

Progressive Relaxation

Origins, Principles, and Clinical Applications

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HISTORY

Influences on Jacobson

In 1905 Edmund Jacobson, the originator of progressive relaxation (PR), was sent to graduate school at Harvard University by Walter Dill Scott, psychologist and president of Northwestern University, to study with three of the great minds of the day: William James, Josiah Royce, and Hugo Münsterberg. All three had a considerable influence on him: James by exhorting him to study “the whole man”; Royce by nurturing his philosophical paper on truth; and Münsterberg in a negative way that, however, was beneficial for PR. Münsterberg discharged Jacobson as his assistant because, as Jacobson later related, the data he collected were at odds with Münsterberg’s theory. Thus freed to work on his own, Jacobson studied the startle reaction to an unexpected loud noise. He found that there was no obvious startle to sudden noise in more relaxed participants. This was the first systematic study of relaxation, and it marked the birth of PR.

After graduating from Harvard, Jacobson worked with Edward Bradford Titchener at Cornell University. He probably was influenced by Titchener in two very important ways: through Titchener’s expertise in introspection and through his context theory of meaning. Titchener’s context theory held that the meanings of words originate, in part, in bodily attitudes (postures) involving the skeletal muscle system. Related to these two avenues of influence, two contemporary applications of PR for clinical purposes are (1) de-

This is an update of F. J. McGuigan’s chapter for earlier editions of this book. Dr. McGuigan, a major contributor to psychology and, particularly, to the understanding of stress and its treatment, passed away before work on this revision had been begun. Dr. McGuigan was Edmund Jacobson’s most articulate and longest term student. He devoted much of his professional life to teaching Jacobson’s method and performing research studies on various correlates of Jacobson’s theory. As someone who also had the privilege of working under Dr. Jacobson’s tutelage, I (PML) have undertaken a revision of this chapter. This is done with great humility, because the original work was quite definitive. Updates include a review of more recent research literature, as well as some minor editorial changes.

tailed observation of ("introspection" on) minute kinesthetic sensations and accompanying mental processes; and (2) clinical interpretation of localized bodily tensions as meanings of acts that occur in one's imagination.

Objective Measurement of Tension

After leaving Cornell, Jacobson received his MD and worked in the Department of Physiology at the University of Chicago from 1926 until 1936; he also conducted a private clinical practice. At Chicago, Jacobson, collaborating with A. J. Carlson, discovered an objective measure of tension: They found that the amplitude of knee-jerk reflexes varied directly with the degree of patients' tension. Consequently, as overly tense patients learned to relax, the amplitude of their knee-jerk reflexes decreased. Jacobson's (1938) further research on several reflexes established that chronic tonus (sustained tension) of the skeletal muscles increased the amplitude of reflexes and decreased their latency; conversely, reflexes diminished in amplitude and increased in latency as patients relaxed. As general skeletal muscle tone decreased, the involuntary startle reflex also was eliminated. Charles Sherrington (1909) also made this point when his research established that it was not possible to evoke the patellar tendon reflex in an absolutely toneless muscle. More generally, Sherrington concluded that the appearance of reflexes depended on the presence of tone in the muscles constituting part of the reflex arc. (After about 2 months in our own PR classes, we sometimes drop a large book onto the floor when the students are well into their relaxation period. Seldom is there even a blink of the eye in these well-relaxed students.)

As successful as it was, measuring the knee-jerk reflex was cumbersome. Through arduous efforts with the aid of scientists at Bell Telephone Laboratories, Jacobson eventually was able to measure tension directly. He recorded electrical muscle action potentials as low as one microvolt, a unit previously unmeasurable by the physiologists of the day. Thus quantitative electromyography (EMG) was launched. The resultant use of objective measures of degree of relaxation and tension guided Jacobson to develop and validate PR.

Measuring Mental Events

With this new instrumentation, Jacobson made important discoveries about how the mind and body function. He found that, in a relaxed person, just the *thought* of moving a limb was accompanied by unique covert EMG responses in that limb. For example, if the individual imagined hitting a nail with a hammer three times, there were three unique EMG bursts in the preferred arm. Through extensive research he concluded that all thought is accompanied by skeletal muscle activity, though response amplitude may be extremely low. The eye and speech muscles, he found, were especially important during visual and speech imagery. Conversely, his data indicated that mental processes diminished and even disappeared as the skeletal musculature relaxed toward zero. As Jacobson concluded, "It might be naive to say that we think with our muscles, but it would be inaccurate to say that we think without them" (cited in McGuigan, 1978, p. iii).

THEORETICAL UNDERPINNINGS

PR begins with the ancient and venerable concept of rest. Physicians have long known the value of rest, frequently prescribing it in the form of "bed rest." However, many people who are instructed to rest in bed simply toss and turn. Mere prescription is not sufficient; patients may be told to rest but do not know how. These patients must diligently learn habits of effective rest. Such habits may enable them to prevent the development of a serious tension malady and to use bodily energy with greater efficiency. When relaxation is applied therapeutically, it has often helped restore the body to a normally functioning condition, providing, of course, that the tension malady is reversible. How tension develops in the body is a straightforward physiological event.

