Pain and the regeneration of whole movement

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This paper presents a novel hydrotherapy-based movement reeducation system which brings rapid improvement to back-pain sufferers showing typical musculoskeletal problems exhibited by over-35s (regardless of injury or disability). The Edwards System program for overcoming the chronic intractable benign pain syndrome has five phases: establishment of the stress-free reference frame (SFRF); reintroduction of perfect-quality movement (PQM); aerobic upgrading using the staged MediSwim; generalization of the SFRF to the normal gravity environment; activity reeducation through movement awareness. Pain evaporates under patient control through experience of the program, and much of the freedom, flexibility, and fluidity of the movement associated with youth is regained. The program is in accord with principles derived from the psychonomic theory of learning described by Burton (1990a, 1990b), and the success with several thousands of patients supports a particular conception of the origin of musculoskeletal pain, consistent with its evident amenability to direct psychophysical control.

This paper describes the outcome of a 2-year study and revision of an unusual but very effective hydrotherapy program developed by one of us (J.A.E.) for the treatment and rehabilitation of chronic back-pain suffering. The program was developed in a rehabilitation hospital environment as one of several treatment modalities; subjective patient reports as to the particular effectiveness of the hydrotherapy component of their overall treatment led to a joint investigation and refinement of the program. From the outset of this study, it seemed likely that the quite novel and unusual activities devised by Edwards for her program were responsible for its effectiveness. The very novelty of Edwards's activities for the patient seemed to provide access to pain-free and relatively fluid movement, in sharp contrast to the guarded and painful movement patterns typical of most patients presenting in this hospital setting. The initiation of this study coincided with the development of the psychonomic theory of early learn-

ing (Burton, 1990a, 1990b), which accords great prominence to novelty. The theoretical insights from this theory, combined with J.A.E.'s extensive practical experience, enabled us to identify early transitory elements of the original program as candidates for articulation and refinement into the first two phases of the present program, called the Edwards System for the Regeneration of Whole Movement. We consider the development of this program to have been exemplary of the benefits of strong interplay of theory and experiment.

The new program surpasses the effectiveness of an already valuable system devised by Edwards, and our experience of it with many hundreds of chronic musculoskeletal pain sufferers in the hospital setting leads us to be confident that the new program is almost universally applicable. The program is now taken by inpatients as part of their overall treatment in the hospital, and by outpatients who enroll specifically in the Edwards System program.

The program is typically dramatically effective in its noninvasive psychophysiological approach to pain management. Within the first hour of the program, even patients with more than a decade of chronic back- or neck-pain suffering can feel their pain dissolve and learn that their pain is *elective*.

The working hypothesis behind the development of the new program is that habitual and unrecognized overload of the brain $\leftrightarrow$ muscle *two-way* 'communication traffic' of the spinal cord is the physiological progenitor of benign pain. The Edwards System is aimed at identifying and eliminating the overload in each such circuit of the musculoskeletal system, and the means by which this is achieved is direct patient modification of this brain-body communication traffic associated with muscle spasm. Since the patient is typically quite unaware (Mixon & Bur-

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ton, 1989) of the source of his/her pain problem, the Edwards trainer's role is to help the patient uncover for conscious intervention the habitually present but disguised problems of their musculoskeletal system.

In view of the continuing debate on the 'peripheralist' versus the 'centralist' concept of chronic pain, we hope the present work will help broaden the debate to incorporate our dynamically interacting, 'hidden overload in two-way communication' concept of pain, and that the Edwards System will be found useful in the thousands of pain-management centers that have been established around the world over the last 15 years (Aronoff, 1988) to deal with, among other problems, the chronic intractable benign pain syndrome.

On the evidence so far, the Edwards System's unique pool-based rehabilitation program should be more widely assessed for its theoretical elegance, its practical efficacy, and its universal applicability.

DEVELOPMENT BACKGROUND TO THE EDWARDS SYSTEM

In general, back-pain patients are a difficult group for medical practitioners to deal with. Often no specific cause or localized origin of the back pain experienced is manifest, so efficacious intervention may be extremely difficult to predict. A protracted series of surgical interventions which prove ineffective at eliminating or ameliorating the pain problem leads, in some cases, to an escalating tension or to adversarial conduct between doctor and patient. In this situation, doctors suffer their patient's mistrust while patients are mostly 'locked in' to the one doctor by an unwillingness to undergo a second 'search and discovery' program of doubtful efficacy. It can happen that a patient may appear to be malingering and therefore to be treated pejoratively. Symptom relief through analgesics is of course available. Without identification of the root of the problem, such a course can lead to prolonged exposures to powerful drugs, a situation neither doctor nor patient relishes. Symptom relief through manipulative therapies can be effective though also transient.

Against this general backdrop, 5 years' experience (at the Lawrence Hargrave Hospital, previously the Illawarra Rehabilitation Centre, IRC) of work in a prescribed multi-component rehabilitation program with several thousands of patients has brought consistently good patient response to the pool-based component devised by one of us (J.A.E.). Most patients suffer either work-related injuries or chronic musculoskeletal pain stemming from diverse categories of accident or injury.

The individual history and nature of each patient's presenting difficulties makes a detailed factor analysis of treatment components virtually impossible. At the same time, a controlled study to verify the widespread belief among patients of the Centre in the efficacy of the pool-based component of treatment as compared with other components was rendered impractical, since withholding this segment of treatment from a control group within the

confines of a small hospital was injudicious. Despite the absence of quantitative measures of the efficacy of the pool-based segment of the rehabilitation program, an outside observer cannot fail to be impressed by the enthusiastic patient response to the almost universally applicable program devised and implemented by Edwards, despite its apparent simplicity.

The incidence of work-related back and other musculoskeletal injuries presenting at the Centre ranged from heavy-unskilled to light-skilled workers often engaged in lifting, reaching, and bending workplace activity. For this reason, the patient population is skewed toward the middle and lower socio-economic groups. A review of a representative cross-section of 30 present and past patients who experienced the pool-based program confirmed this impression. Nevertheless, all patients of the sample proved to have formed very clear personal views as to the value of this particular segment of their rehabilitation. After discharge, many patients elected to continue the pool program on an outpatient basis, or, alternatively, found other pools nearer home in which privately to continue. Written testimonials by this sample of IRC patients contain much evidence which reflects favorably on the benefits they feel they have derived from their involvement with Edwards's rehabilitation methods in the IRC pool.

A review of the medical and rehabilitation histories of this small cross-sectional sample, together with written reports and in some cases interviews with the patients themselves, led to a number of extensions and refinements of the original program. One effect of the review was to bring about an action research paradigm to both increase its practical efficacy and to better relate the program, where possible, to other movement reeducation programs, such as those devised by F. M. Alexander and Moshe Feldenkrais. As a consequence but in contrast to such programs as those, theoretical issues thought to underlie the particular success of the Edwards program in effectively dealing with a wide variety of musculoskeletal pain could be more thoroughly researched and developed. This led to the articulation and documentation of the introductory two phases of the present program, guided by the theoretical framework devised by one of us (Burton, 1990a, 1990b).

Work-Related Injury Sufferers in the Post-35 Age Group

Pain related to musculoskeletal injury and distress in the 35+ years group often seems to be nonspecific in its origin: many patients have pain that cannot be traced to a specific physical cause, despite its debilitating nature; upon assessment, many patients prove to have had prior injuries, most of which seem totally unrelated to their present pain; and in most patient histories, injuries are *not* due to impact, but instead occur through movement, sometimes associated with lifting, bending, or twisting.

Interaction with, and personal supervision of, each patient in the early stages of the pool-based segment of their rehabilitation enabled Edwards to make the following general observations concerning this large group of pa-

tients, irrespective of their presenting musculoskeletal problem: (1) Most have been inactive outside of work activities for many years; (2) most of those treated at the IRC have been extremely stiff and inflexible; (3) most have extremely poor body awareness and coordination; (4) most significantly favor either their right or left side; (5) most are poorly aligned when standing; (6) most float 5°–10° off-center laterally when floating on their backs; (7) most brace their bodies prior to any movement; (8) most have extreme neck-and-shoulder stress reaction that increases during movement; (9) many low-back-pain sufferers suffer chronic neck pain; (10) most find it difficult to initiate leg movement without accompanying arm movement, and leg movement is automatically reduced when arm action is introduced; and (11) most have very poor ankle flexibility.

General observations of the preceding type are unlikely to be as obvious to interviewers confronting a fully clothed, seated patient who typically is preoccupied by a number of distressful symptoms. The *active* pool-based program undergone by IRC patients permits such close scrutiny. Unremarkable as these general observations may seem in the context of any aging population group, it is striking that in the IRC pool-based program many of these more general symptoms begin to disappear. Measure of their evident evaporation, at least for some time, during the course of quite brief exposures to our pool-based rehabilitation activities is to be the subject of a future detailed study. Against the expectation of some staff and the majority of patients, disappearance of most of the described general ills of each patient's suite of symptoms accompanies pain diminution and the enlivening remobilization facilitated by the pool-based program.

An Example of Involuntary Reflex Patterning

Patient A presented for pool-based treatment; his referral letter was quite straightforward, but his affect and appearance was that of a grossly deconditioned, debilitated, functionally disabled person. Upon enquiry as to his condition he reported: "I have three fractured discs in my back." The patient was obviously in extreme pain, and his face reflected intense suffering. The referring medical officer in charge of his case was immediately contacted to find out if there should be any change in procedures. The answer was that the injury had occurred 10 years earlier! To this man, his injury was as real on the day he arrived for treatment as it had been a decade before.

This man was literally riddled with a protective reflex patterning. It was some weeks and with a great deal of psychological support that he began to gain the confidence to simply *move* again. The early stages of the (then) Backswim program were quite painful for him, but his improvement accelerated as he regained confidence to move freely. Over a few weeks of the program, his pain subsided. He had suffered 10 years of debilitating pain virtually for nothing.

