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INDUSTRIAL REHABILITATION

It is now seven years since the inter-departmental committee on the rehabilitation and resettlement of disabled persons (the Tomlinson Committee) issued its report and recommendations which preceded the passing of the Disabled Persons (Employment) Act of 1944. Under Section 3 of this Act the Minister of Labour is empowered to provide "industrial rehabilitation courses" for persons who by reason of unfitness arising from injury, disease, or deformity are in need of vocational training. Since the Ministry's pioneer industrial rehabilitation unit (I.R.U.) was opened at Egham in 1944 much valuable experience has been gained, and the results have been so encouraging as to warrant the establishment of 12 additional units. These units are run in affiliation with Government training centres (G.T.C.s) at Birmingham, Cardiff, Coventry, Edinburgh, Felling-on-Tyne, Glasgow, Hull, Leeds, Leicester, Long Eaton, Manchester, and Sheffield. Each unit, together with an additional one recently opened at Bristol, has accommodation for upwards of 100 persons of either sex, but with the exception of Egham, which can take 180, they are non-residential. They are well equipped with workshops, gardens, gymnasia, and canteens, and are staffed by trained and experienced workers.

The type of patient most in need of rehabilitation has usually had a severe injury or illness resulting in a marked reduction in working capacity, with loss of self-confidence. For such cases progressive reablement or vocational training in the event of permanent incapacity is of the utmost importance after discharge from hospital. In planning such a course at an I.R.U. the staff are guided by recommendations from either the private doctor or the hospital, and individual requirements will vary according to the physical condition, temperament, and aptitude of the person concerned. The courses at the units have two chief aims—to restore confidence, both mentally and physically, by a gradual adjustment to working conditions, and to assess the suitability for selected types of work. The treatment consists in the main of graduated exercises of a remedial nature in combination with gymnastics, physiotherapy, and occupational therapy, the latter carried out in an atmosphere akin to that of industry itself, and with emphasis placed on real productive work rather than on the orthodox handicraft methods of the occupational therapist. Where aptitude is discovered for a skilled trade arrangements can be made for the patient to be transferred to a Government training centre for the necessary training to be given under the Ministry's vocational training scheme. The average time spent in an I.R.U. is 6–7 weeks, but if need be this can be extended to 12 weeks. Each unit is under the control of the manager of the G.T.C., and the staff includes a rehabilitation officer with industrial and administrative ability, a vocational psychologist, a social worker, a chief occupational supervisor, and a disablement resettlement officer (D.R.O.).

A total of 13,213 persons have passed through these centres since the inception of the scheme, and 66% of these were referred by general practitioners or by hospitals. The remaining 44% were offered industrial rehabilitation at local offices of the Ministry of Labour through the D.R.O., who is concerned with the placing in suitable employment of all those who have passed through the unit and of others with a permanent physical handicap. The D.R.O. has special training for his work, and he is always available to interview in private a disabled person who applies for assistance at the employment exchange, where he is informed of all vacancies notified by local employers, with whom he keeps in close touch. He is also available at the medical interviewing committees which have been set up at selected hospitals to assist in finding the right work for the seriously disabled. A simple recommendation by a doctor to the employment exchange that his patient is in need of industrial rehabilitation is all that is necessary to enable the local D.R.O. to apply for a vacancy in the nearest industrial rehabilitation unit. After a job has been found for a patient who has been through a rehabilitation course the D.R.O. follows the case up in order to ensure that resettlement is successful. Over 80% of persons who have completed a course have been satisfactorily placed, 14% of these having received training in a skilled trade under the Ministry's vocational training scheme. Any person over the age of 16 is eligible, and maintenance allowances on a graduated scale, depending on domestic and family circumstances, are payable, free from tax, while training is being taken. Similar

1 *Ministry of Labour Gazette*, May, 1950. See also annotation in the *British Medical Journal*, 1951, **1**, 518.
2 Napier, J. R., Barron, J. N., Gregory, T. P., and Thompson, D. R., *British Medical Journal*, 1947, **2**, 203.
3 Plewes, L. W., Barron, J. N., Thompson, A. R., and Hewell, H. H., *Lancet*, 1948, **2**, 699.
4 Thompson, A. R., *Brit. J. phys. Med.*, 1949, **12**, 114.
5 Thompson, A. R., in *Recent Advances in Physical Medicine*, edited by Bach, F., 1950, London, pp. 403–22; 440–8.

facilities for the blind are available at the Ministry's residential centre at America Lodge, Torquay.[1]