How Stressors Evoke Tension

Each stressful situation ("stressor") that people meet in everyday life reflexively evokes the primitive startle pattern of rising (covertly or overtly) on the balls of the feet and hunching forward. The entire skeletal musculature reacts immediately. Within a matter of 100 or so milliseconds, people thereby ready themselves for fight or flight, as Walter Cannon (1929) theorized. This startle reaction, followed by complex autonomic and endocrine changes, has had great survival value. However, it is often prolonged beyond the immediate emergency, resulting in a condition of chronic overtension and continued hyperactivity of the systems of the body. In particular, consistent, excessive covert tightening of the skeletal musculature overdrives the central nervous system and increases activity of the autonomic, cardiovascular, endocrine, and other systems. Prolonged, heightened skeletal muscle tension may then result in any of a variety of pathological conditions, as we soon explain. To reverse the process of overtension, a person needs to learn to relax the skeletal musculature, whereupon activity in the other systems of the body is reduced.

Principles and Physiology of Progressive Relaxation

In learning PR, one cultivates the ability to make extremely sensitive observations of the world beneath the skin. To acquire such heightened internal sensory observation, which is a kind of physiological introspection, one first learns to recognize subtle states of tension. When a muscle contracts (tenses), volleys of neural impulses are generated and carried to the brain along afferent neural pathways. This muscle-neural phenomenon, the generation of afferent neural impulses, constitutes the local sign of tension that one learns to observe. This tension sensation is the "muscle sense of Bell," which was reported in the early 19th century by the eminent physiologist Sir Charles Bell.

Tension is the contraction of skeletal muscle fibers that generates the tension sensation. *Relaxation* is the elongation (lengthening) of those fibers, which then eliminates the tension sensation. After learning to identify the tension sensation, one learns to relax it away. For this, one learns to allow the muscle fibers that generated the tension to elon-

gate. In the learning process, one contrasts the previous tension sensation with the later elimination of tension. This general procedure of identifying a local state of tension, relaxing it away, and marking the contrast between the tension and ensuing relaxation is then applied to all of the major muscle groups. In PR one thus learns to control all of the skeletal musculature so that any portion thereof may be systematically relaxed or tensed as one chooses. Those familiar with EMG biofeedback may wish to think of PR as a method of “internal biofeedback” in which the learner internally monitors feedback signals from the muscle instead of perceiving their representations on external readout systems.

The Skeletal Muscles Control Other Bodily Systems through Neuromuscular Circuits

In the 19th century, the famous psychologist Alexander Bain (e.g., Bain, 1855) claimed that the skeletal musculature is the only physiological system over which a person has direct control. Hence, as Bain, Jacobson, and others held, skeletal muscles are “the instrument of the will.” They contain the only receptor cells in the body that can be directly shut off, which is accomplished merely by lengthening muscle fibers. A synonym for *skeletal muscles* is *voluntary muscles*, precisely because when one wishes to perform an act, one systematically contracts and relaxes the voluntary muscles. For instance, a person who decides to walk contracts muscles to put one foot in front of the other. This point is so obvious that it does not need elaboration. What is not so obvious is that the internal (covert) functions of the body are similarly controlled by means of the skeletal muscles. PR is predicated on the principle that covert functions of the body can also be controlled through slight muscle tensions.

Thus the tension sensation (the muscle sense of Bell) is called the *control signal* because it literally controls the body’s activities. Muscles exercise such control as they interact with the brain through “neuromuscular circuits” (Jacobson, 1964). When volleys of neural impulses generated by contracting muscles feed back to the brain, extremely complex events result, following which neural impulses return to the muscles along efferent neural pathways. The muscles then further contract, directing additional neural impulses to and from the brain, and so on. Numerous neuromuscular circuits throughout the body simultaneously reverberate in this way to carry out the body’s functions. By learning internal sensory observation, one can become quite proficient in recognizing control signals wherever they may occur throughout the skeletal musculature. Through practice, those controls may be activated or relaxed. Relaxation of the skeletal muscle controls produces a state of rest throughout the neuromuscular circuits, including reduced activity of the brain itself. The long-range goal of PR is for the body to instantaneously monitor all of its numerous control signals and to automatically relieve tensions that are not desired. The trained body has an amazing capacity to monitor the many neuromuscular circuits that reverberate in parallel fashion throughout the body. The ultimate goal is to develop “automaticity,” wherein one automatically, unconsciously, and effortlessly identifies and relaxes unwanted tensions.

Jacobson (1964) emphasized the control functions of PR when he used *self-operations control* as a synonym for PR. *Self-operations control* was a precedent for con-

The Concept of Neuromuscular Circuits Has a Venerable History

The concept of reverberating neuromuscular circuits driven by muscle controls is ancient. Dating from the period of the early Greeks, its evolution can be impressively traced through the writings of philosophers, through the scientific Renaissance, through the research of later physiologists and psychologists, and into the very forefront of contemporary scientific and clinical thinking (see McGuigan, 1978). Some of our the most prominent thinkers have recognized that the human body functions in terms of information generated and transmitted between the muscle systems and the brain. One of the most influential presentations of this concept was provided by Norbert Wiener (1948) in his classic book *Cybernetics*. In greater depth than all others before him, Wiener developed the model that the body functions according to principles of feedback circuits. As he put it:

