussion about psychosomatic reactions the physiotherapist might help the patient to gain a deeper insight into the interrelation between somatic symptoms and emotional phenomena and how the body reacts to situations of stress and conflict (19).

Some investigations have been performed to evaluate the effect of physiotherapy treatment on cervico-brachial disorders with respect to mobility and pain in the neck and shoulders (2, 3, 5, 9, 12, 13). No definite conclusion can be drawn from the studies as to the effectiveness of the treatment models used.

Previous studies indicate that there is a need of a more global intervention programme, including not only individually adjusted ergonomic intervention, but also specific physiotherapy treatment and a psychosomatic approach.

The aim of the present investigation was to compare two different kinds of physiotherapeutic intervention among dentists with occupational cervico-brachial disorders. One model comprised individually adjusted therapeutic treatment and ergonomic instruction. The other model consisted of individually adjusted ergonomic instruction only.

Table I. Background data of the dentists in group A and group B, $n=22$ in both groups

	Group A	Group B
Age		
Mean	42.5	40.5
SD	± 6.8	± 5.9
Range	33–58	30–53
Working-hours/week		
Mean	38.1	36.1
SD	± 5.1	± 6.2
Range	20–40	20–40
Years in profession		
Mean	15	15
SD	± 8.3	± 5.7
Range	3–32	6–30

MATERIAL AND METHODS

Subjects

In this investigation 45 official dentists (government employed) in the Malmöhus District and the Municipality of Malmö—in the southern part of Sweden—took part. These dentists are a part of the study group that participated in the investigation undertaken in 1987, when 359 dentists answered a questionnaire concerning musculoskeletal symptoms in different parts of the body (16). In this study 120 randomly selected dentists were called who in the questionnaire had reported headache, pain and discomfort in the neck and shoulders. Ninety-six dentists with symptoms accepted the invitation and were examined about six months after the questionnaire had been answered (17).

These 96 dentists were invited to take part in the present study six months later. However, 37 dentists reported to be free from cervico-brachial pain and discomfort at that time and were therefore excluded.

Furthermore, 14 specialist dentists were excluded, as their working situation is not comparable with that of the other dentists. The remaining 45 dentists who took part in this project had repeatedly symptoms of headache, pain and discomfort in the neck and shoulders from 12 to 24 months. The most common symptom was pain, often described as an ache in the back of the head and pain in the neck radiating towards the shoulders. Pain and discomfort in the shoulders was mostly described as pain in the shoulder joint or pain when the arm was moved. With headache means pain in the crown, forehead or the eyes.

The dentists were divided into two groups. Those who worked near to the physiotherapy receptions were offered adjusted physiotherapy treatment, including information based on a psychosomatic approach and individually adjusted ergonomic instruction. The individually adjusted ergonomic instruction was given at the dentists workplaces. This group, further called group A, consisted of 13 men and 9 women.

The remaining dentists, further called group B, consisted of 14 men and 9 women, were given individually adjusted ergonomic instruction merely at their workplace. One dentist in

the ergonomic group did not answer the questionnaire in the follow-up, thus making 22 dentists in both groups.

Background data of the dentists in the two groups are shown in Table I. From the table it can be concluded that the groups are comparable with respect to age, working-hours/week and years in the profession.

Ergonomic instruction

The ergonomic instruction was based on an interview and ergonomic tests reported previously (17). It was adjusted to the present symptoms experienced by the dentist and to his needs and wishes first of all with respect to neck and shoulder problem. The ergonomic instruction for both groups was given at the workplace to make the instruction as realistic as possible. The instruction was given in one session during the dentists treatment of one or two patients.

Physiotherapy treatment

The physiotherapy treatment consisted of treatment to reduce pain and discomfort and information based on a psychosomatic approach. This information was intended to draw the dentists' attention to how the body may react with pain and tension in situations of stress and conflict and to provide an understanding of the interplay between physical and psychosocial phenomena.

