Relaxation Measured by EMG as a Function of Vibrotactile Stimulation

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The present study investigated the effect of vibrotactile stimulation on relaxation as measured by EMG recording. Forty-eight subjects from three age groups were randomly divided into 8 experimental groups: (1) simultaneous footrest vibration and back vibration (A1C1); (2) simultaneous footrest vibration and back roller (A1C2); (3) simultaneous footrest vibration, back vibration and back roller (A1C2A1); (4) footrest vibration alone (A1C); (5) back vibration alone (A1C); (6) back roller alone (A1C2); (7) simultaneous back vibration and back roller (A2C1); and (8) control group (no vibration/stimulation) (A2C0). The three major variables studied were footrest vibration (A1 and A2), pre- and post-EMG measures (B1 and B2), and back vibration (C1C2C3). Results showed that footrest vibration had a significant effect on relaxation. Other conditions (except the control) produced a decrease in EMG levels, but did not reach significance. Pre- and postmeasures by experimental conditions were also significantly different. Application of vibration as an aid in relaxation is discussed.

The therapeutic effect of relaxation has been the target of considerable research for the past several years. Jacobson's (1938) work with progressive muscle relaxation and the work of Wolpe, Salter, and Reyna (1966) in systematic desensitization have provided empirical evidence of the benefits of relaxation in varied clinical and therapeutic settings. Previously, drug therapy has been the primary technique in dealing with stress and its associated symptoms. More recently, however, researchers have undertaken the task of finding other means of achieving muscle relaxation.

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Sargent, Walters, and Green (1973) discussed the importance of muscle relaxation in the control of tension and migraine headache. They found many patients relaxed to avoid migraine headache. Budzynski and Stoyva (1973) studied the effects of relaxation on anxiety reactions and concluded that muscle relaxation typically affects the autonomic nervous system so as to produce a shift from sympathetic to parasympathetic dominance.

Stimulated by the current interest in the therapeutic effectiveness of relaxation, several recent investigations have focused on determining the best techniques for facilitating muscle relaxation. Green, Green, and Walters (1970) have suggested that relaxation of muscle tension is quite easy to learn with the feedback of EMG signals to the learner. The implication for both progressive relaxation and EMG feedback is that changes in muscle relaxation levels can be learned over time, given the proper training conditions.

Another variable affecting muscle relaxation that has been the subject of considerable investigation is electromechanical vibration. Bierman (1960) reported vibration effective in increasing relaxation in hip flexors and abdominal muscles as measured by length of trunk flexion. Williams, Drury, and Bierman (1961) supported these findings by providing evidence that mechanical vibration applied to the paravertebral areas of the back and posterior aspects of the lower extremities increased relaxation and elasticity in muscle groups as determined by trunk flexion and grip tests. Hagbarth (1973) stated that persons suffering from spastic hemiplegia who were trained in muscle movements assisted with vibration felt more relaxed and less handicapped by their spasticity. Ekland (1971) stated that low-frequency vibration (< 70Hz) may be used to cause muscle relaxation. However, little research has been published which validates the physiological effectiveness of low-frequency vibration. As with other therapeutic measures, the claims made by physicians and other therapists must rest on objective evidence of physiological changes.

In studies heretofore, researchers have depended solely on external observations (such as trunk flexion) or subjective reports as determinants of muscle relaxation. Subjective reports are not always reliable indicators. It seems logical to adopt a means of detecting muscle activity that would afford a reliable and objective measure of muscle relaxation. EMG recording from the frontalis muscle has proven to be a reliable means of measuring muscle tension (Budzynski & Stoyva, 1973; Balshan, 1962). With the advent of sophisticated electromyographic (EMG) equipment, muscle tension can be measured accurately and objectively. The advantages of using EMG recordings from the frontalis muscle as an indicator of muscle relaxation are threefold: (a) it alleviates the problem of using subjective reports; (b) it provides a continuous tracking of levels of specific muscle-