The central nervous system no longer appears as a self-contained organ, receiving inputs from the senses and discharging into the muscles. On the contrary, some of its most characteristic activities are explicable only as circular processes, emerging from the nervous system into the muscles, and re-entering the nervous system through the sense organs, whether they be proprioceptors or organs of the special senses. (Wiener, 1948, p. 15)

A similar neuromuscular concept was put forth by Alexander Bain in 1855:

The organ of mind is not the brain by itself; it is the brain, nerves, muscles, and organs of sense. . . . We must . . . discard forever the notion of the sensorium commune, the cerebral closed, as a central seat of mind, or receptacle of sensation and imagery. (cited in Holt, 1937, pp. 38–39)

More recently, a considerable number of research findings have shown a close connection between skeletal muscle innervation and the sympathetic nervous system (e.g., Delius, Hagbarth, Hongell, & Wallin, 1972) such that increased muscle tension triggers a burst of sympathetic activity, causing constriction of blood vessels within the muscle tissue. These vascular effects are regulated by the baroreflexes (Kienbaum, Karlsson, Sverrisdottir, Elam, & Wallin, 2001), which also are important modulators of autonomic stress responses (cf. Chapter 10, this volume).

Neurophysiology of Relaxation

In various publications, Gellhorn (e.g., Gellhorn, 1958; Gellhorn & Kiely, 1972) sought to specify the neural mechanisms by which the skeletal musculature leads to relaxation of the body. Gellhorn was especially impressed with Jacobson's method, and Jacobson approved of Gellhorn's theorizing as to those neural mechanisms (Jacobson, 1967). Gellhorn started with the basic fact that PR decreases afferent neural impulses from the skeletal musculature. He then noted that the reticular formation receives considerable innervation from those skeletal muscles, so that relaxation reduces activity there. The reticular formation, in turn, functions in circuits with the posterior hypothalamus and thence with the cortex. Consequently, muscular relaxation reduces proprioceptive input to the hypothalamus, with a resulting lessening of hypothalamic–cortical and autonomic discharges. Gellhorn concluded that lessened emotional reactivity during muscular relaxation is the result of reduced proprioceptive impulses to the hypothalamus, which then decreases excitability of the sympathetic nervous system. Jacobson summarized research by Bernhaut, Gellhorn, and Rasmussen (1953) as follows:

These findings suggest that a relaxation of the skeletal musculature is accompanied by a diminution in the state of excitability of the sympathetic division of the hypothalamus and, through a reduction in the hypothalamic-cortical discharges, by a similar reduction in the state of excitability of the cerebral cortex. (Jacobson, 1967, p. 155)

In these ways, then, the skeletal muscles can control other systems of the body, including the reduction and elimination of mental (including emotional) events.

More recent research on muscle relaxation therapy has documented decreases in sympathetic arousal, including a decrease in circulating norepinephrine levels and myocardial contractility (Davidson, Winchester, Taylor, Alderman, & Ingels, 1979), as well as decreased electrodermal activity and heart rate levels and reactivity (Lehrer, 1978; Lehrer, Schoicket, Carrington, & Woolfolk, 1980; McGlynn, Moore, Lawyer, & Karg, 1999; Shapiro & Lehrer, 1980). The close connection between the skeletal muscles and the sympathetic nervous system has received much empirical attention. The muscles are an important element in a complex feedback system that controls physiological arousal. Perception of muscle sensations and afferent feedback from the muscles are provided by active sensory cells called *muscle spindles*. The muscle spindles are active in that they may expand or contract independently of actual muscle tension. Efferents to the muscle spindles may therefore control the amount of afferent feedback provided by muscle tension. Activity in the muscle spindles is strongly influenced by the sympathetic system (Grassi & Passatore, 1988; Roatta, Windhorst, Ljubisavljevic, Johansson, & Passatore, 2002). Jacobson's emphasis on training people to perceive very low levels of muscle tone through his *method of diminishing tensions* may provide specific training in perception of low-level afferent feedback from the muscle spindles. By controlling this activity, one may directly alter the feedback loop between the muscles and the sympathetic system during PR training. Perception and control of muscle spindle activity may be an important mechanism behind the effects of PR in diminishing sympathetic arousal.

Differential Relaxation

Differential relaxation (DR) is the optimal contraction of only those muscles required to accomplish a given purpose. Those and only those muscles should contract, and they should contract only to the extent required to accomplish the purpose at hand. All other (irrelevant) muscles of the body should be relaxed. In the moment-to-moment monitoring of tensions throughout the day, people can often catch themselves wasting energy. Some needlessly clasp their hands together; others tap their fingers and feet, wrap their legs around the legs of a chair, or needlessly rock back and forth. In learning DR, while studying a particular tension signal that is to be controlled, the learner recognizes other tensions elsewhere in the body. These are unwanted tensions that can be relaxed away when the learner later practices on that part of the body. By learning to differentially relax 24 hours a day, a person can save considerable energy, so that relevant tensions can be more efficiently directed toward the accomplishment of specific goals. Later we consider some specific applications of the principle of DR.