The Edwards Pool Component Compared with Conventional Hydrotherapy

The dramatic alleviation of symptoms in this case and others is not merely the result of the patient's participation in programmed pool exercises that readers may expect to be typical of most hydrotherapy. Important as was the original pool-based exercise component in the Edwards System, it is now the third phase of kinesthetic upgrading within the System. Pool-based exercise is preceded by crucial psychophysical reawakening stages which comprise the initial phases, 1 and 2, of the present Edwards System. Indeed, the exercise component of the Edwards System has now gained a special and apparently universal efficacy from the unique nature and staging of the precursor phases.

The pool component of the Edwards System represents a complete rethink of conventional hydrotherapy exercise programs. It is both a revision of, and an extension to, such programs. In essence, it relies on completely novel activities, coordinations, and exercise repertoires. Thus the Edwards pool program is quite unlike conventional hydrotherapy treatment. Differences are not there for the sake of difference, but for their direct role in pain rehabilitation. Before describing further the actual contents and staging of the Edwards System, however, it is desirable to review some problems and difficulties associated with conventional hydrotherapy. The Edwards System has been refined to take maximum advantage of opportunities the water medium affords, and these are considered critical to the introduction of whole-movement regeneration. Nevertheless, a review of the more commonly seen drawbacks to the water environment for rehabilitation is apropos. As may be seen, the Edwards System converts into opportunities some of the worst 'drawbacks' of the water environment.

The Water Environment: Drawbacks and Opportunities

We are all instinctively and habitually adapted to the weight-bearing environment of the ground, which forms the customary rigid, rather than mobile, surface upon which to base normal movement. The transition to a buoyant, gravity-reduced, mobile water environment is initially unfamiliar and destabilizing. The unfamiliar water environment may produce a fear reaction of the same order as falling. Since survival skills in the water are not instinctive, they must be taught. Swimming instruction is the culturally accepted introduction to water skill.

Children generally receive swimming instruction at an early age, over a relatively short and stressful period, with emphasis on survival against the risk of drowning. Increased leisure activities associated with the water are a normal feature of increasing affluence, but only in recent decades have children had much opportunity, for the most part, to progress beyond this survival stage. Complete ease and control in water is by no means a universal skill in

the current adult population. The incidence of fear and avoidance of water tends to increase with age group in those studied. In fact, many post-35 adults were found never to have learned to swim. Of those who swam, most had in fact not passed the 'survival' stage.

Of those who at some stage had learned 'survival skills' in water, most tended to exhibit quick repetitive movements, movements often jerky and uncoordinated in appearance. Stamina allowing, their typical response was to fight to remain above water. They resorted to familiar weight-bearing stabilizations, thus showing little or no accommodation to the water environment; this, despite the fact that use of flotation or buoyancy required less exertion, was less tiring and often less painful.

For these reasons, possibly exacerbated by memories of unpleasant experiences in water, a large segment of the adult population can be presumed to have become disinclined to spontaneously engage in water-based activities for exercise or pleasure, and may actively resist any form of hydrotherapy in case of injury or distress. Under such circumstances, mere advocacy of water-based therapy by professionals is unlikely to bear fruit. Arguments that water is a relatively weightless environment, that, unlike earth and pavement, it absorbs impact and can be very relaxing when heated to a comfortable temperature can, and often will, prove unpersuasive.

Yet water's mobility, coupled with low viscosity, affords a wide range of movement, particularly while bodies remain buoyantly suspended, as in the first phases of the Edwards System. The Edwards System is designed to take advantage of this throughout its early stages in order to cement the changes in physiology and attitude which will bring lasting relief from recurrence of back pain. Only in the third phase of the program, using water's resistance to movement, do we take advantage of the possibility of muscle-strengthening and aerobic upgrading through increasingly intense exercise to produce ancillary benefits.

Throughout the following outline of the Edwards System for the regeneration of whole movement, the word 'exercise' is used in a descriptive sense. It should not be taken to imply the mindlessness of some repetitive exercises or high degree of vigor. In fact, precisely the opposite senses apply. Mindfulness and subtlety are the appropriate implications to draw from our use of this term.

THE FIVE PHASES OF THE EDWARDS SYSTEM

The first three phases of the Edwards System comprise the pool-based segment of the overall program. The final two phases represent both a generalization and a managed transition of the lessons and gains from the pool environment to the normal gravity environment. Phases 4 and 5 are designed to generalize principles established in the first three phases of the pool-based program across to the whole spectrum of patients' normal, everyday activities, and they draw from the work of Alexander (1974) and Feldenkrais (1972, 1985). We believe that such programs become

much more effective within the setting of the Edwards System; since the general tenor of these approaches to movement reeducation in the normal gravity environment is well known, we concentrate, in this paper, on a water-based approach, both as an end in itself and as an ideal preconditioning for subsequent 'floor-work' and related activities.

At no stage in any phase is the patient either uninformed or out of full personal control of his/her own progress through the Edwards program. The whole upgrading process is characteristically noninterventionist in the medical sense. Furthermore, upgrading does not rely on drugs or physical or surgical manipulations. The focus of the program lies implicitly in the psychophysical domain, with the immediate goal being that the patient shall become released from perhaps subconscious constraints arising from his/her habitual movement and posture limitations. The Edwards System gives back to the patient full control over the whole of his/her musculoskeletal system (the 'hardware'), much of which typically and surreptitiously will have been lost by age 35. Absent but never before present will be the necessary principles and skills (the 'software') that afford effective, pain-free management of body use, principles that have emerged as the Edwards System has been developed and refined.

Phase 1. Establishing a Stress-Free Reference Frame (SFRF)

The first phase of the Edwards approach to whole-movement regeneration is aimed at establishing a reliable, obvious, and optional reference frame that can be invoked at will and against which all subsequent posture and movement refinements can be monitored and gauged. The importance of the initial reference frame is twofold.

First, the patient must acquire an internal monitoring system that in some way is absolute, that is, has non-arbitrary elements against which to feel, judge, and measure relative success or failure of new or relearned posture and movement skills at any stage of the whole reeducation process. Without such a reference system, impressions of success or failure will be of the 'shifting sands' type. Clarity of purpose will be lost and reliability of measurement dissolve, with the result that the patient can become confused as to the extent and significance of early gains. Such uncertainties destroy motivation. Even with the will, before long the patient can become unable systematically to monitor and manage his/her own movement reeducation, and so requires constant external tutelage.

The accessibility of a stress-free reference frame (SFRF), which can be established under direct personal control of patients so that continued involvement of the Edwards trainer is unnecessary beyond the initial stages, means that patients can become quite independent and autonomous in effectively monitoring themselves in the short to medium term. In the early stages, continuing support and guidance of the Edwards trainer is both necessary and desirable.

A continuous, but uneven, improvement by self-management technique complemented by intermittent referral back to the Edwards trainer may offer a practical solution in some cases, provided the patient in need of constant and regular external referrals to the Edwards trainer is not allowed to backslide. Each patient's progress will be made at a highly personal rate. For the system to be generally useful across a whole spectrum of widely differing cases and case histories, each patient must be enabled to make clear and unequivocal judgments as to when next to seek professional Edwards guidance. At every level, the patient must be able to satisfactorily monitor the level of achievement and beneficiation, so that it is always clear whether or not to (1) maintain self-management at the current level, (2) refer to reestablish previous gains, or (3) upgrade to a higher level.

The availability of the SFRF is thus essential for reliable self-monitoring and appropriate decision-making over the long-term process of rehabilitation through the regeneration of whole movement. Only with effective self-monitoring established for every patient can the Edwards System gain its cost effectiveness in allowing much of the time in which beneficiating activity occurs to pass without constant one-to-one patient supervision.

Second, the ability to first reach the SFRF creates the *benchmark of meaning* for all subsequent communication between trainer and patient. The unequivocal and absolute nature of the SFRF ensures the quality and effectiveness of vital patient-trainer rapport and strengthens the basis of all subsequent communication. The totally unexpected feelings of peace, of being pain-free, and of utter relaxation that accompany the SFRF at the outset of the Edwards program greatly strengthen the bond of trust and confidence between the patient and the Edwards trainer. Naturally the quality of the patient-trainer bond influences the pace and effectiveness of patient improvement. The lack of such a shared reference frame, together with attendant weakness of the patient-trainer bond, may well be a factor in the failure of a number of long-established posture and movement reeducation programs to attract strong support outside of 'cult' circles. The introduction of the SFRF is undoubtedly responsible for the standard of effective communication that exists between patient and trainer in the system under review; in any case, it opens the door to the regeneration of whole movement.

Achievement of the SFRF in the Pool

The SFRF is approached systematically in the pool. In each of the two stages, 'hands-on' guidance by the trainer is essential; simple demonstration coupled with verbal instruction is inadequate in helping the patient to achieve the SFRF. Close, hands-on guidance of the Edwards trainer is essential to achievement of the SFRF simply because, in almost every case, the patient, regardless of age or history, will not have approached the desired state on a conscious basis. The beginning patient is treated as a complete neophyte on the assumption that until SFRF has

actually been experienced, no words adequately convey the wholeness of the SFRF feeling.

Stability Lift

The first stage of SFRF approach is based on the *stability lift* (SL) which we describe in detail. This involves the following steps:

SL1, supported float—The patient is placed and manually supported in a supine position, floating in the water.

SL2, hip floats—Hip floats are slid under the legs to support the buttocks region in the water.

SL3, neck support—The trainer positions his/her shoulder as support for the patient's head and neck in the water.

SL4, legs relaxed—The patient's elbows and knees are slightly bent to reduce the desire to brace in the unfamiliar position.

