A recent overseas study tour provided an opportunity for observation of the physiotherapist as one of a team concerned with health care in the workplace. This paper presents impressions gained during visits to some overseas institutions and industries in Scandinavia and the United Kingdom. A number of roles are possible for the physiotherapist in the workplace, but the nature of the contribution made varies between countries. The special features of physiotherapy practice in some overseas industries, the practical problems faced by the physiotherapist in implementing ergonomic principles and some of the solutions devised by physiotherapists are described.

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Environment Committees', where employee representatives and both blue and white collar union delegates are in the majority when meeting with the professionals mentioned earlier. This communication with the workers is fundamental to all of the ergonomic processes in Volvo, and it recognizes that the worker has a first hand knowledge of the task and the workplace. It also acknowledges that without the worker's co-operation, few changes could be implemented successfully.

Swedish Physiotherapists have observed that unless the worker perceives the appropriateness of a possible solution during discussion, its incorporation into the workplace is probably subsequently ignored. This need to ensure that the workers themselves implement suggestions for improvement has also been a particular interest of the Institute of Occupational Health in Finland. Realizing that a research report itself is unlikely to reach the worker affected by the study, a series of leaflets was prepared for specific workplaces (eg typing). These draw the attention of workers to special features of their task, so that problems can be easily identified by the worker. Matching recommendations for simple corrections are also provided in the leaflet, which uses easily understood expressions and illustrations (Koskela 1984).

The preventive versus therapeutic role

The concept of industrial health embraces many aspects of care, both therapeutic and preventive. The balance between these two major roles for the physiotherapist varies between countries and between companies. For example, the physiotherapists in industry in Sweden spend 50 per cent of their time in the preventive role. In contrast to this, in the United Kingdom, most of the 200 physiotherapists working in industry offer therapeutic and fitness programmes, and only a few can offer advice 'on the floor'. Their contribution to prevention depends on the policies of the management. Indeed, in some cases, attempts to introduce preventive programmes too quickly has antagonized management, with subsequent curtailment of the physiotherapist's prevention activities. The reluctance of some people in management to introduce ergonomic principles led to the Doctor of Occupational Health Medicine in one large office in London, to emphasize the importance of 'sensitization' of management to the need for ergonomics and the advantages of its application. Believing that sensitization is an important precursor to the greater use of ergonomics, she carefully involves people who could be influential in introducing ergonomic principles, draws the attention of management to the incidence of problems and suggest ways and means of resolving them.

Injury Prevention

There are many facets to the preventive role of the physiotherapist. They include such responsibilities as job analysis, task design, personnel selection and placement, education, supervision of work methods, influencing motivation and attitudes, providing activity breaks and physical fitness programmes.

The thorough analysis of the physical aspects of a job is a task of considerable magnitude. It includes surveys of the nature of the task, the work layout and the work environment. But it also involves a comprehensive evaluation of the worker's method of performing the task.

Job analysis should be approached from two angles. One is the analysis of the work site itself and the other is the analysis of the physical and mental demands on the worker. At the moment there are several approaches to analysis. In Sweden, for example, the National Board of Occupational Health and Safety devised a system for describing work requirements, referring to fifteen factors to be assessed, using a three-point rating scale. Such simple but comprehensive check lists appeared to be popular with some physiotherapists.

One aspect of job analysis involves a detailed quantitative study of work postures and this can be done in several ways. For example, the Ovaco working posture analysis system (OWAS) was developed in Finland for the identification and evaluation of unsuitable working postures. During the first stage of this procedure, observations of the work are recorded by the physiotherapist at regular intervals (usually every thirty seconds), using coding digits which refer to previously defined basic postures. These records are then summarized into an overall posture which is classified according to the strain it imposes on the musculo-skeletal system. Recommendations for the type and timing of action to be taken depend on the degree of strain perceived (Karhu 1977).

In a new Swedish system, termed 'Arban', details of the work place are recorded on videotape or film, and the posture and load on the body are coded in a series of 'frozen' situations for computerised analysis (Holzmann 1982).

A simpler method named VIRA was developed at Ericsson's Telephone and Communications Systems, by the chief physiotherapist, working in conjunction with the National Board of Occupational Safety and Health. This method focusses specifically on movements and postures of the arms and head during short-cycle seated assembly work with relatively rapid repetitive arm movements. It involves a type of frequency study in which a video technique registers movement patterns subsequently analysed by microcomputer (Persson and Kilbom 1983).