The Method of Diminishing Tensions

In developing control over one's muscles, it is necessary (eventually) to detect the most subtle control signals. For this purpose, PR starts with relatively obvious control signals

generated in the dorsal surface of the forearm by raising the hand at the wrist to nearly a 90° angle. Thus the learner initially perceives a localized sensation of tension in the forearm. With the “method of diminishing tensions,” one then studies tensions of ever-decreasing intensity. Thus, after the control signal generated by raising the hand vertically at the wrist is studied, for the next practice the hand is raised only half as much—at a 45° angle from the horizontal. Then the third practice position is to raise the hand only half as high as before (at about a 20° angle); on successive practice positions the hand is raised less and less until movement is imperceptible, but perception of tension persists. The eventual goal is to identify tension signals of perhaps 1/1000th the intensity of those with which the learner began. Such signals are common in the minute muscles of the tongue and eyes, but occur in nearly all muscles.

Some practitioners give instructions to generate high-intensity tensions (e.g., to clench the fist tightly). We believe that this practice is counterproductive for learning to perceive and control *low-intensity* tensions. Many covert responses are below 1 μ V. To control small tensions, one should study *them* rather than large tensions.

Avoiding Suggestion

In learning PR, trainees are never told that they are doing well, that they are getting better, that they are relaxing, that their hands feel heavy, that they are getting sleepy, or the like. No attempt is made to convince the individual that he or she will be “cured” in any sense of the word. Instead, the trainees are aided by instructions, just as in any other learning procedure. Thus a teacher may interrupt a trainee’s practice with criticism whenever the individual is failing to relax.

Jacobson (1938) listed a number of reasons for avoiding suggestion. As with the placebo effect, any method will accomplish something (although usually only temporarily) if it instills into the person the belief that he or she will benefit from its application. Jacobson pointed out that relaxation is a fundamental physiological occurrence that consists of learning to elongate muscle fibers systematically. He specified definitive physiological changes in the body that differ from those occurring during suggestion. The trainee may be skeptical in regard to the procedure, but he or she still can learn very well when presented with objective evidence of progress. Moreover, the person learns to be independent of the therapist; in “suggestion” therapies, by contrast, dependence on therapists is engendered. As Lehrer, Woolfolk, and Goldman (1986) added,

[Jacobson held that] the danger of suggestion . . . is that it may make the individual feel that relaxation is taking place even when it is not. The *perception* of relaxation is not so important as actual physical relaxation, according to Jacobson. Therefore, suggestion may be deleterious because a person may stop devoting the time and concentration necessary to learn relaxation if he or she [incorrectly] feels relaxed already. (Lehrer et al., 1986, p. 202; italics in original)

Tape-Recorded Relaxation Instructions and Biofeedback

Just as Jacobson eschewed the use of suggestion in relaxation instructions, he also avoided the use of tape-recorded instructions. He did this primarily because he thought that tape-recorded instructions might offer more suggestion than training. In support of this position, a literature review by Lehrer (1982) found that taped training did not produce physiological effects that were measurable outside of training sessions.

Jacobson also recommended against using surface EMG biofeedback, even though he was the first to use this technique (see Jacobson, 1978, fig. 25, p. 146). He thought that people should not depend on external sources of biological information but should develop their own powers to sense very low levels of muscle tension and to relax in all situations, even when a biofeedback machine is not available.

However, modern technology has made surface EMG biofeedback a much easier and cheaper methodology. People now can afford to have home monitors, which may be used as teaching aids for attaining more sensitive perception and greater control of the muscles. Jacobson's objections to biofeedback may no longer apply.

Relaxation Practice Is Not an Exercise

Many suggestions for how to relax use a lay meaning of the term, which is inappropriate in a scientific/clinical context. For instance, advice to exercise is not advice to relax, because exercise is work. Exercise is very advisable on other grounds. For the same reason, terms such as *relaxation exercises* or *relaxation response* are self-contradictory, because *exercise* and *response* are "work words." The essence of relaxing is to allow the muscle fibers to elongate, which is physiologically impossible when one *tries* (through exercising or responding) to accomplish it. One simply cannot make an *effort* to relax, because an effort to relax is a failure to relax.

Is There a Shortcut?

From a naive learner's point of view, the amount of time required to learn PR may seem excessive. Indeed, one needs to learn to control a large mass of muscle that makes up almost half the body weight. Recognizing the desire on the part of the learner for brevity, Jacobson spent many years attempting to shorten the method. However, he abandoned his attempt because patients did not sufficiently generalize from what they learned in the clinic to everyday life. His conclusion was that there simply is no satisfactory brief method for learning to relax a body that has been practicing overtension for decades. Nevertheless, Jacobson (1964) did offer a "briefer course," reducing the time devoted to each muscle group. For instance, instead of practicing for 3 hours on a single position, one practices three positions in 1 hour, starting with the first three in Table 4.2 (later in the chapter). Similar abridgements have been made for other muscle groups. The complete course can thus be shortened to one-third of the time it ordinarily takes. However, in this world "you get what you pay for," so that you learn considerably less control from a briefer than from a longer course. An appropriate analogy is learning to play the piano: Certainly you can practice for shorter periods, but your competence is thereby reduced. Nevertheless, in clinical practice, the method has been routinely shortened to six or fewer sessions by combining training in several muscle groups in a single session (e.g., muscles of the arms in one session, then the legs in another, the trunk in a third, the face and neck in the fourth, and differential relaxation training in the fifth and sixth).

Jacobson's research in school systems and in clinical work led him to conclude that children learn PR quite rapidly. His reasoning was that they have not spent so many years acquiring maladaptive tension habits that must be reversed. Teaching PR in elementary school has been done on a large scale in Sweden (Setterlind, 1983).