SL5, shoulder stabilization—The trainer's hands are placed under the patient's shoulders in a position of maximal advantage to stabilize the shoulder and the upper back.

SL6, eyes closed—The patient is instructed to close his/her eyes as if going to sleep. The eyes are to remain closed throughout the water-adaption process of achieving the SFRF and while in the SFRF.

SL7, security contact—The patient's shoulders and upper back are then drawn in toward the trainer's chest to provide maximum security and stability for the patient in the water.

SL8, take weight—The trainer then uses his/her own shoulder and hands as support to raise the patient's head, neck, and shoulders slightly above the buoyant level in the water. As soon as the patient's weight is felt, the desired height of the lift has been reached.

SL9, breathing monitored—At this point, the trainer focuses full attention on the patient's breathing pattern. The nature of changes to be monitored and the approach to the desired breathing pattern will be explained fully after enumeration of the steps of the stability lift.

SL10, relaxed breathing—The stabilized-lift position is maintained until the breathing-pattern goal is achieved and sustained by the patient without effort. The trainer interprets this as a conscious and subconscious acceptance on the part of the patient that, despite the unfamiliar environment, support, and position in the water, he/she feels safe, stabilized, and protected.

SL11, tension drain—After the goal breathing pattern has been maintained for some time, the musculature in the neck and shoulders begins to spontaneously relax; gradually, the rest of the patient's body reacts similarly. The patient's weight pressure on the trainer increases as the relaxation progresses. The patient's body becomes quite floppy.

SL12, independent floating—On completion of SFRF stage 1, the trainer slowly returns the patient to the supine floating position, but continues manual support of the patient until a neck flotation collar is applied to maintain reassurance. The combination of hip and neck flota-

tion aids ensures that the patient will float securely in this supine, now relaxed, position as long as is desirable.

Since the patient's breathing pattern in the stability lift gives an excellent indication of the patient's state of relaxation, the breathing-pattern goal is not defined in advance. Moreover, it appears certain that achievement of the breathing pattern is a consequence of the stability lift itself. The trainer's position throughout the stability lift facilitates close observation of the patient's rhythmic breathing pattern, which is the main external monitoring system as the SFRF is approached.

At commencement of the supported stability lift, trainers notice that patients' natural breathing pattern markedly diminishes in intensity. Such a fading and traversal of a transient phase of slight rhythmic pulsation at the base of the sternum—a pulsation similar to that which accompanies a high-stress or fear reaction—indicates transition to the patient's acceptance of the security of the stabilized lift. Early shallow breathing tends to give way to longer and easier breaths. However, it can happen that relaxed breathing can revert to the somewhat erratic, which the trainer notes as a return to 'anxious' pulsation near the base of the sternum.

Eventually a quite noticeable change in breathing occurs that normally is flagged by a deep, relaxed inhalation. Other signs include increased body pressure against the trainer's shoulder and maintenance of regulated, easier, and more gentle breathing. This style of breathing denoting internal feelings of security and safety is a precondition to moving on to the SFRF. Occasionally, patients need several experiences with the stability lift to reach this stage.

Relaxation Control

The second stage of SFRF approach is based on *relaxation control* (RC). This involves the following steps:

RC1, dynamic monitoring—As established in the stability lift, the patient remains in the supine floating position with eyes closed, supported by hip and neck flotation devices, while the trainer maintains light hand contact to initiate dynamic monitoring of muscle relaxation in the neck and shoulder region (DMNS).

The DMNS contact is a deceptively simple device that allows the trainer to monitor neck and shoulder muscle release (freedom from spasm) as the patient is quietly instructed to permit the trainer to take the floating arm (left or right) through *adduction*. The patient is asked to abstain from all voluntary arm movement or assistance. The floating arm is taken loosely by the wrist, gently moved or floated away from the body, then returned to the patient's side. If muscle reflex or resistance is felt by the trainer, as is almost universally the case despite the apparent relaxation of the patient, then a structured approach (stage 2 of relaxation control, or RC2) is initiated to identify which muscles are being subconsciously invoked in tension or maintained in spasm by the patient.

The stability lift will have brought the patient to a relatively high degree of relaxation by this stage; the initial

DMNS arm-adduction exercise serves as a baseline measure of the approach to absolute relaxation, providing the instructor with a tool to monitor improvement in relaxation beyond the initial, only relatively relaxed state of the stability lift. The DMNS arm adduction typically will reveal to the instructor the restrictions and resistances infiltrating what should be a fluid and free involuntary movement guided by the instructor.

The neophyte patient will normally be quite unaware of any problem in the arm adduction, precisely because the habitual reflex restrictions and automatically invoked resistances operate below the level of conscious awareness. Such is the nature of habit.

RC2, tension probing—In RC2, the trainer slowly and systematically runs a hand over the neck, shoulder, upper back, and finally lower back musculature of the floating and relatively relaxed patient. Hand movements are firm and investigatory but not manipulative or massaging. Since early SFRF will have already successfully relaxed a large proportion of the back musculature, the trainer readily discerns contrasting muscles which retain full or partial spasm. To find some of the problem areas, it is necessary to firmly and deeply probe beneath the superficial musculature.

The freedom from antigravity stress, the generally relaxed state, and the floating supine position are several elements of the preliminary procedure which, for the patient, facilitate a clear differentiation of the subconsciously tensed musculature from consciously relaxable musculature after the trainer first pinpoints instances of the former. This allows the patient to begin the systematic process of devising sensing strategies of his/her own which can pinpoint normally unperceived muscular stress.

The trainer's overall trajectory of analysis through this stage is not critical, since most patients, whatever their particular presenting symptoms, will have a range of spasmed muscles. In particular, habitual postural imbalances can lead to chronic but unnoticed spasm of tissue lying well below the superficial musculature, tissue amenable to investigation only when the overlying tissues have softened in relaxation.

This stage provides the patient with a first confrontation of the distance that their subjective, relatively relaxed state lies from a state totally free of muscle tension.

RC3, tension intervention—This is the part of the program in which the patient is first asked to consciously intervene in the process by focusing his/her mind on the area being pinpointed by the trainer.

Regardless of where the trainer first encounters muscular spasm in the patient's neck or shoulders or back, the procedure initiated by the trainer conforms to the same pattern. Adequate pressure is applied with the fingertips to the muscle exhibiting spasm to pinpoint for the patient each of the residually stressed areas in turn. Even if the patient remains unaware of the offending 'knot,' he/she will be asked to focus on the area being indicated by the trainer's hand pressure. For each such focal point, after first identifying the area in such hard and unyielding terms

as "ice" or "clay," the patient is asked to concentrate on that particular area while at the same time thinking of something very soft and pliable; the subject is asked to use his/her own imagination to reduce the 'ice' to 'water' or the 'clay' to 'putty.' In some cases, patients have chosen quite obscure visualizations with good results. The important thing is to reverse the physical tone by mental intervention while focusing the mind on the area.

Because of the patient's need to discriminate an area of musculature not normally sensible, the visualization exercise requires considerable concentration in the initial stages; most patients, however, have little difficulty in acquiring the necessary new awareness. The process initially requires the trainer's external indications of areas of tension; much later each patient can learn from his/her own little exploratory test movements of suspected areas of tension in order to discern specific areas to work on.

Because of the early absence of clear or familiar 'cause and effect,' the trainer's tolerant persistence is essential as the patient gradually learns to focus on the indicated muscle while shutting out distracting thoughts to concentrate exclusively on releasing the problem muscle. The patient must develop an adequate concentration span to deal with each problem area in turn, and if a particular area seems intractable or stops changing, it is usually because the patient's mind has wandered. Once the patient can direct and maintain mind focus to the tensed areas, with some practice the muscles respond quickly.

As muscle release and softening occurs, sometimes accompanied by a light flutter or pulsing, an involuntary change in the head and shoulder position of the floating patient usually follows. In some cases, depending on the degree of tension release, the patient's body will twitch or jerk in a manner not dissimilar to the movements that occur prior to deep sleep.

This process of imagery and self-suggestion as a means of directly diminishing muscle spasm becomes familiar to the patient fairly quickly. Later, with such expressions as "make it softer," or "let go," or "relax," the trainer can simply tell the patient to soften the spasm. The opportunity to repeat the process for a range of different muscles defines and consolidates the skill of tension control and serves to increasingly generalize it to the stage where the conscious intervention process can have a widespread effect of overruling subconscious tension.

However, while being initially trained to make associations between previously unnoticed muscle-in-spasm and auditory, visual, or kinesthetic imagery denoting soft, pliable, and relaxed modes, the patient must maintain considerable concentration. Specifically, the patient's evident prior lack of awareness of spasmed muscle helps bring sharply into focus his/her need to work with the trainer in learning to discriminate each such muscle from its surrounding musculature. This process of dissociatively recognizing each problem muscle element from its surroundings is necessary if the patient is to gain conscious control over the muscle's degree of tension and relaxation;

because of the trainer's role, the process is termed *guided self-monitoring*.

Regaining conscious control over previously unperceived muscles subject to habitual misuse or tension is a subtle process and may take some time, particularly for the novice patient. By their very nature, habitual movement and postural patterns derive from repetitive or routine activities, rigidities, loadings, or imbalances. As a corollary to the automation in habit from constant use or innumerable repetitions, misused and spasmed musculature becomes desensitized to free access by the *conscious* self. If the few proprioceptive or kinesthetic sensors which might be available to detect such a problem have never before been discriminated, or singled out for recognition, and if in addition these sensors become dormant through habit formation, the patient has literally to reconstruct a sensing path for each problem muscle if the process of personal intervention in the spasm is to be successful.

A case need not be made for the importance of the role biologically adaptive habit-formation plays and has played in human function and its evolution. Repetitive activities enable and support automation leading to successively higher degrees of human competence in abstract and conceptual as well as manual and bodily spheres. Yet, we see here that it is in the very nature of habit to hide much of the source of the low-grade, nagging musculoskeletal pain with which most of us become acquainted.