The physiotherapy treatment was based on the symptoms experienced such as pain on palpation and shortened upper part of the m. trapezius. Other findings were, for example, tendinitis in the tendons of the shoulder joint muscles, restrictions of the mobility of the cervical and the upper thoracic spine, weakness of the stabilising muscles of the scapula or weak cervical prevertebral muscles. The treatment was thus entirely individual, and therefore the programme as well as the number of treatment sessions varied (Table II). The treatments included measures to reduce the pain such as soft tissue mobilisation and cervical traction. To increase mobility, stretching of tight muscles was performed, especially concerning the upper part of the m. trapezius, m. levator scapulae and m. pectoralis major. Other parts of the treatment were the training of endurance of the prevertebral neck muscles and of muscles acting on the scapula such as the lower part of m. trapezius, m. latissimus dorsi, m. serratus anterior and the rhomboid muscles. The treatment also included exercises in order to correct faulty posture and to facilitate relaxation. Further, home exercises aiming at improving physical fitness, strength and endurance were given. Finally, ergonomic problems which had been observed during the ergonomic instruction were discussed and corrections practised. The 22 dentists making up group A received 1–8 treatments, as shown in Table II.

Table II. Number of therapeutic treatments in group A ($n=22$)

	Number of treatments			
	5–8	3–4	2	1
Number of dentists	8	9	4	1

Table III. Data in groups A and B before and after the intervention in mm on VAS measured at 8 a.m., noon, and 6 p.m.

Pain and discomfort in the neck, shoulder and headache: 0=no pain, 100 unbearable pain. Well-being: 0=bad well-being, 100=good well-being

	Group A		Group B	
	Mean (mm)	SD	Mean (mm)	SD
<i>Headache</i>				
<i>Before</i>				
8 a.m.	5	11.2	9	18.1
Noon	6	11.5	12	22.7
6 p.m.	7	14.6	16	27.8
<i>After</i>				
8 a.m.	3	9.21	6	16.0
Noon	3	7.1	8	20.1
6 p.m.	5	13.6	13	24.1
<i>Neck</i>				
<i>Before</i>				
8 a.m.	21	22.0	21	23.7
Noon	30	24.3	29	27.0
6 p.m.	30	25.9	30	27.3
<i>After</i>				
8 a.m.	12	14.3	17	21.1
Noon	17	17.2	25	23.9
6 p.m.	23	22.2	28	26.8
<i>Shoulder</i>				
<i>Before</i>				
8 a.m.	13	16.7	17	24.6
Noon	25	23.5	23	28.4
6 p.m.	27	24.0	24	28.5
<i>After</i>				
8 a.m.	12	16.5	16	23.7
Noon	19	21.5	21	26.8
6 p.m.	22	24.1	23	28.5
<i>Well-being</i>				
<i>Before</i>				
8 a.m.	72	22.0	67	23.6
Noon	72	21.0	72	20.2
6 p.m.	70	23.3	73	22.6
<i>After</i>				
8 a.m.	81	14.9	78	20.0
Noon	80	14.9	77	20.6
6 p.m.	79	15.8	77	19.1

Methods of evaluation

Rating of pain, discomfort and general psychic well-being. The rating of pain, discomfort and general psychic well-being was done by means of the VAS (Visual Analogue Scale) (10) three days in succession before the intervention. The visual ana-

logue pain scale (100 mm) has as endpoints "no pain and discomfort" and "unbearable pain". The scale of well-being has at its endpoints "bad" and "excellent", respectively. The ratings were performed three times a day (at 8 a.m., noon, and 6 p.m.) and were repeated five weeks after the treatment and/or ergonomic instruction in both groups.

Psychosocial survey. The dentists answered two questionnaires five weeks after the intervention. The questionnaires measure psychosocial factors in the work environment and personal harmony. The results were compared with those obtained six months before the present study. Each questionnaire consists of different variables, described below, which contain several items. Each item has fixed alternative answers which are given points (14).