With this explanation of the principles of PR, we now turn to the psychologically important topic of clinical control of mental (cognitive) processes. To establish a basis, we first consider the scientific nature of mind and its component mental events.

A Psychophysiological Model of Mind

Mental (cognitive) events are generated by the selective interaction of reverberating neuromuscular circuits. Various functions of the everyday notion of “mind” are indicated by such terms as *ideas, images, thoughts, dreams, hallucinations, fears, depression, and anxieties*. According to the present model, all such mental (cognitive) events are generated when selective systems of the body interact through highly integrated neuromuscular circuits. Most mental processes are generated when muscles of the eyes and speech regions tense, whereupon specialized circuits to and from the brain are activated. Other pathways are activated also, including those involving the somatic musculature and the autonomic system. A detailed presentation of and perhaps the most extensive documentation for this neuromuscular model of the generation of mental events are provided in McGuigan (1978).

1. *Muscular events are present during cognition.* McGuigan's (1978) summary of relevant research over an 80-year period provides a firm basis for the conclusion that muscular contraction in selected regions of the body corresponds to the nature of the mental activity present. During visual imagery, the eyes are uniquely active (e.g., when one is imagining the Eiffel Tower, the eyes move upward in imaginal scanning as detected through electro-oculography). During imagining, somatic activity EMG readings detect localized covert responses (e.g., imagining lighting a cigarette produces a distinct covert response in the active arm). Covert muscular responses have been recorded in the speech musculature during a great variety of thinking tasks; for example, there was heightened tongue EMG while participants were performing a verbal mediation task using Tracy Kendler's paradigm (McGuigan, Culver, & Kendler, 1971). In addition, there is heightened speech muscle activity in both children and adults during silent reading; increased speech muscle activity covertly occurs while individuals are engaged in cursive handwriting; in deaf children, covert responses occur in the fingers, which are the locus of their “speech” region, while they think; rapid, phasic speech muscle activity occurs during night dreams involving auditory content; heightened speech muscle activity occurs in patients with paranoid schizophrenia during auditory hallucinations; and so on for other mentalistic activities (see especially McGuigan, 1978, Ch. 10). Conversely, there is no conscious awareness at all when people are well relaxed, as objectively determined by a lack of tension measured through EMG readings (Jacobson, 1938).

The reasoning here is that because specific muscle activity occurs during cognitive activity, and because cognitive activity disappears when this muscle activity is reduced to zero, it may be concluded that muscle activity is a critical component of those cognitive events.

2. *Numerous covert reactions during cognition are related by neuromuscular circuits.* Although there are foci of muscular activity in selective regions of the body depending on the nature of the cognitive activity, other covert responses are simultaneously occurring throughout the skeletal musculature. For example, while participants in one study processed a silent answer to a question, events were simultaneously recorded in the arms, lips, neck, and eyes, as well as in the left temporal lobe and left motor area of the brain (McGuigan & Pavek, 1972). The conclusion is that these unique, simultaneously occurring events throughout the body are not independent. Rather, they are related by means of rapidly reverberating neuromuscular circuits between the brain and the extensive skeletal musculature. Because those widespread events occur simultaneously with the silent thought, it is assumed that the neuromuscular circuits generate that thought. We turn now to how such a verbal thought is generated.

3. *There are general linguistic, visual, and somatic components of cognition.* Focusing on linguistic cognition, research has indicated that speech muscles generate a phonetic code, which is presumably transmitted to and from the linguistic regions of the brain (see especially McGuigan & Winstead, 1974; McGuigan & Dollins, 1989). When those speech muscles and linguistic brain regions function in unison, perceptual understanding of linguistic cognitions occurs. No doubt similar processing occurs to generate nonlinguistic cognitive activity. Thus circuits between the eyes and the brain generate visual imagery, and circuits between the nonspeech skeletal musculature and the brain generate somatic components of thoughts (see McGuigan, 1989, 1991b).

Control of Cognitions

From a practical point of view, this model of the mind makes it abundantly clear how people can volitionally control their emotions and other cognitive activities, as well as other bodily functions. That is, if cognitive activities are identical with the energy expended when neuromuscular circuits reverberate, those cognitive events can be eliminated when the neuromuscular circuits cease to be active. They stop reverberating when a person relaxes the skeletal muscle components.

The Meaning and Purpose of Tensions

Recalling Titchener's context theory of meaning, a compatible basic principle of PR is that every tension has a purpose—that every tension means something. This point is obvious in many instances. For example, the purpose of the tension in the upper surface of the forearm while bending back the hand at the wrist is simply to raise the hand. Similarly, the purpose of tensions in the muscles of the legs while walking is simply to move the body. What is not so obvious is the interpretation of subtle muscular tensions in the application of clinical PR.

Distinguishing between "Meaning" and "Process"

To interpret control signals, one learns that *process* is the way in which meaning is generated—process is the actual tension sensation that one observes within one's body. *Meaning* designates the purpose of the tension, the reason why one tenses. In generating mental events, "process" consists of the muscular contractions within neuromuscular circuits that generate the relevant images, sensations, and so on. "Meaning" is thus the content of those mental processes.