The breakup of inappropriate kinesthetic and proprioceptive habits so that they can be brought under conscious control is a design principle of the Edwards System. The deconstruction of coordinations which have become painful through overuse or regular overload or imbalance necessarily involves focusing on the elements contributing to the coordinations concerned.

Obvious as this principle may seem, adults often don't expect that ordinary day-to-day activities should require *any* mental effort on their part. By pinpointing previously hidden yet painfully stressed parts of *themselves*, the impact in patients' minds can be considerable. This stage of the Edwards System awakens patients to the general lack of bodily self-awareness at the same time as they come to recognize the potential for their own conscious intervention in pain due to habitual malpractice. Just as the message can be grasped as a general principle, so can the corrective strategies involved be readily taught.

The high degree of subconsciously maintained muscular spasm, as exhibited by patients after having overtly attained subjective but only relative relaxation, comes as a considerable surprise to most patients. To patients experiencing a normally unsurpassed state of relative relaxation after the stability lift, possibly even approaching euphoria if presenting pain has been chronic and severe, the discovery during the relaxation control stage of retained muscular spasm despite subjective feelings of relaxation can be sharply unexpected. In this situation, patients can immediately recognize that knowledge of their own tension states has been obviously deficient.

The stark disjunction between a patient's prior conception of a perceived state of relaxation with the reality of muscular spasm can create a sense of intrigue and positive anticipation of advantage to both trainer and patient in subsequent movement-reeducation sessions. Such anticipatory reactions—even when unspoken at the time—not only help to diminish a guarded, possibly quizzical affect of patients, many of whom arrive with a history of chronic pain and inhibited movement, but also testify to the elegance and effectiveness of early phases of the Edwards program.

Although patients are awakened to the potential for conscious intervention in these early stages of the Edwards program, this knowledge alone is insufficient unless it is complemented by modeling and training for the types of skilled interventions required. Such skill cannot be willed into existence without training. Accordingly, the next stages of the Edwards program were designed to implant this skill in each patient as effectively and as quickly as possible.

There are likely to be difficulties the first time patients are directed to consciously intervene in the control of a skeletal musculature problem; the task set is doubly novel and doubly difficult since the patients are neither accustomed to noticing nor accustomed to controlling the muscles that are normally imperceptible contributors to everyday activities as well as everyday misuse. And even as patients become able to control the first 'problem' muscles indicated by the Edwards trainer, the workings of the whole process can seem quite mysterious. The opportunity to repeat the process for a range of different 'problem' muscles defines and consolidates the early skill. It also convinces the patients that they really can regain control of their bodies. Since, in this context, body control is *pain management*, the realization can be an exhilarating one.

When this 'letting-go' process is directed at severe habitual tensing and spasm of the long paraspinal musculature, patients may jump or jerk quite sharply as the tension is released. Normally, however, external manifestations of the release pass unnoticed to an observer not in direct contact; trainer contact with the spasmed musculature serves to provide the patient with assurance of focal location while providing the trainer and patient alike with a direct monitoring of success in the softening process.

The Edwards trainer guides the patient in a systematic scan of likely problem areas, so that eventually the patient will have loosened, released, and relaxed all previous unnoticed tenseness. A patient's gain of conscious control of one muscle has little direct effect on neighboring muscles, which remain 'in limbo,' indicative of the degree of their dissociation. These neighbors may not automatically release in association with others, but usually can be brought into association to respond quite quickly to touch or pressure without specific visualization by the patient. The trainer normally takes note of the proportion of fatiguable and nonfatiguable muscles involved in

the process so that it may be related to both the patient's presenting state and to subsequent progress.

The general outcome of this guided tour of intervention in the patient's problem areas, perhaps at once obvious to the trainer though unnoticed by the patient, is that as these are brought progressively under personal control, the partially relaxed state achieved by the preliminary stability lift is progressively deepened. By concentrating on and controlling each in turn, the patient progresses through the release of various regions of muscle tension, from the initial relative and subjective state of relaxation of the stability lift towards a more absolute degree of relaxation that has trance-like or 'transcendental' qualities. Patients are encouraged to savor this experience and to practice the deepening of the absolute relaxation.

After all muscular tension has drained from the upper back, neck, and shoulders, and while still supported in floats in the warm pool environment, the patient is exhorted to progressively relax the whole body as, with eyes closed, he/she makes a slow scan from head to toe and back again to find any residually stressed areas. The patient by now will be learning to make tiny hypothesis-testing movements as part of the spasm-test repertoire; in common with almost all that has gone before, these will probably be quite novel in character or coordination. This is to be encouraged because if a basis for monitoring statically does not exist (as it does when the trainer is pinpointing a problem area), a basis for comparative monitoring must be created by inventing movements to support the required discrimination and sensory recognition.

Full relaxation means that the patient has achieved his/her first experience with the SFRF. The SFRF is the reference frame of absolute, rather than relative, relaxation characterized by a uniformly low-degree muscle spasm and concomitant low incidence of traffic of brain-body neural communication along the spinal chord. The SFRF is pain-free and corresponds to a complete relaxation of proprioceptors.

RC4, retention of SFRF—kinetic—This SFRF is the frame of reference against which the patient and the trainer must monitor the reintroduction of voluntary movement: *The objective throughout the successive stages of the reintroduction of more and more complex movements is simply that the SFRF remain undisturbed insofar as is possible consistent with the actual execution of (re)introduced movements.* Kinesthetically relaxed movement is sought which minimally disturbs the SFRF.

The importance of the SFRF lies in its absolutely minimal brain-body neural communication, a trance-like state that is voluntarily achieved and subsequently revisited when necessary. The state serves as the 'noise-free' backdrop for the reintroduction of selected voluntary movements. Against this backdrop, much of the habitual but entirely unnecessary bracing, readying, or tensing often associated with much adult movement can most readily be sensed.

At this point, the trainer returns to the DMNS arm-adduction exercise, and this time the trainer verbally indicates to the patient when a habitual reflex restriction or resistant point is encountered through the cycle. The instructor can quickly identify the area in the neck or shoulders responsible, and the patient is asked to refocus and relax the area under pressure during another arm-adduction cycle. The process is repeated until the patient's conscious intervention overrules the habitual reflex intrusion into the free adduction enacted for the passive patient by the trainer. Unconscious tensional habits of movement are revealed in this manner, and shown to be dispensable.

The patient begins to be able to exclude unnecessary or 'parasitic' coordinate movements. This problem of excessive or unnecessary conscription of parasitic intrusions to movement has been the subject of much study in the body reeducation programs initiated by F. M. Alexander and Moshe Feldenkrais. While the Edwards System shares goals (and to a considerable extent, the means) of reintroducing relaxed and fluid pain-free movement, accessibility of SFRF in the heated-pool environment enables even the novice patient to clearly discriminate 'good' from 'bad' movements. The usual inescapable 'noise' of brain-body neural communication associated with being in a strongly gravitational environment greatly increases the difficulty novices experience when attempting to recognize the sometimes subtle distinctions between 'good' and 'bad' quality of movement.

A clear image of 'good' movements in the gravitational environment can prove elusive. It may be that seemingly marginal gains perceived by patients early in the Alexander or Feldenkrais programs has detracted from their deserved popularity; this is discouraging to interested students of movement programs who would have heightened expectations from early success. For this reason, we advocate involvement in such programs *after* initial Edwards training has raised awareness of skills in body relaxation control. Transfer of Edwards pool environment skills to normal-gravity environments is our medium-term goal. An Edwards priming stage should enormously amplify perceived gains and realized progress in Alexander or Feldenkrais training.

RC5, consolidation—Occasionally the DMNS arm-adduction test is repeated. If resistance to this trainer-initiated movement is met, the verbal instruction "let go" is used and the arm returned to the side. This cycle is repeated until the arm passes freely and fluidly through a 180° adduction without resistance.

This repeated arm-adduction exercise trains the patient to recognize infiltration of habitual reflexes associated with simple movements and so gain conscious control of such infiltration. One instance of the adduction is insufficient for the patient to form a clear image of any problem. During further instances of the adduction, the initial task of learning to recognize undesirable elements of the movement is considerably facilitated by the 'low-noise' backdrop of the SFRF.

As F. M. Alexander clearly recognized, inhibition of these unwanted associates to the movement can be achieved most effectively by specific concentration on the *beginning* of each coordinated movement. Each usually quite automated sequence of elementary movement units may involve some unwanted elements that occur from the outset, some with deferred onset, or both. As an exemplar of extended movements, the arm-adduction exercise involves a series of movement units acting mainly in sequence but partly in parallel with generally partial temporal overlap, each element of the sequence being active at a different time during the overall movement. The slow, trainer-initiated, nonvoluntary activation to arm adduction facilitates recognition of the onset of any unwanted elements so that the movement segment into which they intrude can be identified.

Seen in this light, the DMNS arm-adduction exercise acts as the prototype of a general strategy of systematic self-analysis wherein problem movements of any kind may be scrutinized and if necessary restructured. Achievement of inhibition of common but unwanted muscular 'restraints' or unwanted associative motor elements within this prototype fosters in the patient a clear self-image of competence to improve other undesirable movement patterns. At this stage, the DMNS constitutes for the patient an exercise in *systematic noticing* of the typically subliminal structure-in-action of coordinated movements. This systematic noticing of problem movement elements is made more effective by the 'low-noise' backdrop setting of the SFRF. The term *dynamic self-monitoring* is used to signify noticing in this special context of the SFRF.