The questionnaire measuring the *psychosocial factors in the work environment* comprised the following variables: personal influence on decision-making at the workplace, the relation between staff and management, the stimulation experienced from the work, the feeling of solidarity with colleagues, and how the work load is experienced. The evaluation of the answers in the survey of the psychosocial work environment is done according to a scale on which 15 is the mean value. According to Rubenowitz, values below 15 are considered as unsatisfactory and values below 10 indicate that measures for improvement should be undertaken (14, 15).

The second questionnaire measures *personal harmony*, comprising the variables: self-confidence, freedom from anxiety, psychosomatic health and confidence in the future. By psychosomatic health Rubenowitz means that one to great extent does not suffer from insomnia, palpitation of the heart, nervousness, headache, stomach trouble or a deeply depressed state of mind. The questionnaire is evaluated according to the stanine scale on which 5 is the mean value (6), which is called the reference value (14). Values below 5 are unsatisfactory.

Statistical methods

The statistical analysis is made with repeated measurements within the ANOVA concept. A technique often used when data are measured by the Visual Analogue Scale. The analyses of the questionnaires are based on Student's *t*-test. A check up with a correspondent non parametric method have been done. A probability level of $p < 0.05$ has been accepted as statistically significant.

RESULTS

Rating according to the VAS; Improvement or deterioration?

The analysis of the mean values from the VAS showed that pain increased during the day. This was most obvious for pain and discomfort in the neck which was experienced most intensively at the end of the working-day, at 6 p.m. ($p < 0.001$) (Table III). In cases with remaining pain or reduced pain the same was found after the interventions. However, in both groups the feeling of well-being did not vary, but was constant during the day (Table III).

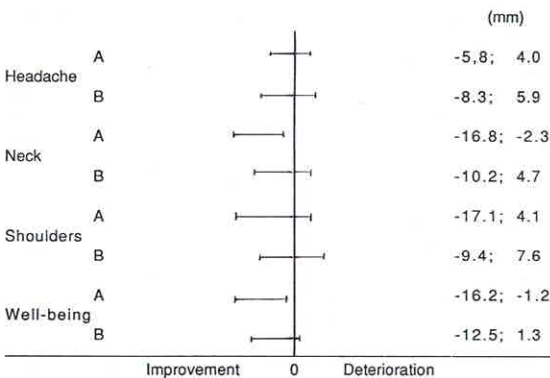


Fig. 1. Confidence intervals (95%) for improvement or deterioration five weeks after the intervention with respect to headache, pain and discomfort in the neck and shoulders in group A ($n=22$) and group B ($n=22$). Data in mm on VAS.

No significant differences between the mean values of the two groups were found in the ratings over three days before the intervention, with regard to headache, pain and discomfort in the neck and shoulders. No significant difference was found concerning the feeling of well-being between the groups either (Table III).

In the second measurement, five weeks after the ergonomic information and treatment, a significant decrease within group A ($p<0.01$) in the intensity of the neck symptoms and an increase of the feeling of well-being ($p<0.05$) was found. A corresponding change could not be observed for group B. Compared with the first measurement there was a tendency towards reduction of headache and of pain in the should-

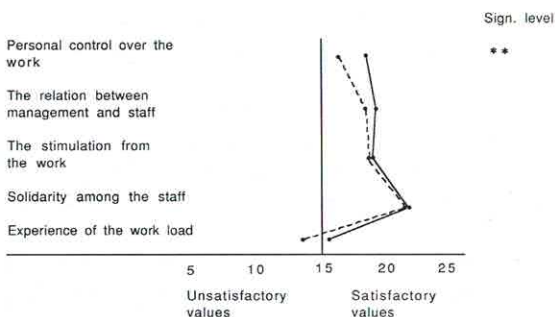


Fig. 2. Profiles of mean values of the psychosocial factors in the work environment (personal control over the work, the relation between management and staff, the stimulation from the work, solidarity among the staff, experience of the work load) in group A six months before (solid line) and five weeks after (dotted line) the intervention ($n=22$). ** $p<0.01$.