Another approach which eliminates the need for the physiotherapist's manual recording of the operator's work posture has been the subject of research in Holland. This provides quantitative data on the curvature of the spine throughout the day. From the
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Despite educational sessions and careful design of the workplace, the workers can still circumvent the prophylactic process. For example, in the Volvo factory, the assembly of the car worker completes his task in two or three minutes. The car moves to the man so that at his designated station, he works at appropriate heights and relationships and he has at hand the necessary tools. However, the skilled assembler seldom takes the time generously allocated for the task, so he practises what is called 'working up'. That is, he moves back progressively to oncoming cars to complete his task on each of them. This means that he works in a station not designed for the task and at which appropriate aids have not been provided. So the worker chooses to take on work which is more strenuous and more likely to produce strain, in order to save time. Physiotherapists have learned that they must accept 'working up' to some extent and therefore they make plans for a program of five minutes of each day are allocated to an exercise programme designed by the physiotherapist. At Ericsson's, a company that has been introduced in some car factories where several men work in a team to complete a major task on the car. This demands a variety of work postures and provides a variation in work routine. In such circumstances sickness absence and incidence of physical problems have decreased markedly (Malstrom 1983).

During the past few years, the concept of pre-employment screening has attracted interest. In some firms in the United Kingdom a form of screening is undertaken by medical and nursing staff, who identify factors such as skin, respiratory or back problems which would preclude the placement of the employee in certain occupations. In Sweden, the workers' union does not permit either pre-employment screening or a probationary period.

One of the most important roles of the physiotherapist in industry is in the education of various categories of people. Courses can be offered to the new employee, the worker in general, workers in specific areas, workers suffering chronic back pain, employees in special circumstances (e.g. ageing, disabled), safety officers, foremen and to managers. Naturally, the physiotherapist must direct the course work according to the special needs of each group.

In the large factories in Sweden and Finland, several physiotherapists are employed as part of the Occupational Health team. This allows each physiotherapist to take responsibility for one section of the industry and to spend time with the workers in one area. The readiness of foremen and individual workers to approach the physiotherapist on the factory floor demonstrated the acceptance of the physiotherapist as a consultant, advisor and supervisor.

The increase in the number of repetitive tasks requiring a static posture during their performance and the effect of industrial noise or tension have led to the physiotherapist's promotion of brief exercise periods during the working day. These can take several forms.

For example, attempts have been made to introduce 'Pause Gymnastics' in large industries in Sweden, whereby five minutes of each day are allocated to an exercise programme designed by the physiotherapist. At Ericsson's, the physiotherapist has found that women do not like to be observed by the men, who they say, make unnecessary comments to and about women. Even though the physiotherapist modifies the programme periodically, she finds that interest and cooperation soon wane.

Similar problems with implementation of Pause Gymnastics have been found in the Volvo plant. While it is not possible for physiotherapists to force workers to participate, it is also difficult to find figures which would demonstrate that it is economically justifiable to stop production for five minutes. For this reason, a six-month evaluation project involving female assembly workers in Pause Gymnastics during work time with full pay has recently been commenced. Volvo physiotherapists also find that although men are happy to go jogging after work, they will not participate in the more varied exercises of Pause Gymnastics.
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As an alternative to the relatively unsuccessful attempt at Pause Gymnastics at Ericsson's, the physiotherapist there introduced a 'mini pause', where the workers are encouraged to do four or five exercises each half hour. This takes about one minute and is designed to encourage relaxation of tense muscles. Women are particularly interested in this approach. Unlike the Pause Gymnastics which require a special space, exercises in the mini pause are carried out at the workplace. On the whole the mini pause is proving to be more successful in this particular industry than the longer break.

Many industries in which physiotherapists are employed overseas have a programme relating to stress and for physical fitness. For example, at the Ericsson company, one physiotherapist offers a weekly stress management programme for personnel from top management to the factory floor, with stress of various kinds. She talks about stress and offers a relaxation programme. Lunch hour talks by the physiotherapist on stress to sedentary workers in some large factories are not uncommon in the United Kingdom.

At the Central Electricity Generating Board and Marks and Spencer's Head Office in London, those employees over the age of 35 shown to have two or more coronary risk factors on initial assessment, attend the physiotherapy gymnasium three times per week during work hours, on a voluntary basis. This physiotherapy supervised programme is offered for three months, when a reassessment indicates whether a further three months need be offered. Patients keep their own record cards up to date and record their weight. Regular ECG monitoring is undertaken by the nursing staff. Home activities are also recommended on discharge (Lilley 1982).