Dynamic self-monitoring of movement sequences provides the basis for the patient to bring problem locations and associated muscular elements in their discovered context to conscious and focal attention. Problem elements are thereby brought out from their hidden, habitually subliminal participation in highly automated volitional movement procedures. Only when brought into consciously independent '*existence*' separate from their incident context is it possible for problem movements to be deconstructed, allowing for subsequent reconstruction to be free of the unwanted elements.

RC6, managed inaction—horizontal—Once the DMNS procedure has been completed, the patient, still in the floats in the supine position and with the eyes still closed, rests essentially undisturbed in a fully reestablished sleep-like SFRF for approximately 10 min. To commence this stage, the trainer monitors the neck and shoulder area to ensure it is free of tension. If there appears to be any change in the floating position through this period, the patient is asked to "let go"; usually by this stage the patient does not require hands-on guidance to achieve the release back to the SFRF. If the patient does not respond, it is time to end the session and begin again the following day.

RC6 is a stage in which the patient appears to be in a deep sleep in the water. The body floats deeper in the water and a visible oneness of movement between the

body and the water is observed by the trainer. There are no patient movements at this stage; it is a novel state of managed inaction in a novel context which must become mentally comfortable despite any urge to act against the unfamiliarity.

RC7, retention of SFRF—vestibular—After the rest period, the patient is slowly brought to a more vertical floating SFRF. The patient is warned that the hip floats are to be removed and that he/she will be manually supported during their removal. Loss of hip-float support may trigger a reflex action to stiffen. To counter this urge, the patient is asked to allow him/herself to be repositioned in the water in a completely relaxed state. The degree of stiffening, clearly discernible by the trainer, is countered by appropriate guidance at the onset. The clear analogy of this *vestibular change* with the *kinesthetic changes* of the recently accomplished DMNS allows most patients to be readily repositioned to a more vertical plane with little disturbance to the SFRF state. The means of systematic improvement of posture and movement quality is the patient's closest possible maintenance of the SFRF through any change.

RC8, managed inaction—vertical—The patient is moved to the wall at the edge of the pool, at a depth of about 1.4 m. The patient is gently propped with his/her back resting against the wall; the legs are positioned in a monkey-like manner, as if in an arm chair, with the feet resting on the floor of the pool but taking barely perceptible weight. In this position, the arms should float freely without constraint. A neck flotation collar offers slight support as the patient's head is allowed to flop forward to a balanced, but perhaps unusual, position. While in this position, the head floats with the nostrils just 5–10 mm above the water; the chin and lips are under water.

While the patient remains in this vertical SFRF position, the trainer checks for tenseness by raising the patient's arm at the elbow in a gentle adduction. The neck and shoulder muscles are also explored for evidence of support reflex. If reflex is apparent, the patient is instructed to focus on the problem area and "let go," a request that by now causes little difficulty for the patient.

The patient is allowed to remain in this position for another extended period; the main support will be buoyancy while the feet and back take only a minimal role. The patient should be continuing to breathe deeply and gently, with eyes closed throughout. It is found that the longer the patient remains in this vertical, partially supported SFRF position, the more deeply relaxed he/she becomes.

The initial awareness and capacity for control created by the relaxation control procedures remain with the patient. The initial result is a slightly euphoric feeling of rest and well-being, and the experience generally leaves a deep impression on patients, particularly on those who have endured chronic musculoskeletal or movement pain. The reason is straightforward: the managed inaction of the SFRF is free of pain.

In overview, the SL and the RC stages of the first phase of the Edwards program initiate access to the SFRF, and

through a clearly articulated and programmed sequence of activities, the patient is shown how to retain the SFRF despite (1) the reintroduction of movement, and (2) the reintroduction of vestibular change.

Throughout the SL and RC stages, the patient is taught to become highly attuned to his/her proprioceptive and kinesthetic senses, possibly for the first time. The blanking out of vision, the inhibition of speech, and the minimal, quiet instruction from the trainer all facilitate in the patient a rapid heightening of awareness of these 'new' senses.

The first phase of Edwards's program graphically illustrates to the patient that musculoskeletal and habitual movement pain *can be voluntarily controlled*. In other words, the patient learns that the pain itself is *elective*.

Phase 2. Reintroduction of Perfect-Quality Movement (PQM)

The period of *managed inaction* which characterizes establishment of SFRF in the first phase of the Edwards System provides the context into which intentionally novel movements are introduced. Such movements are, by design, unfamiliar in order to forestall the introduction of habitual or parasitic coordinations into the second phase of the patient's movement repertoire. The intention here is that the patient shall become consciously familiar with the quality and feel of 'pure' movement taking place against a background of the established SFRF.

In this context, the 'pure' movements could, in principle, include any elementary movement, but to minimize any risk of reintroducing pain, limb movements are chosen. There is no requirement that introduced novel movements should involve only previously unused or dormant musculature. Novel movements are generally unattended by unnecessary coordinated or parasitic accompaniments in contrast to almost any of the habitual repertoire, and are chosen for this reason.

The purpose of this phase is the reintroduction of a smallish exemplary repertoire of individual movement elements, with the goal that the patient learn to activate each with *perfect-quality* movement without disturbing the SFRF. Initially these are movements guided by the trainer for the completely passive patient. This early repertoire of elementary movements will serve as the base from which other more complex coordinated movements may be constructed and subsequently invoked with perfect quality.

Perfect-quality movement, or PQM, specifically refers to the introduction of perfectly balanced and reversible movements into a stress-free (SFRF) body. Initially the introduced movements are quite gentle, particularly where they may invoke musculature that has lain dormant from disuse or that has been under almost permanent tension.

PQM1, novel movement guidance—To initially achieve PQM, the stress-free reference frame must first be re-established in the pool environment under the management of the Edwards trainer. Onto the established base, the trainer introduces slow limb movements in which the pa-

tient is specifically instructed to maintain slow movement progress with an absolute minimum of effort or stress with (1) active inhibition of any incipient parasitic unwanted and habitually coordinated movement, and (2) perceptual concentration *not* on the movement or position of the limb itself, but rather on deliberately unfamiliar perceptual cues such as the external feel of the water against the movement together with the water's variably buoyant effect on the limb. First, simple but unusual leg movements, such as a horizontal pumping of the less dominant leg of the floating patient, are undertaken. Then, with cessation of leg movement, novel arm movements, such as a two-arm version of arm adduction (from the DMNS) to where the backs of the hands touch, are introduced.

PQM2, novel control of novel movement—After following the trainer's guiding touch through the first examples, the patient learns to gradually take over and initiate and control newly uncoordinated elementary movements with ease and fluidity, using unfamiliar perceptual cues apart from the trainer's touch. This is a dramatically different form of voluntary movement for every patient.

This difference is due to the following circumstances: The (water) environment is relatively unfamiliar; the preliminary SFRF achievement creates an unmistakable (probably unusual) sense of ease for the patient in the water; the kinesthetic and proprioceptive sensory background noise against which novel movement is introduced is, thanks to SFRF, as low as possible; and finally, control and guidance of the movement is effected while unfamiliar and atypical sensory systems, relative to the moved limb, are being used.

Through this conjunction of novel elements, the patient learns to *deconstruct* habitual or parasitic elements otherwise brought into play with intended elementary movement by invoking control sensors which are independent from those normally used for movement control and which provide the normal, but unwanted, cues that bring in parasitic movement. Complete deconstruction of all unwanted coordinations is a prerequisite to achievement of perfect quality, perfectly balanced, perfectly reversible, and perfectly stress-free voluntary movement.

PQM3, dissociating neck/shoulder bracing from limb movement—The early ingredients of the PQM elementary movement repertoire are simple movements of the limbs, beginning with relatively simple leg movements. Such movements normally have coupled to them some head and neck, upper torso, or, most likely, arm movements. For example, in the two-arm adduction, the neck and shoulder region become involved almost universally and the head will tilt forward. To counter this tendency, the patient is instructed to first relax and then move. The patient thus makes sure that the SFRF is in place prior to the move.

Such habitual couplings are remnants of learned coordinations associated with the weight-bearing environment. Decoupling of such movements forms the basis of progress towards PQM. The head and neck register the physical counterbalancing which would normally be re-

quired in the vertical, weight-bearing environment but which is quite unnecessary in the supported flotation environment of the pool. While preparation might be necessary to move in gravity, we can relax to move in buoyancy, making the pool environment invaluable to the sensitization and decoupling processes necessary for PQM to be mastered.

PQM4, coordinating PQMs—Once a reasonable repertoire of dissociated PQM elements has been developed, the second phase involves a progressive selective coupling of different pairs of PQM elementary movements in coordination, a step that leads to higher and higher coordinations.

Guiding Principles for PQM

The first guiding principle for the patient throughout this second phase of the Edwards program is the conscious inhibition of *any* 'preparation,' 'tensing,' or 'guarding' of muscles not directly involved in production of the movement. That is, we seek to eliminate and avoid participation of inappropriate habitually programmed associates to elementary movements. The second guiding principle is an even-handed, or 'democratic,' participation of as much as possible of the motor repertoire which should appropriately be conscripted for that movement.

The first principle is obviously aimed at retaining a state as close as possible to that of the SFRF despite the introduction of new PQM elements. The aim of the second principle is attainment of (or regaining of) large-scale movement fluidity as well as local PQM, but the basis for this is not so obvious and requires some detail in background commentary.

The essential, universal element of any kind of perceptual learning is that of 'abstraction,' that is, the dissociation of a 'perceptual element' from its polymodal perceptual background. This is a largely subconscious and progressive process, which depends on recurring perceptual episodes that are sufficiently similar to retain the same focal context but, at the same time, sufficiently different from one episode to the next to enable progressive articulation and refinement of the 'abstracted' perceptual element. The recurring similar-but-different episodes allow the dissociation of nonpermanent perceptual attributes from the initially abstracted, but rather diffuse (in a sensory modality sense), perceptual 'object.' This dissociative element in perceptual learning (Burton, 1990a) provides the basis, the very ingredients, for the derivative, much more thoroughly recognized and researched *associative* phase of learning. As this dissociative abstraction of perceptual elements is a universal supporting 'mechanism' for all learning, but is almost totally imperceptible itself, in that it is largely subconscious to the untrained subject (it forms the basis for much of what is commonly known as 'intuitive' learning), it can and does operate in the kinesthetic/proprioceptive domain of motor learning.