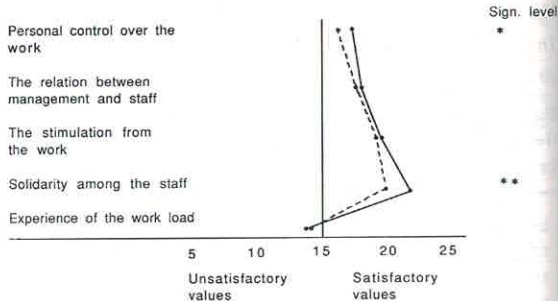


Fig. 3. Profiles of mean values of the psychosocial factors in the work environment (personal control over the work, the relation between management and staff, the stimulation from the work, solidarity among the staff, experience of the work load) for group B six months before (solid line) and five weeks after (dotted line) the intervention ($n=22$). * $p<0.05$, ** $p<0.01$.

ders in the second measurement, but these differences were not significant (Table III).

Improvement or deterioration was also calculated for each individual dentist (Fig. 1). No significant improvement could be noted after giving the ergonomic information to the dentists in group B. However, the dentists in group A experienced less pain and discomfort in the neck and the well-being had increased. The confidence intervals for headache, pain and discomfort in the neck and shoulders in groups A and B and with respect to well-being were calculated (Fig. 1). Confidence intervals concerning pain and discomfort in the neck and well-being in group A showed that these dentists experienced a significant improvement after the treatment.

Psychosocial factors in the work environment

Figs. 2 and 3 show the profiles of the mean values in the two groups five weeks after the intervention as compared to the analysis six months before. In comparison with the first investigation concerning personal control over the work (Figs. 2 and 3) a significant deterioration was found in both groups ($p<0.01$ in group A and $p<0.05$ in group B). The experience of solidarity among the staff had decreased for group B compared with the first measurement ($p<0.01$) (Fig. 3). The remaining items showed no significant differences. All values, except the experience of the work load were still above the reference values, which was also found in the first analysis undertaken six months before (16).

Between group A and group B there were no significant differences with respect to psychosocial factors

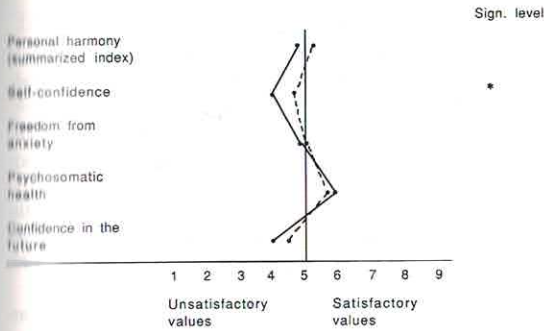


Fig. 4. Profiles of mean values of personal harmony in group A (summarized index and the variables self-confidence freedom from anxiety, psychosomatic health and confidence in the future) six months before (solid line) and five weeks after (dotted line) the intervention ($n=22$). * $p < 0.05$.

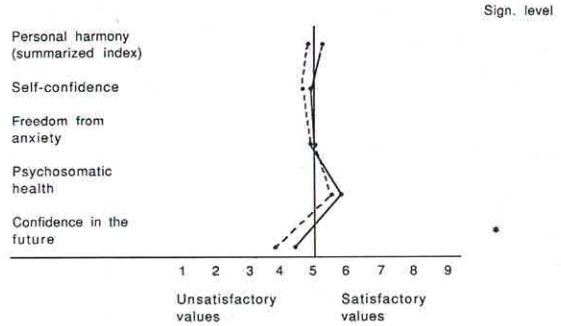


Fig. 5. Profiles of mean values of personal harmony in group B (summarized index and the variables self-confidence freedom from anxiety, psychosomatic health and confidence in the future) six months before (solid line) and five weeks after (dotted line) the intervention ($n=22$). * $p > 0.05$.

in the work environment before the investigation. However, after the intervention a significant difference was found between the two groups concerning the experience of solidarity among the staff ($p < 0.05$), due to the deterioration in group B.