In therapy, a patient is first carefully trained in detecting (proprioceptively introspecting on) subtle tensions throughout the body that constitute process. Then she or he is carefully trained in developing the ability to introspect on and report the content of mental activity in considerable detail. Process usually occurs in unexpected places in the body. The patient first identifies the nature and locality of process. When these are identified, the question to be answered by clinician and patient working together is this: Why do those tensions occur in particular regions and during a given kind of mental activity? Establishing the meaning of the tensions can give the patient better understanding of and control over his or her difficulties. For example, while learning to relax, a man observed subtle tensions throughout his entire right leg. That was process. After some study, the tensions were interpreted as follows: The man was tensing *as if* he were about to fall out of a tree house and crash into a board with the leg. The mental content generated by the

covert tensions in the leg was his remembrance of actually having fallen out of a tree house when he was a boy. As the muscles in the leg covertly contracted in the present, he relived that experience in his memory as if it were overtly occurring. Rolfers report similar experiences when muscles are stimulated.

Consider a case of a woman whose complaints included anemia, chronic constipation, nervous tension with inability to sit quietly, slight dizzy spells during excitement, and a slight discharge from the nose (Jacobson, 1938). After training, she reported the process of sitting stiffly and formally. The meaning of this apparently was that she sought to maintain proper posture in her back because of a fear of developing a habit of faulty posture. That is, the purpose served by maintaining a stiff and formal posture was the prevention of an incorrect everyday posture. To control the tension on the meaning level, she came to understand the reasons why she held herself stiffly and was persuaded to change; on the process level, she learned how to relax the relevant controlling muscles.

In clinical work, it may take a long time to identify tensions characteristic of the “nervous” condition of the patient, to interpret those tensions, and to deal with them effectively. But the history of clinical PR is one of considerable success in following this paradigm. For example, anxiety is regarded as a fearful condition represented in the skeletal musculature. Once the clinician can ascertain the meaning of the skeletal muscle representations, it is then possible to relax those critical tensions, whereupon the state of anxiety can be diminished or eliminated. We return to anxiety later in this chapter.

ASSESSMENT

Applications of the Method

There are two general purposes of tension control—prophylactic and therapeutic. By learning to relax differentially 24 hours a day, a person can increase the likelihood of preventing a stress or tension disorder. For a person already thus victimized, clinical PR can often ease or eliminate the condition.

Stress and tension disorders fall into two classic categories: cognitive (“psychiatric”) and somatoform (“psychosomatic”) disorders. Elsewhere (McGuigan, 1991a), applications within the first category are discussed. This includes such neurotic disorders as anxiety state, panic disorder, phobic disorders, neurotic depression, and neurasthenia, as well as lesser fears and worries. The second category includes such disorders as irritable bowel syndrome with accompanying diarrhea and constipation, teeth grinding (bruxism), essential hypertension, coronary heart disease, rheumatological pathologies, chronic fatigue, and such pains as those of headaches and backaches.

For over seven decades, Jacobson (e.g., 1938, 1970) collected an abundance of scientific and clinical data that validated the therapeutic application of PR for “psychiatric tension pathologies” (his term). These included nervous hypertension, acute insomnia with nervousness, “anxiety neurosis” (what we now would consider to be panic disorder, generalized anxiety disorder, or one of the other anxiety disorders), cardiac neurosis, chronic insomnia, cyclothymic disorder, obsessive–compulsive disorder, hypochondria, fatigue states, and dysthymia. Somatoform disorders to which he successfully applied PR included convulsive tic; esophageal spasm; various bowel disorders including colitis, irritable bowel, and chronic constipation; arterial hypertension; and tension headaches. More recent controlled studies have found improvement in a variety of disorders after at least eight sessions of training in Jacobson’s technique, including chronic pain (Gay, Philippot, & Luminet, 2002), headache (Murphy, Lehrer, & Jurish, 1990), anxiety

(Lehrer, 1978; McCann, Woolfolk, & Lehrer, 1987), and generalized stress (Carrington et al., 1980; Lehrer, Atthowe, & Weber, 1980; Woolfolk, Lehrer, McCann, & Rooney, 1982). Effects on asthma, although *statistically* significant, tend not to be of *clinically* significant magnitude (Lehrer et al., 2004).

Therapy

Cognitive (psychiatric) and somatoform (psychosomatic) disorders, as well as lesser conditions, are characterized by excessive, chronic tension and may be reversed by relaxing the skeletal muscles. To summarize, practice in the gradual lengthening of skeletal muscle fibers can result in a generalized state of relaxation, which in turn can produce a state of relative quietude throughout the central nervous system. Consequently, the viscera can also relax, as evidenced by a lowering of blood pressure, a reduction of pulse rate, and a loosening of the gastrointestinal tract. In this way, numerous somatoform disorders can be alleviated or eliminated.

The rationale for treating cognitive aspects of neurotic and related disorders is to interrupt the reverberation of neuromuscular circuits, preventing undesired thoughts from occurring. Some drugs can interrupt neuromuscular circuits by acting on the brain. However, the most natural way to cause these circuits to be tranquil is to relax the tense muscles that are their peripheral components (a "natural tranquilizer"). Verbal components of undesired thoughts, such as those of phobias and worries, can be eliminated by relaxing the speech muscles (tongue, lips, jaws, throat, and cheeks). The eye muscles are the focus for eliminating the visual imagery of thoughts. When the eye muscles are totally relaxed, one does not visually perceive anything; the eyeballs must move in order for visual perception or visual imagery to occur. Thoroughly relaxing all of the muscles of the body can bring all undesired mental processes to zero.