At Volvo and Ericsson's, workers are able to use the exercise equipment in the Physiotherapy Department after working hours, but at the time of the visits these companies did not provide a routine physical fitness programme in company time. However, all employees were expected to have a screening test each five years, and those above forty annually.

In the Netherlands, the director of one large industrial medical service tried to introduce exercise programmes. But he found that the Dutch people thought it was embarrassing to do gymnastics in the lunch hour and that 'you would have to be neurotic to be occupied with your body in that way'. In some physiotherapy units in the United Kingdom, for the young and fit (less than 30 or 35), the physiotherapist offers a programme of aerobics in the evenings.

One method of providing an opportunity for relaxing muscles at the work place is the institution of job rotation. However, the success of the approach tends to depend on whether the employee is being paid for the number of items completed. Where this is so, the dextrous employee develops great speed at assembling the one item for which she is employed and is often reluctant to be moved to another task where she has less skill and therefore less earning power. But where the day's production quota is set (eg in car assembly), the possibilities for rotation are greater. In such cases, job rotation is promoted for the purpose not only of providing a change in physical demands, but also of ensuring that interchange is possible in times of sickness. The newer approach to assembly in which men perform several tasks on the one vehicle provides an inbuilt form of job rotation.

Therapeutic Activities and Rehabilitation

The advantages of having a physiotherapist on-site in industry for therapeutic purposes have been expounded many times. The adequate provision of physiotherapy at the worksite means that treatment is available immediately, that it can be given as frequently as necessary and that it may be scheduled at times most convenient to the employee's work programme. The physiotherapist can provide immediate treatment in the acute stages, more prolonged care for those who develop a chronic condition and can offer advice regarding the placement of disabled workers.

Patient Treatment

It has been shown that intensive physiotherapy applied in the acute stages of occupational illness or injuries is desirable for rehabilitation and that it limits the total period of treatment. All Physiotherapy Departments in industry overseas were well equipped for this early care and some spent the greater proportion of their time in treatment of acute conditions. This was the case in many industrial physiotherapy units in the United Kingdom. In some areas, though, therapeutic care has been moved out of the industry. For example, at the Head Office of Philip's Industries in Holland, a large Department of twelve physiotherapists once employed to care for employees at work was disbanded in 1980. Currently, that particular Philips office employs only one part-time physiotherapist to contribute to prevention of injury (Asselbergs 1984).

The two areas of the body reported by physiotherapists in industry as having the highest incidence of complaints were the back and the neck. At Volvo, the patient sees the company Nurse first. If she considers it necessary, she sends the patient to the physiotherapist where the patient is likely to be lent a back corset immediately, and given a special information pamphlet on the back and neck problems. As soon as possible physiotherapy is given.

I found that attitudes to the use of a Back School as part of the management of the back patient varied both between and within countries. The term 'School' refers to structured programmes, based on an ergonomic approach, for the education of the worker in methods of back care and prevention of further injury. The first of these was the Swedish Back School, developed by Zachrisson, a physiotherapist. The original programme consisted of
four weekly audio visual lessons, but most institutions have modified the original concept. For example, at Volvo, finding that four lessons over a month resulted in great participant loss, the physiotherapists compressed their material into two lessons of sixty minutes each. Other physiotherapists assert that thirty minutes is the maximum time they could expect the workers' attention in this type of class. As it is, it was noted that many of the workers fall asleep during the audio-visual presentations.

It was emphasized that audio-visual aids must relate to the patient's own work site. For this reason, some factories have produced their own series of slides and videos rather than use the stilted approach of the original School. Some separate patient groups into blue collar and white collar workers, so that relevant illustrations can be used. The need for patients to discuss their back problems openly, as part of the therapeutic process has been acknowledged. In fact, in New York, an additional session has been added for this purpose.

By no means all physiotherapists in industry or in clinics working with back patients use a Back School. Many maintain that individual physiotherapy is more important, claiming that their total management of a back patient includes advice about mechanism of injury, and methods of protecting the spine and preventing further disability. In the view of many, Back School groups do not work. Further, many of the physiotherapists who do incorporate a Back School into their total programme express doubts as to the real value of this approach. They question the ability of patients to absorb and remember new material such as Anatomy, Biomechanics and Physiology in one brief lesson, even if they have given their full attention to the instruction.