Later, during the course of progressive motor skill refinement and concomitant automation of movement sequences, one of the largely unnoticed processes accom-

panying this progression over instances is a conceptually similar successive dissociation of nonessential motor units from involvement in that movement sequence. The upshot is that many 'fully developed,' or 'mature,' often highly automated movement sequences, those which by meeting these very criteria are frequently invoked, are movement sequences that are effected by much less than the appropriate full range of possible contributing motor units. As habitual movement becomes progressively more ingrained, ever fewer motor units will be conscripted to effect it. By the naturally dissociative process of subconscious perceptual learning, the number of motor conscripts to each regularly invoked routine movement will, in effect, be surreptitiously diminished over time.

In all of us there is, unless consciously checked, an inevitable and inexorable process going on with all forms of repetitive movement, whereby gradually fewer and fewer candidate motor elements are actually conscripted to action with each successive invocation of the movement element.

The noticeable result of the (subconscious) dissociative selection process is that the *ease* (which comes from sharing movement effort over many simultaneous contributors) and *fluidity* (which comes from flexibility of 'programming' in the coupling of motor elements from one movement unit to the next) of the total action sequence becomes progressively compromised. As this process is subtle and slow, it is normally quite unnoticeable without some form of external comparison such as through the use of videotape over intervals of several years.

The insidious aspect of this process's being unnoticed is of course the fact that the very movements that are most frequently invoked or activated are the ones that will be actuated with an ever-diminishing repertoire of appropriate motor units, leading in some extreme cases to overuse of the residual supporting and actuated repertoire. This shows up in what has become known as repetitive strain injury. The process is literally insidious because the central 'awareness' as to the availability for conscription of a particular motor unit diminishes as it falls from use. Quite literally, at the motor unit level, if you don't use it, you 'lose' it. Eventually, after some years of inactivation during regular movements, and the absence of non-routine activities, motor units become dormant. Through relative atrophy of the activating synaptic pathways, these units become less and less available for conscription to use.

The motor unit is of course not lost from *potential* use; it is only lost from *available* use through the progressive process associated with habitual disuse within the context of a stereotyped repertoire. The remedy is simple and clear: any dormant units can be reactivated to full availability by novel movements. Thus, the consistent emphasis throughout the introductory phases of the Edwards System on novel movements can be understood.

The second principle of Phase 2 of the Edwards System is thus explicitly targeted at re-conscripting to actual use any habitually disused motor units, those which ideally

should properly support the (possibly overworked and then often sore) nondissociable essential contributors to the movement. The lost, or 'loafer,' motor units are thus reawakened to conscious use to share the work, and the renewed availability of these units makes them eligible for conscription in relearned and new coordinations. Over time, their involvement will again become imperceptible as the novel coordinations become automated anew.

Operational perfect-quality movement is achieved by maintaining a broad polymodal cross section of internal and external cues to the quality of each movement, so that there are redundant ways of noticing the onset of degradation from perfect quality in each movement. The motivation for this is twofold. On the negative side, without PQM pain will eventually recur; on the positive side, PQM is an end in itself because it feels so good.

The PQM Game

By adherence to these two principles, the second phase of the Edwards System thus serves as an introduction to an open-ended game. The subtle and challenging game of PQM is to continually intervene in the process of habit formation in regular movements so as to retain all the desirable conscripts while avoiding encroachment of foreign and undesirable motor units. The game is seasoned with novel movements to jolt potential loafers into full readiness: any activity is good, but subtle novel movements are best, in accordance with Alexander or Feldenkrais principles. It is interwoven with perfect-quality posture, which involves maintaining perfectly balanced reversibility of change in any position, steadfastly avoiding giving away to gravity with 'slumps' of any kind. This provides the patient with a general game plan to avert recurrence of the presenting pain.

Perhaps the most important outcome of experience with Phases 1 and 2 of the Edwards System is the realization that adherence to its principles serves a preventive role as much as it does a rehabilitative and remediation role.

In fact, the PQM game is universally appropriate and is one in which all should be expert by their late teens; it is the only way of *preventing* the chronic intractable benign pain syndrome. This might be of some interest to the 80%-90% of the adult population who will otherwise encounter this problem at some stage of their lives.

Phase 3. Aerobic Upgrading using the Staged MediSwim (SMS)

MediSwim, a completely novel form of swim therapy, was the first development of the Edwards System. It was invented out of necessity. First, as noted in the introduction, many patients tend to be uncomfortable in water. Second, orthodox swimming training techniques simply take too long for the typical rehabilitation patient. Third, ways had to be found to teach patients to become independent in the water so that they could move around in it *without hurting themselves*. From the early Mediswim, we have extended and articulated the following three opening stages of MediSwim in the current program.

SMS1, independent propulsion—In the first stage of the reintroduction of systematic and prolonged *independent activities*, the patient reenters the pool, is fitted with both the neck and hip flotation devices and with flippers, and asked to regain the reassured, relaxed supine floating position of the original SFRF. The patient is shown how to introduce a gentle leg kick, with perfect movement quality.

This kick emphasizes the horizontal pumping aspect of the kick and avoids the possibly familiar scissors character; an image of bicycle pedaling on one's back creates the style sought. The patient is instructed to relax back into the water and commence a leg movement similar to that taught in PQM, but this time making sure that the ankles remain completely relaxed to allow the flippers to produce the desired fishtail effect that will produce fluid movement through the water with little effort. Most patients find it rather difficult to deconstruct habitual movements of the foot associated with walking, and begin this phase by keeping their ankles and feet stiff. However, they readily respond to instruction.

At the outset of this stage, to aid the patient in focusing on the unfamiliar force of buoyancy restoration when the leg is lowered into the water, the trainer uses a single finger to guide the rate of lift. Still under guidance, the patient continues to kick upwards so that the knee moves above the water but with the same slow and subtle effort as that involved when the knee approaches the surface. Throughout the introduction of this movement, the trainer ensures that no spurious stress infiltration enters the neck and shoulders of the patient.

The patient continues in this stage until an effortless, low-scale leg kick is successfully coordinated to smoothness and fluidity with perfect-quality movement of both legs in alternation, with hip and leg action smooth and efficient. At this stage, either the arms are left floating freely by the sides or, if extra security is needed initially, a kickboard flotation device can be loosely hugged to the chest.

SMS2, backscull introduction—As in other phases, the patient, again completely relaxed, begins, with the trainer's assistance, a gentle two-arm backscull movement similar to the PQM arm adductions of Phase 2. As with previously introduced movement patterns, the trainer interferes as little as possible while the state of relaxation of the SFRF in the floating supine body position is held. The aim is for the patient to 'take over' once the rhythm and effort level have been established.

In the introduction to this stage, the trainer generally recognizes signs of infiltration of habitual neck and shoulder tensing prior to 'effort.' In such cases, the patient has to be guided, sometimes again and again, to execute the backscull with perfect quality. The trainer may find it advisable to revert to explicitly guiding one arm through the backscull, thus deferring the patient's initiation of the coordinated two-arm backscull. In the backscull, the patient's arms show little or no extension; the elbows circulate without leaving the water.

The patient is helped to establish a regular, smooth breathing pattern in conjunction with the two-arm stroke, all the while *concentrating on exhaling* on the backstroke rather than on the downstroke or push-through, contrary to most habit.

SMS3, novel leg/arm coordination—At this stage, the gentle flipper-assisted alternating leg kick of SMS1 is coupled with the nonalternating backscull to enable the patient to move along the pool independently of the trainer. This phase is practised until the patient can coordinate the leg kick perfectly with the backscull despite the entirely novel character to this coordination of movements. At this stage, the neck collar is usually unnecessary.

Most patients again find it quite difficult to 'deconstruct' long-term habitual couplings associated with walking, so that the cyclic alternating kick action finds an unfamiliar associate in the horizontal planar two-arm backscull. Try it! In difficult cases, additional trainer intervention is required to assist in this process of maintaining perfect quality in novel movement. It is important for the patient to persist and to remain vigilant of the 'relax, then move' rule, and to learn to generalize it to make sure that even while moving, muscles unemployed for the coordination remain in the SFRF mode of relaxation. Occasional checks of the neck and shoulder tension by the trainer help to ensure that movement quality is maintained.

Independent Backswimming

During the SMS phase, starting and recovery techniques are thoroughly taught as a safety and reassurance measure, and to ensure that the patient can manage independently in the pool, lapping the pool with relative ease and little exertion. Throughout the early stages of this third phase, emphasis once again is on ease, balance, effortless coordination, and the maintenance of a high degree of relaxation. The ongoing goal is retention of the nearest possible approach to the SFRF during any movement.

In contrast to the first two phases of stability lift/relaxation control and perfect-quality movement, where patient-initiated communication was intentionally restricted, from this point on dialogue is strongly encouraged. Through talk, patients come to recognize that although they remain within the general framework, the trainer is always tailoring the program elements to suit the particular abilities and disabilities of each patient.

SMS4, flipper propulsion—Once the patient has become fully proficient with the first three stages of this third phase, the patient is upgraded to yet another new and unfamiliar style of swimming backwards. Again, the neck flotation collar is used, but not the hip floats. Instead, the patient is fitted with flippers, and, while being supported by the trainer in the now familiar supine position, is introduced to a leg action similar to alternate leg 'kicking of a football.' Although it is an unfamiliar hydrotherapy exercise, most patients relate quite quickly to the action. Note that the possibly more familiar straight-leg 'scissors' kick of conventional backstroke is avoided at this stage. The large surface area of the flippers serves to produce

the desired leg movement with minimal effort. The cyclic leg movement moves the body backwards, and once the trainer feels that the patient is 'in control,' he/she is encouraged to move up to circuit laps of the pool using only the cyclic leg-and-flipper movement.