Developing Emotional Control

Jacobson (1938) demonstrated that relaxation and the experience of emotions are incompatible—that it is impossible to experience emotions while simultaneously relaxing. The paradigm for controlling emotions, as for controlling other mental events, is to control the skeletal musculature that generates them when neuromuscular circuits are selectively activated.

The goal is to determine rationally when to experience and when not to experience particular emotions. One can thus be wisely emotional by wisely tensing to allow favorable emotions to flow freely and inhibiting negative emotions such as temper tantrums or anxiety states. As has been observed clinically in numerous cases, patients who learn to control the skeletal musculature in both its tonic and phasic activity diminish undesired emotions, such as proneness to anger, resentment, disgust, anxiety, or embarrassment. Conversely, as general tension increases, the proprioceptive impulses thereby generated increase emotionality by exciting the central nervous system, the autonomic system, the endocrine system, and so on, presumably through the pathways specified by Gellhorn (Gellhorn, 1958; Gellhorn & Kiely, 1972).

Both increased and decreased emotionality are objectively evidenced by the amplitude and latency of patients' reflexes, as discussed earlier. Everyday examples of this point are obvious, such as when a saucer is accidentally dropped at a tea party. The excessively tense guest will emit an exaggerated startle reflex with heightened emotionality, whereas the well-relaxed person may not even blink or interrupt ongoing conversation.

Individuals who are excessively anxious often continually rehearse their griefs, worries, and difficulties with life. If they can acquire control of the skeletal muscle tensions that key this internal speech, they can consequently control their emotions and other negative mental processes. These controls occur principally in the eye muscles, for visualizing their difficulties, and in the speech muscles, for verbalizing their problems, though the remaining mass of skeletal musculature also helps to control mental processes. Thorough training in PR makes it possible to change gradually away from a condition of continually attending to difficulties and to develop a habit of turning attention from those issues. Anxious individuals thus become better able to verbalize relevant contingencies and to react to problems more rationally. That is to say, instead of reacting reflexively to a difficulty, they can stop and reason about the problem (unless, of course, it is something like an onrushing truck). As they become relaxed, then, they attend less frequently to disturbing issues and can instead focus on other matters and become less emotionally disturbed about problems. A trained person can stop, momentarily relax, and assess a situation—verbalizing, for instance, that “this other person seems to be yelling and screaming at me, and it is to his advantage as well as to mine if I do not yell and scream back.”

Specific Applications of DR

The term *tension control* does not mean the same thing as *tension reduction*, because people could not function in life without tensions. The purpose is not to eliminate all tensions but to control them so that they can be wisely used. In other words, the purpose is to relax differentially, which can be prophylactic as well as therapeutic.

For instance, relaxed eating behavior is as appropriate for healthy people as it is for patients with ulcers. Many people exhibit bizarre, often frantic, eating patterns. Such an individual may be hunched over a plate with elbows on the table, eating tools grasped in the hands, tensed legs, and bent shoulders—all as if the eater is ready to leap in animalistic protection of the food should an adversary momentarily appear. The eating process is often a continuous shoveling of food from plate to mouth, with no interruption of the chewing process. Conversation, if any, is through half-ground food, with particles exuded in the direction of the listener. Such overtense eating habits most assuredly do not contribute to smooth digestion. People should be differentially relaxed when eating in order to help prevent a variety of gastrointestinal difficulties, as well as to enjoy dining as a pleasant process.

Similarly, a major industry that dispenses a wide variety of products dedicates itself to helping people alleviate their sleep problems. The complaints of such people include not getting to sleep when they first get in bed, as well as waking up during the night and not getting back to sleep. One patient reported that he had only about 2 hours of actual sleep over a period of 4 nights in bed. The consequences of night after night of inadequate sleep can be catastrophic, producing chronic fatigue and inefficient work performance. Nonprescription medicines, opaque blinds for the windows, earplugs, and covers over the eyes are meant to satisfy complaints that the room is “too hot,” “too noisy,” “too bright,” “too cold,” and so forth. The effective solution for the insomniac’s problems is to learn to practice DR 24 hours a day, which includes sleeping at night. By applying the principles of DR, one can carry the habit of automatic relaxation into the sleeping state.

Several other common applications of DR discussed by McGuigan (1991a) include relaxing while hurrying; conquering the fear of flying by differentially relaxing on an airplane; controlling one’s own temper; and learning how to deal with unreasonable people by controlling the tempers of others, too.

Support for Various Applications: Problems in the Literature

Jacobson's clinical applications of PR are impressive indeed. However, there apparently are no experimental (vs. clinical) data that validate the method, probably because of the extensive methodological difficulties in conducting an experiment. That is, a true experimental test would require randomly assigning a sufficient number of patients to two or more groups and giving the experimental group(s) extensive training over an extended period of time with an hour of practice each day. A procedure approximating that of the clinical case study presented at the end of this chapter would have to be employed with a number of experimental participants—a demanding requirement indeed. The problem of comparable activity in a control group (or groups) to contrast with such an extensive treatment presents another difficult issue.