It is interesting to note that at Ericsson's, a theory test is given after the programme. In addition, a video records the patient's movements at the first and last sessions to determine any improvement. While videos have proved useful in demonstrating to the patient how he is doing the exercise, as a tool, they do not appear to have improved either his exercise or his lifting methods (Melin 1984).

It was proposed by the designers of early Back Schools that such worker education would help develop better work habits, make workers more aware of the knowledge gained in the Back School and show them how to protect their backs at home and at work. If the Back School were successful, improvements could be expected in degree of pain, fitness level, acceptability of pain and work habits. To determine if this were so, some studies have been mounted. The first of these, conducted in Sweden (Bergquist-Ullman and Larson 1977) revealed that sub acute low back pain was resolved to almost the same degree with extensive physiotherapy and use of the Back School. A more recent study at Ericsson's has shown that while all patients agreed that the knowledge gained in the Back School was important, the four hours of teaching did not change their behaviour towards work habits (Melin 1984).

There seemed to be little support for the use of the Back School for patients with chronic pain. This is reflected in the approach of the Orthopaedic and Industrial Centre in New York, where workers with back pain of less than six weeks duration are offered acute low back pain was resolved to almost the same degree with extensive physiotherapy and use of the Back School. The Back School provided a suitable vehicle for large scale organised education of the workers.

Neck problems were also very prevalent in industry. These occurred not only through the constant use of the video display units (which receive so much attention nowadays), but also in factories where women were engaged in fine precision work, dextrously assembling small components. Where Back Schools were part of a Physiotherapy Department's programme, Neck Schools were often also offered. As a rule, only two classes were given in this series.

Return of the injured worker to the workplace

Industrial physiotherapists also take an interest in replacement of the injured worker. An interesting rehabilitation measure in Sweden is the concept of 'fifty percent sick leave', where half salary is paid by the Health Insurance Board and half by the Company. This allows the patient to visit the Physiotherapy Department as required, and to work at his own speed, gradually retraining for the work situation. At Volvo, some special category patients (eg with heart conditions) may work only part time, while for the elderly, job sharing between two or three people is available. Further, a number
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of jobs in Volvo are specifically set aside for convalescents, to allow for their slower work pace.

Research

Research is one of the important roles of the physiotherapist in industry and there are several areas for fruitful involvement. These include surveys of the incidence of fatigue, pain or injury, basic studies of work postures or work movements and the development of new designs which acknowledge the limitations of worker capacity. Studies of factors contributing to work related injuries, or evaluation of specific preventive or therapeutic programmes are other areas for research. Major research projects are mounted by physiotherapists working within the Institutes of Occupational Health and Safety, and in Helsinki, Finland, physiotherapists in the Institute are active in a number of important ergonomics studies. The physiotherapists employed within the Department of Occupational and Industrial Orthopaedic Centre in the Hospital for Joint Diseases in New York are also initiating research studies in this field. It was gratifying to see that in some areas, the physiotherapists working within industry spend some time on research. The development of the Activity Matching Ability System (AMAS) was the result of a major research project undertaken by the Institute for Consumer Ergonomics in Loughborough. Carried out within the British Steel Corporation, this project aimed at developing and testing assessment techniques to identify jobs suited to the varying abilities of differently disabled production workers. Compatible techniques for assessing both job demands on the one hand and personal abilities on the other were developed (Watson, Whalley, Stead and McClelland 1983).

In Sweden, physiotherapists are involved in private consulting in ergonomics and, through funding from the Government Research and Development Resources, they are able to divide their time between research and commissioned work on ergonomic problems. Because of the Government funding, reports are made available to relevant industries. This introduction to ergonomic solutions has attracted some industries to seek assistance in applying ergonomic principles to their own problem areas.

Conclusions

It was gratifying to discover that in some overseas countries, the comprehensive role of the physiotherapist in industry is recognized. Although there are several countries in which the physiotherapist is employed on site, it is in Scandinavia where the physiotherapist is able to contribute most meaningfully in all of the areas yet described for our profession in this field.

I found stimulating to observe physiotherapists in action in large industries and was particularly interested to learn of the practical problems faced by physiotherapists when attempting to implement the principles advocated theoretically as being appropriate for physiotherapists in the workplace. It is hoped that some of these observations may be of interest to those physiotherapists working in this field in Australia.

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