At this stage, with arms resting at the side, propulsion of the flippers helps to keep the body buoyant despite the absence of hip floats. The patient continues at this style of swimming until laps can be freely completed with the body relaxed and balanced.

SMS5, increased-intensity kick—Stage 5 of the swim phase of the Edwards System consists of upgrading to a more powerful and straighter-leg kick style than that of SMS4. In some cases, here a kickboard flotation device is held over the abdomen as the kick is refined to produce a fluent, uninterrupted body flow. The kickboard device over the abdomen minimizes the risk of trunk extension. The straighter leg kick, still aided by flippers, is refined so that interference to both relaxation and balance is minimal.

SMS6, backscull reintroduction—The patient is now ready for the reintroduction of the gentle backscull arm action described in Stage SMS2. Because this is still a learning stage in which incorrect or overemphasized arm action can unbalance the body and interfere with relaxation, no emphasis is placed on the arm 'pull.'

SMS7, conventional arm pull—In this stage, the more conventional alternate arm backstroke is substituted for the two-arm backscull. Again, the pull phase is kept passive until effortless coordination has been achieved. With the flipper-aided kick to provide sufficient momentum, the arm-pull phase can be upgraded as slowly as is consistent with the principles of PQM. The body rotation about the long axis is approximately 5° to 7° at this stage.

SMS8, regaining external orientation—This is an important transitional stage in the Edwards System. Now that the patient can move about the pool independently while retaining perfect-quality movement in the MediSwim backstroke, the several hours of direct personal training and supervision by the Edwards trainer gives way to a group dynamics involvement with other patients circulating around the pool at various levels of performance.

In this way, exercise in the pool becomes more of a team effort as the patient is integrated into the rhythm of activity of other pool patients. Self-consciousness evaporates; self-esteem begins to improve with increased patient mobility and fitness at a rate often surprising to naive observers and to the patients themselves. Patients soon come to support each other, just as they become keen to observe others' progress.

SMS9, gaining endurance—Aerobic levels of effort can be achieved through following an upgraded time-over-distance program with resting intervals at the end of each lap. The flipper-assisted kick is so efficient that maximum effort is never placed on the 'pull' phase of the backstroke.

Even at a fast pace, trunk rotation normally does not exceed 15°.

After review, an interval training program designed for each individual according to the need for upgrading will normally involve a series of bouts of exercise at submaximal effort. Rest intervals between each bout are short enough to permit only partial recovery.

SMS10, the beginning of fitness—The staged MediSwim phase of the Edwards System is completed when the patient can maintain 30 min of effort with little or no rest periods. Patients swimming aerobically are expected to swim 30 to 60 laps of a 25-m pool per 30–40-min exercise session, depending of course on condition and age.

For most patients, there is a dramatic halo effect as they approach aerobic levels of fitness. The more 'imprisoned' with pain, the more deconditioned the patient is at the outset, and the lower the initial confidence or expectations of the presenting patient, the more dramatic appears the psychological uplift gained by the patient at SMS 10. The realization of the benefits associated with progression through the Edwards program comes to the patient without overt or covert prompting by the trainer, since nothing is promised by the trainer.

From benefits to mood and temperament, patients often come to understand that they have regained control over emotional states by participating in the voluntary activities associated with the Edwards System, even though these activities were neither specifically tailored nor apparently relevant to psychological effects.

The ameliorating effect of pain management, coupled with the mood-elevating effects of progress through the Edwards program, typically instigates a personality refocus from introversion to a more extroverted state. Since these changes are readily noticed by both patients themselves and others around, they provide a notable element of positive feedback to all members of the training group.

Phase 4. Generalization of the SFRF to the Normal Gravity Environment

In contrast to the presenting patients, persons who have successfully progressed through the first three phases of the Edwards System usually exhibit general remobilization, often considerably improved fitness levels, and a good deal of newly found self-confidence.

Most injured patients will leave the hospital environment at this stage with their pain ameliorated, and they will return to everyday activities with a much greater awareness of desirable body management, content that their injury and pain has been adequately treated. However, for those who wish to generalize the gains of the pool phases of the Edwards System to the normal-gravity environment and those who strive for optimality in their body use generally, further training for consolidation of the skills of body management is desirable. Some patients can proceed directly to a general fitness aerobics program

designed for mature and deconditioned adults; for others, a slower and more subtle awareness-through-movement program is more suitable.

Phases 4 and 5 cannot be described specifically because they are unlikely to achieve the same degree of standardization as the initial three pool-based phases of the Edwards System; they are outlined here as our considered view, on the basis of much more limited experience, of the optimal follow-up to the indispensable pool-based phases of an overall program of whole-movement regeneration.

Phase 4 of the Edwards System of whole-movement regeneration is concerned with showing the trainee (no longer a 'patient') how the skills of relaxation control (RC), perfect-quality movement (PQM), and the stress-free reference frame (SFRF) can be transferred to and maintained in the normal ground environment.

Influences of the pool-based program already evident in the trainee's movements in and around the pool will be pointed out. Arrangements for nonintrusive videotaping of general activities of the training group at 3- or 4-day intervals in and around the pool can help illustrate the extent of upgrading that has taken place. Often trainees find the extent of their own upgraded freedom of movement hard to believe. Their obviously diminished private pain, coupled with the impact, upon both themselves and those around them, of the change from their former states to their present more agile fitness, helps create a motivation for, and a willingness to participate in, upgrading of movement quality in their everyday activities.

The entire program of activities of the pool environment is, by design, centered on novel and unfamiliar patterns of movement—this being the *essence* of the efficiency and effectiveness of the Edwards program. In the normal-gravity environment, in contrast, the generalization of gains achieved in the pool has now to be made in spite of an almost universal tendency to revert to ingrained habitually programmed patterns of weight-bearing movement. Trainees must learn to deconstruct these movement habits and reconstruct perfect-quality versions of them one by one. In this phase, many of the techniques and exercises used by Alexander and Feldenkrais teachers can be brought into play.

Phase 4 of the Edwards System of pain control and movement reeducation introduces a *floor-based* equivalent of the SFRF. Exercises that enable the Edwards trainee to feel and control perfect-quality movements—from breathing to pelvic rotation—then follow. With focus on the neck and shoulders, emphasis here is on achieving a floor-based stress-free reference frame similar in quality and resilience to that of the SFRF of the pool, and on the reintroduction of movements which are always perfectly balanced, perfectly smooth, and perfectly reversible despite the pulls of gravity and ingrained habit.

In general, exercises from the teachings of Alexander and Feldenkrais follow naturally at this phase of the overall program, forming a perceptual and a conceptual continuum with the first three phases of the Edwards System despite the change from pool to floor. Compared with

these older programs of movement and posture reeducation, the important advance represented by our developments is that ordinary patients are able, precisely because of their 'preparatory' experience of the pool-based phases of the Edwards program, to immediately comprehend the significance and potential value of the often quite subtle exercises introduced by these movement educators. Once the typical patient has gained the experience and the capacity to monitor and control the use of his/her body in a freely conscious and voluntary manner through the first three Edwards phases, the generalization of the lessons of the pool-based environment to the gravitational floor environment can be enthusiastically addressed from the outset, with considerable clarity of purpose. The sometimes slightly mysterious aura of 'Alexander' or 'Feldenkrais' programs for uninitiates insensitive to proprioceptive and kinesthetic cues is simply cast aside by the unequivocal and convincing experiences of the first three Edwards System phases.

The particular sequence and choice of activities in this phase are dependent on the personal history and circumstances of each patient, and his/her interest in successfully maintaining bodily self-management throughout day-to-day activities through the long term. While particular stress is given to balancing the contribution of the patient's less dominant side to such activities as walking, to evident imbalance in posture, and to avoiding slumping when sitting wherever necessary, basically the skill sought in this phase is that of systematically noticing body use to guard against the incursion, or reintrusion, of poor habits of body use, so that the patient/trainee is enabled to help him/herself over the long term.

Phase 5. Activity Reeducation with Floor-based Awareness-Through-Movement

Conventional Alexander- or Feldenkrais-style activities are selected to round out the Edwards System, with the aim of providing the Edwards trainee with on-going relaxation control, the skill to recognize the encroachment of habitual poor use in motor activities, and the capacity to restore perfect-quality movement to those activities whenever necessary. The incorporation of such activities is readily understandable given the well-known foundation of each style of body reeducation.

As the work of both Alexander and Feldenkrais is well known and adequately documented (Alexander, 1974; Feldenkrais, 1972, 1985), details of this final phase will be skipped over in favor of an outline of the relationship of each of the 'teachings' of these men to this program.

The fundamental basis of Alexander-style exercises is that habitual 'poor use' can be corrected only by conscious control at the *onset* of the voluntarily initiated movement pattern. Alexander advocated the practice of *consciously inhibiting the actuation* of parasitic movements at the stage at which they are 'primed' for action. This breaks the automated conscription of parasitic movements (incorporated through many repetitions and much practice, at least in

the adult) in the transition between 'volition' and action (Davis, 1979), and makes possible the reprogramming of the motor coordinations which comprise these movement patterns.