Personal harmony

All values, except psychosomatic health, had increased in group A five weeks after the intervention. However, the difference was significant only with respect to the feeling of self-confidence ($p < 0.05$) (Fig. 4). The new value was just below the reference value. In group B all values had decreased except freedom from anxiety compared with the values before the intervention. However, the difference was significant only concerning confidence in the future ($p < 0.05$) (Fig. 5).

Between the two groups there was a significant difference only concerning self-confidence before the intervention ($p < 0.05$). After the intervention a significant difference between the two groups concerning self-confidence remained ($p < 0.05$). With respect to personal harmony (summarized index) the values in group B had further decreased. The difference was significant between the two groups ($p < 0.05$).

DISCUSSION

The physiotherapy treatment was most effective with respect to the pain and discomfort in the neck. One reason why the results on the shoulder pain was less

successful may be that the ergonomic unsatisfactory state still remained after the ergonomic intervention. The instrument tray was for example still kept on the left-hand side, with a faulty loading as a consequence, even when no assistance was being given by the nurse (8). Further, when the dentist changes instruments, his right arm has to reach far to the left. Working in this way the shoulder joint is loaded in the extreme range of movement and pain may result. This could possibly be one reason for the high frequency of arthrosis in the shoulder joint among dentists reported by Katevuo (11).

Headache may have more psychological causes, which take a considerable time to influence. To get better results it is possible that physiotherapy should be given for a longer period of time and with greater importance attached to a treatment of body awareness with the aim of avoiding unfavourable muscle strain (9).

Three ratings a day with respect to pain with the VAS during three days were asked for, firstly so as to study whether the intensity of the pain changed during the day and secondly to give a more representative value.

General psychological well-being rated on the VAS was, however, found not to change during the day. Consequently incidents in the working situation during the day did not influence the experience of well-being in either direction. Well-being measured with the VAS was significantly improved after the treatment of the dentists in group A. Also, according to the questionnaire of Rubenowitz, a change in the positive

direction had occurred concerning self-confidence in this group. Steinbach (20) claims that by reducing pain, personal variables change. However, according to Finer (4) the pain is experienced less intensely when self-reliance improves.

Many of the dentists were very pressed for time and by the economic situation of their clinics. Dentists with a salary based on commission have been shown to have headaches to a greater extent than dentists with a fixed salary (18). This was also reported by Bejerot (1) in her investigation concerning the psychosocial work environment in the National Dental Service. The dentists experience of psychosocial factors of the work environment had deteriorated for both groups compared with the investigation six months before. It cannot be decided if it is the variation of the seasons of the year that is reflected in the results or if it is the increasing economic responsibility in the clinics that comes to play.

In the ergonomic instruction the dentist's pain and discomfort were put in relation to the way of working with patients at the time as well as to the results found in the investigation six months earlier. Dentists with symptoms mostly in the neck, often worked with their head bent sideways and rotated more than 15 degrees. On several occasions they were close to the extreme range of movement (7). The difference with respect to the position of the head was significant between dentists with and without pain and discomfort (17). In the analysis at the work place of the dentists with symptoms in the shoulders, it was found that, for example, "the arm" of the bridge with the suction and drill or "the arm" of the lamp was too stiff to be easily moved into the right position.

Concerning the ergonomic instruction it is probably necessary with more than five weeks to learn and practice a new way of work before it is possible to register the entire effect of the intervention.

Therapeutic treatment including discussions about psychosomatic reactions and individual ergonomic instruction gave better relief from pain and discomfort and an increased feeling of well-being than did ergonomic instruction alone. In the therapeutic treatment the physiotherapist has a possibility to analyse the cause of the pain and discomfort and to analyse whether the pain and discomfort is physical and/or related to the work or is of a more psychosocial nature. In the light of these facts the physiotherapist is able either to give advice on which therapy should be applied or which changes in the work environment should be proposed (21).