Although the literature on various forms of relaxation therapy is impressive, descriptions of the length and nature of training indicate either that the research has not used Jacobson's PR procedure or that this procedure has been confounded with other methods. Several examples should illustrate. Nicassio and Bootzin (1974) gave their participants four 1-hour individual sessions using something of an approximation to PR; however, in a short training period, "the entire sequence of muscles was covered at each session" (p. 255). Such a compressed learning session must have been overwhelming to the participants and is contrary to Jacobson's directions. Murphy, Lehrer, and Jurish (1990) taught participants a combination of PR training and autogenic training and used a headache diary, a cognitive questionnaire, and an expectancy measure for their dependent variables. Because their participants learned both methods, however, specific conclusions about PR are precluded. Schaer and Isom (1988) confused PR with hypnosis, stating that "progressive relaxation has some similarities to hypnosis" (p. 513), and used a scale of hypnotic susceptibility to specify participants who were "susceptible to progressive relaxation."

Despite the lack of experimental data on this original version of PR, extensive clinical and related data nevertheless lend credence to the effectiveness of the method. There also is a large body of experimental literature on other methods that involve briefer muscle training (consult Chapters 5, 24, 25, this volume). Because of the relative intensiveness of Jacobson's original method, there is reason to believe that its effects may be considerably more robust than those of the briefer methods.

Limitations and Contraindications

We have seen that PR can be appropriately applied to the reduction of everyday tensions, as in DR, and clinically to the elimination of syndromes related to stress and tension. We have discussed a number of cognitive and somatoform disorders, along with other tension-related maladies, that have been shown empirically to benefit from PR. This specification of potentially beneficial applications means that other applications are probabilistically excluded; these would constitute the limitations of the method. One thus could not expect to use relaxation directly to remove a cancer or to cure a viral infection. At the same time, PR can be an adjunctive therapy that can ease discomfort resulting from any malady. There do not appear to be any contraindications to its use.

PR does not induce anxiety. Some investigators have reported an adverse effect of relaxation therapy, referring to it as "relaxation-induced anxiety" (e.g., Heide & Borkovec, 1984; Lazarus & Mayne, 1990). It is reported that learners become frightened of sensations, fear losing control, fear the experience of anxiety, engage in worrisome cognitive activity, and the like. "Relaxation-induced anxiety" apparently results from the use of methods of relaxation that differ from PR. Lehrer, Batey, Woolfolk, Remde, and Garlick

(1988) specified several differences between what they called “post-Jacobsonian progressive relaxation techniques” and Jacobson’s PR. “Briefer methods,” in which learners engage in large tensions, do not use the method of diminishing tensions, and rely heavily on suggestion, clearly depart from PR. “Relaxation-induced anxiety” apparently results from such other methods of relaxation, but it rarely if ever occurs using this approach to PR and is not a contraindication for PR. What sometimes does happen in PR during the early stages of learning to observe and control internal tension signals is that patients say such things as “I think my body is floating.” In the initial stages of learning to control anxiety, a learner experiences the world beneath the skin for the first time and lacks words to describe novel sensations adequately. However, these experiences are minor, causing no undue discomfort. In any event, they are forgotten after the first month or two of training, when such ambiguous statements are replaced with more precise reports of process, such as “Tension in my lower left calf.”

Another event that sometimes occurs early in the learning process is the “predormescent start,” in which the trunk and limbs may give a convulsive jerk. Apparently it takes place in individuals who have been hypertense during the day’s activities or are experiencing a traumatic event. The physiological mechanism may be similar to that of a nervous start, so that it disappears as relaxation progresses but may appear again after exciting experiences. In any event, some months later the learner usually does not recall having made the predormescent start.¹

THE METHOD

Introducing the Method to the Client

The basic physiology of neuromuscular circuits and the nature of tension and relaxation are explained to the learner. Muscles, the learner is told, contain muscle fibers that are about the diameter of the human hair and are aligned in parallel. Their action is very simple, in that they can do only two things: by sliding alongside each other, they can either contract (tense) or lengthen (relax). When muscles contract, they generate the control signal that is used within neuromuscular circuits to control the functions of the body. Relaxation of the body is achieved when a person learns how to allow the muscle fibers to elongate.

The learner is provided with a realistic estimate of how far an overly tense individual has to go. It is explained that there are some 1,030 striated muscles in the human body, which make up almost half of the body weight. A lifetime of injudicious use of such a mass of muscle simply cannot respond to “quick and easy cures” for tension maladies. Just as the learner has spent a lifetime learning how to misuse the muscles, it is reasonable to expect that prolonged practice is required to reeducate them. It simply takes time and practice to learn to reverse long-standing maladaptive muscular habits. Fortunately, this cultivation of a state of bodily rest can be achieved in much less time than it took to learn deleterious muscle habits in the first place.

A frequently asked question is “How long will it take me to learn to relax?” A reasonable answer is to counter with the question “How long would it take you to learn to play the piano [or become a good golf, chess, or tennis player]?” The answer, of course, depends on where one starts and on how proficient one wishes to become. An answer more acceptable to the prospective learner is that the basic course specified in Jacobson (1964) and in McGuigan (1991a) is about 13 weeks in length. In our experience, students who take a university course covering those practice positions become quite proficient by