The necessity for explicit conscious intervention as a prelude to the detailed deconstruction of inappropriate movement patterns and then the reconstruction of better movement patterns nowadays can be seen to lie in the physiological basis of voluntary movement initiation (Rothwell, 1987). It has now been documented that the measurable '*readiness potential*' in EEG recording of patients planning to initiate a freely voluntary act *clearly precedes (by at least several hundred milliseconds) the reportable time of awareness of the conscious intention to act* (Libet, Gleason, Wright, & Pearl, 1983). This simply means that activity is well under way—unconsciously—to program movements before awareness of the intention to so act becomes conscious, at least in simple and voluntarily elective activities, including previously stereotyped acts. In such circumstances, in order to deconstruct habitual movements, it is clearly necessary to consciously defer by a process of biofeedback (see, e.g., Brown, 1977) the onset of the actuation of movement so that it becomes cotermporal with the onset of conscious awareness of intention to act (Burton, 1990b). Only when this is achieved does it become possible to voluntarily reconstruct the early phases of each activated movement pattern and to so create the possibility for subsequent *movement units* (Fetters & Todd, 1987) of the activity to be electively reprogrammed.

As with Alexander or Feldenkrais activities, in the pool and out of it, we emphasize the earlier rather than the later units of any movement sequence. The appropriateness of this is obvious, since gaining control of the earliest phase of a single-movement trajectory implies the capacity to so master the later trajectory of movement segments.

A second feature of Alexander's teaching which has much in common with Feldenkrais's teaching is the desirability of maintaining an ideal head-neck relationship. The 'supported-head' pose of functional integration of the supine patient undergoing Feldenkrais training for purposes of mastering perfectly relaxed breathing is a refinement of Alexander's notion of an ideal head-neck relationship. That there is overlap in the goals of the Feldenkrais teacher and the Edwards trainer in this initial approach to the pool-based stress-free relaxation frame is obvious. Also obvious is the similarity in the patient's postural outcome from engaging in all three approaches to good head-neck relationship; the alert reader will already have noticed that the stability lift has much in common with the relevant primary activities of both Alexander and Feldenkrais.

The Alexander principle of maintaining appropriate *postural balance* complements the Feldenkrais principle of *dynamic reversibility* in movement. One pertains to proprioceptive equilibrium, while the other pertains to kinesthetic control. In the Edwards System, both principles are equally valued.

A difficulty of many presenting patients with musculoskeletal pain is that their original problem or injury has often become encumbered with 'protective' traits of postural disequilibrium. While such reflex misuse may be almost incidental to the initial difficulty or injury, over time habitual misuse of 'protective' poses can generate ever more severe pain and muscle spasm symptoms, with the result that the originating problem's impact becomes relatively diminished.

Such unintended encumbrances of habitual movement or posture must be clearly brought home to the patient. The Edwards program begins with this primary goal, as did Alexander; however, the Edwards means of achieving the desired end are more subtle, less direct, and, from the perceived outcome, may be more compelling for the ordinary patient than Alexander himself probably achieved.

Our strategy is to eliminate the need for maintenance of postural equilibrium in the first place. By having the initial training take place with the patient floating in the heated pool, we achieve enhancement of progress elegantly and dramatically. Thus, the usual (though subconscious) priority of 'posture' before 'movement' is reversed. In fact, we have extended to the limit that desirable improvement in heightened sensitization to movement—compared with upright weight-bearing normality—that is represented by floor-based movement reeducation, as in those Feldenkrais exercises which involve patients lying supine on the floor. When the possibly overwhelming neural-body communication along the spinal tract for postural maintenance in the gravity environment is eliminated, the patient/trainee is more able to readily sense and discern the subtleties of gentle movement.

With 'movement before posture' as the early teaching principle in the pool, we ensure that kinesthetic control can be fully mastered before undertaking reintroduction of more 'natural,' yet more compelling and difficult-to-modify, postural control.

While these late phases of the Edwards System have a number of areas of overlap and similarity with the raw 'Alexander' or 'Feldenkrais' trainings, we believe that the introductory early phases of the Edwards System provide a unique and essential base which dramatically heightens ultimate effectiveness of any gravity-based movement reeducation within the overall system.

In addition, any negative connotations of the 'conscious inhibition' ingredient so essential to Alexander or Feldenkrais work are entirely avoided. Our approach introduces *any* movement or *any* postural change in relation to the maximally quiescent SFRF. The patient/trainee thus sees and feels *any* change to be elective within the Edwards System; furthermore, he/she is never asked to juggle simultaneously the inhibition of one movement element with the actuation of another. Thus, the Edwards System philosophy is entirely proactive and, as a consequence, unfailingly positive in its connotations. That this positive accent contributes to the psychologically uplifting halo ef-

fect observed in patients who participate in the Edwards System seems a reasonable assumption.

CONCLUDING REMARKS

Several more comments are required in this initial presentation of the Edwards System. Seven of these relate to practical implementation of the program; brief, more general, comments on the overall approach follow.

First, the initial phases of the program are relatively labor intensive, involving 40-60-min sessions with the trainer in the pool one-to-one with the patient. Normally, the stages of Phase 3 can be easily accomplished with three consecutive daily 30-min sessions. Over the course of five daily sessions, even quite severely immobilized patients will have become well on the way to both 'recovery' and self-management. The Edwards System begins with concentrated teaching/learning, with the result that subsequent phases can be managed almost entirely under the supervision of a watchful trainer, even with quite large groups.

Second, all phases are readily adapted to the individual requirements of each patient/trainee while still conforming to the same framework of the five phases of the Edwards System. The framework is generic and universally applicable because it consists of activities that are unfamiliar and novel for *every* patient.

Third, as we have indicated above, to avoid any pain reflex and guarded anticipation of familiar activities, the use of novel activities and coordinations is essential to the effective progress of any patient. This means that the speed of progression through the early stages depends rather more on subtle factors, which nevertheless can be very illuminating, than on any inherent athleticism or lack of it in the individual patient.

Fourth, the whole program is fail-safe from a number of viewpoints. The patient remains in control of his/her degree of participation throughout the program; this ensures that the risk of further injury or damage is absolutely minimized. Furthermore, since, at each stage, the teaching style of the Edwards program is mastery-oriented, patients are never placed in a position of failure. So long as the patient is making an attempt to achieve goals within any phase of the program, he/she is not failing. The open-ended timing of the program caters to individual differences, yet traversal of the program does not show very large time variation between patients. The exercises—mindful and subtle as they are—require no prior skill or fitness and little perceptible effort. The components of the Edwards System have proved popular with patients, perhaps because they couple simplicity and achievability with effectiveness. The momentum from this popularity and accessibility may help generate the motivation to move surprisingly fast through to levels of aerobic fitness in the third phase of the Edwards System and beyond.

Fifth, a patient's willingness to participate is the main requirement asked. The program suffers little interference

from regimes of medication to which the patient may be subscribing, despite the wide range of medical treatments that might be anticipated in any large segment of the rehabilitation population.

Sixth, the program is holistic in that patients are given little opportunity to focus on 'their' problems, in reality their *symptoms*. The design of the Edwards System is predicated on the empirically well-founded assumption that the problems that are consciously evident to the patient are just the proverbial 'tip of the iceberg.' Therefore, in the Edwards System, the focus of training is directed toward the entire generic psychophysical context of chronic musculoskeletal pain, rather than to specific presenting symptoms.

Finally, the program embodies the training principles that are used to elicit top performance from elite athletes; the full panoply of motivational techniques employed in such training is routinely used throughout the Edwards System of training. While this may seem incongruous in a rehabilitation setting, it should be remembered that the Edwards program is based on the constant need to upgrade performance. In the back-pain context, only the starting level of performance is typically low; the need for upgrading is generally implicit in the presenting condition. It is found that surrounding patients with enthusiastic staff that maintains a friendly and relaxed but confident attitude and makes liberal use of humor helps as much with back-pain sufferers as it does with elite athletes.

Indeed, the psychological principles behind the Edwards System appear very robust, and this makes it possible to avoid paying any explicitly *overt* attention to what are deemed psychological issues that arise during the course of training. To the patient, the Edwards System may seem to be purely physical. If its success derives from psychophysical gains, and more particularly from the means to achieving those gains, this seems a modest claim to make for a back-pain program that works.

On the more theoretical side, the program appears likely to have derived its success to date from being tailor-made to avoid pain or further injury. In operational terms, this means that the program is based entirely on activities that are novel and unfamiliar to the patient. Thus, the program conforms to the 'neophyte learner' case, which one of us (P.G.B.) has attempted to account for in an explanatory theory dealing with the physiological-psychological interface in learning (Burton, 1990a, 1990b). This theoretical model adopts an approach to explanatory theory that is quite different from that of conventional models of learning (e.g., Weingartner, 1984).

The focus of this paper, and of the context in which the Edwards System was developed, has been on patients suffering chronic musculoskeletal pain. The context of patients presenting with pain creates a motivational climate for ready participation in elements of the program. But the program is by no means limited to such a context. We expect that it will find increasing use in a preventative milieu, which may in turn lead to an expanded use for the seemingly in-built capacity of participation in an

Edwards System program to generate and maintain feelings of physical and psychological well-being.

The illustration provided by the System, which we have presented for the first time here, may suggest to the reader widespread underutilization of capacities for managing and mastering the *relearning* of motor behavior. It is clear that great opportunity exists to intervene in the normal operation of the physiological infrastructure that supports human voluntary movement. This might appropriately be capitalized on by the introduction of elements of the Edwards System into the normal processes of the *initial* development of behavioral competence in infancy and childhood.

The Edwards System is relevant to the 80%–90% of the population who will, at some point in their lives, be subject to life-style-diminishing back pain. The Edwards System clearly demonstrates to each participant the skills and techniques they can employ, personally and at will, for managing or preventing such problems.

By example, the Edwards System teaches everyone to mitigate the encroachment of poor habit and, in particular, to avoid the incidence of pain from habitual misuse. Such pain is learned. It can be unlearned. Better still, it can be avoided with such intervention strategies as the Edwards System.

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