REFERENCES

1. Bejerot, E.: Dental piece work-inquiry of the psychosocial work environment. Department of Stress Research, Stockholm, 216, 1989. (In Swedish.)
2. British Association of Physical Medicine. Pain in the neck and arm: A multicentre trial of the effects of physiotherapy. *Br Med J* 29: 253-257, 1966.
3. Dyrssen, T. & Svedenkrantz, M.: Muscle training at disorders from the neck and shoulders, an effective treatment to reduce pain. *Läkartidningen* 88: 2116-2120, 1989. (In Swedish.)
4. Finer, B.: Existential pain a nuanced phenomenon? *Läkartidningen* 81: 3007-3008, 1984. (In Swedish.)
5. Fitz-Ribon, D.: Therapeutic traction. A review of neurological principles and clinical applications. *J Manipulative Physiol Ther* 7: 39-49, 1984.
6. Guilford, J. P.: *Fundamental Statistics in Psychology and Education*. 4th ed., p. 528, 1965.
7. Harms-Ringdahl, K.: On assessment of shoulder exercise and load-elicited pain in the cervical spine. *Scand J Rehabil, Suppl* 14, 1986.
8. Hagberg, M.: The influence of the work environment on pain and discomfort in the neck and shoulders. The Work Environment Fond, Stockholm, 1988. (In Swedish.)
9. Houge, N. H.: Physiotherapy in certain aspects of psychosomatic medicine. *Psychother Psychosom* 32: 302-305, 1979.
10. Huskisson, E. C.: Visual analogue scale. In: *Pain: Measurement and Assessment* (ed. R. Melsack). Raven Press, New York, 1983.
11. Katevou, K. & Aitasalo, K.: Skeletal changes in dentists and farmers in Finland. *Community Dent Oral Epidemiol* 13: 23-25, 1985.
12. Nitz, A. J.: Physical therapy management of the shoulder. *Physical Therapy* 66: 1913-1919, 1986.
13. Nordemar, R. & Thörner, C.: Treatment of acute cervical pain: a comparative group study. *Pain* 10: 93-101, 1981.
14. Rubenowitz, S.: The questionnaire PSYV, PAK. Department of Psychology, Gothenburg University, Gothenburg, Sweden. (In Swedish.)
15. Rubenowitz, S.: *Psychology of organisation and leadership*, pp. 1-95. Esselte Studium, Stockholm, 1984. (In Swedish.)
16. Rundcrantz, B. L. & Johnsson, B.: Cervical pain and discomfort among dentists. Part 1. *Swed Dent J* 14: 71-80, 1990.
17. Rundcrantz, B. L. & Johnsson, B.: Occupational cervico-brachial disorders among dentists—analysis of ergonomics and locomotor functions. *Swed Dent J*. Accepted for publication 1990.
18. Rundcrantz, B. L.: Occupational cervico-brachial disorders among dentists—psychosocial work environment, personal harmony and life-satisfaction. Submitted 1990.
19. Rundcrantz, B. L.: Cervico-brachial disorders—the influence of psychosocial factors on the results of treatment. Report at the Department of Physical Therapy, Lund University, Lund, 1985. (In Swedish.)
20. Steinbach, A. & Timmermans, G.: Personality changes associated with reduction of pain. *Pain* 1: 177-181, 1975.

21. Theorell, T. & Allebeck, P.: Socio-medical and psychosocial medicine. Studentlitteratur, Lund, 1987. (In Swedish.)
22. Åkesson, I.: Ergonomic investigation within the National Dental Service. Part II. A report from the Malmöhus District, 1976. (In Swedish.)

Address for offprints:

Britta-Lena Runderantz
Department of Physical Therapy
Box 5134
S-22005 Lund
Sweden