Of no less interest is the part now being played by some of the larger industrial undertakings in the rehabilitation of their own workers.[2-5] Here the physical and psychological rehabilitation of employees injured at work or elsewhere, as well as those who are disabled by disease, is shared between the rehabilitation department of the hospital and the remedial workshop set up in the factory itself. In such factories the place of the D.R.O. is taken by a rehabilitation superintendent with an engineering and industrial background, who acts as the liaison officer between the hospital and the factory, working under the direction of the industrial medical officer. Such a project, however, requires close co-operation between the industrial medical department and the hospital, supported by an enlightened general-practitioner and consultant service and by a management prepared, under suitable guidance, to place the resources of industry at the disposal of the medical profession. The results achieved have been very encouraging and suggest that for most types of injury, whether encountered in industry or elsewhere, engineering methods can go a long way in replacing the conventional type of occupational therapy in the restoration of function within the patient's own working environment.

ULTRASONICS IN DIAGNOSIS AND THERAPY

Although ultrasonics were first tried in medicine about 1927 it is only in the last three years that there has been a flood of papers on the subject, principally from Austrian and German workers, to which the reports of the international congresses held at Erlangen in 1949 and Rome in 1950[1] provide some guide. Sound or sonic energy is a form of mechanical energy transmitted through matter as vibrations or propagated waves. Particles of matter are displaced back and forth longitudinally in the medium, producing in it alternating zones of pressure and rarefaction. If the frequency of vibration is above 20,000 cycles per second this energy is called ultrasonic. For medical purposes frequencies from 800 to 3,000 kilocycles per second are generally used, produced from quartz crystal oscillators. This makes use of the so-called piezoelectric effect shown by certain crystals, which when placed in an alternating electric field proceed to change shape (i.e., to oscillate) with the same frequency as the field, and thus to produce high-frequency vibrations. Similarly, a magnetized rod held in an alternating magnetic field is set into vibration by the field and emits ultrasonic vibrations from its ends. This magnetostrictor, as it is called, produces ultrasonics of higher energy but lower frequency than the quartz oscillator.

The biological effects of ultrasonics have been extensively studied, and varying conclusions have been reached. It is, however, generally recognized that the principal effects on living tissues are mechanical, thermal, and chemical. In therapeutics mechanical and thermal effects are probably of equal importance, chemical effects being difficult to assess outside the laboratory. The best picture of the mechanical effect seems to be that put forward by von Sanden.[2] He compares it to the result of shaking a sieve full of stones. The stones will pass through the mesh during agitation but not if the sieve is held still. Similarly the rate of diffusion through semipermeable membranes in the tissues under the influence of normal osmotic and hydrostatic pressures is greatly increased by the agitation of the ultrasonic field. The thermal effect is greatest at interfaces between tissue layers, as at fascial planes, joint capsules, and the periosteum of bone. In this way heating by ultrasonics differs from that of the various forms of diathermy and microwaves. The combined result of thermal and mechanical effects is therefore hyperaemia and greatly increased exchange of tissue fluids, with consequent increase of local metabolism. Chemically the acceleration of oxidative processes is probably the main effect.

Many other phenomena are known in laboratory practice and have been used in industry—for instance, the detection of flaws in metals by the reflection of ultrasonic beams. Gross destructive effects, due to heating and to the phenomenon of cavitation, with splitting and fragmentation of tissues, can be produced in plants and animals but require much higher energies than those normally used in ultrasonic therapy.

Thus the logical application of ultrasonic energy in treatment seems to be in the promotion of local inflammatory reactions and particularly the softening, by hyperaemia and diffusion, of fibrous tissue deposits. Analgesic and spasmolytic effects have repeatedly been observed in the treatment of muscle and nerve lesions and there is evidence of peripheral autonomic effects when ganglia are exposed to the ultrasonic beam.

1 *Der Ultraschall in der Medizin*, 1950, **2**. Edited by K. Woeber. S. Hirzel Verlag, Zurich. Contains a list of 678 articles on the subject in various journals.
2 *Practice of Ultrasonic Therapy*. G. Barth and K. von Sanden. Translated from *Aerztliche Praxis*, 1950, **2**, 9, 11, 21, 29, 30. Siemens, Ltd.
3 *Archives of Physical Medicine*, 1950, **31**, 6. See also *American Yearbook of Physical Medicine and Rehabilitation*, 1950, and the international review section of *Occupational Therapy and Rehabilitation*.
4 *British Medical Journal*, 1950, **2**, 1107.
5 Wild, J. J., and Neal, D., *Lancet*, 1951, **1**, 655.
6 Ballantine, H. T., Holt, R. H., and others, *Science*, 1950, **112**, 525.