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A RE-EXAMINATION OF SOME ASSUMPTIONS OF SOMATIC PSYCHOTHERAPY

BY

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "A Re-examination of Some Assumptions of Somatic Psychotherapy" submitted by Margaret Wilkinson in partial fulfilment of the requirements for the degree of Master of Education.

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ABSTRACT

The main purpose of this study was to test some of the assumptions underlying the use of somatic psychotherapy with children, and to consider the influence of sex differences on anxiety and physiological functioning among children. More specifically, this research sought to examine the relationship between anxiety, on the one hand, and muscle tension and peripheral blood flow, on the other hand, to investigate the relationship between muscle tension and peripheral blood flow and to explore the effects of sex on anxiety, muscle tension and peripheral blood flow.

Forty-eight males and 48 females, randomly selected from the 117 grade six students attending an elementary school in a city of approximately 500,000 residents in northern Alberta, served as subjects for this study. The neuroticism (N) scale of the Junior Eysenck Personality Inventory (JEPI), which was used as a measure of anxiety, was administered to all the grade six students. Following the administration of the N scale of the JEPI, individual measures of muscle tension and peripheral blood flow were obtained for each subject. The muscle tension score for each subject consisted of average EMG activity, in microvolts, and the peripheral blood flow score for each subject comprised average skin temperature, in degrees Fahrenheit.

In order to examine the relationship between anxiety and physiological functioning, the subjects were divided into high anxious and low anxious groups, according to whether they scored above or below the mean on the N scale of the JEPI. Then the significance of the difference between the means of the two groups for each of the two physiological measures was calculated. The relationship between muscle tension and peripheral blood flow was investigated by calculating the correlation between the EMG activity and skin temperature scores. Finally, in order to explore the effects of sex on anxiety and physiological functioning, the significance of the difference between the means of the male and female groups for each of the anxiety and physiological measures was calculated.

The results of this study revealed the existence of positive relationships between anxiety and muscle tension ($p < .05$), muscle tension and peripheral blood flow ($p < .05$) and sex and anxiety ($p < .01$). However, no significant relationships were found between anxiety and peripheral blood flow ($p > .05$), sex and muscle tension ($p > .05$), and sex and peripheral blood flow ($p > .05$). These findings were discussed both in terms of the research objectives and in relation to some of the theoretical and practical issues in the area of somatic psychotherapy for children. In addition, some implications for further research and somatic psychotherapy were delineated.

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CHAPTER I

INTRODUCTION

Somatic Psychotherapy

Among the current approaches to the problems of anxiety and stress-related disorders are a group of techniques aimed at teaching voluntary somatic alteration. These techniques, which are presently experiencing increasing popularity in the treatment of both adults and children, include Jacobson's (1938) progressive relaxation training, Schultz and Luthe's (1959) autogenic training and several types of biofeedback relaxation training (Benjamins, 1976; Bernthal & Papsdorf, 1977; Coursey, 1975; Engelhardt, 1978; Lowenstein, 1977; Raskin, Johnson, & Rondestvedt, 1973; Reinking & Kohl, 1975). In common, these techniques are designed to enable the individual to achieve a calm psychological state, through the establishment of voluntary control over physiological functioning, and typically entail training in the relaxation of striate muscle and/or peripheral vasodilation.

Voluntary Somatic Alteration as a Prophylactic

A growing number of therapists believe that, in addition to constituting an effective approach to anxiety and stress-related disorders, training in voluntary physiological control helps to prevent the subsequent development of emotional and psychosomatic disorders (Benson, 1975; Brown, 1974, 1977; Haugen, Dixon, & Dickel, 1958; Jacobson, 1967a; Luce & Peper, 1971; Pelletier, 1977; Volpe, 1975). On the basis of this supposition, Haugen, Dixon, and Dickel (1958) and Jacobson (1967a) strongly recommend instruction in self-regulation for children. Presently, however, there is no empirical evidence directly pertaining to the merits or limitations of such early training.

Some Assumptions of Somatic Psychotherapy

Anxiety and physiological state. One of the fundamental assumptions underlying somatic psychotherapy is that anxiety is associated with certain physiological responses and is incompatible with others (Haugen et al., 1958; Jacobson, 1967b; Schultz & Luthe, 1959; Wolpe, 1958). While there is a lack of consensus regarding the nature, origin and resolution of anxiety, it is generally agreed that anxiety is accompanied by a number of physiological responses that are in the direction of heightened physiological arousal or a shift toward dominance of the sympathetic division of the autonomic nervous system (Budzynski, 1973; Stoyva & Budzynski, 1974). At this juncture it is relevant to note that there is sound scientific evidence in support of a positive relationship between anxiety and physiological arousal. Based on extensive research, Horvath and Fenz (1971) indicate that "there is abundant evidence that most autonomic measures... are responsive to heightened emotional states (p. 147)." The physiological concomitants of anxiety have been variously termed the "emergency reaction" (Cannon, 1914), the "ergotropic reactions" (Hess, 1954), the "defense reaction" (Abrahams, Hilton, & Zbrozyna, 1960) and, most commonly, the "fight or flight response" (Benson, 1975). Grinker (1966) summarizes a well accepted point of view when he observes that "anxiety is accompanied by a host of interrelated somatic processes which are in the nature of activity preparatory to emergency action (p. 133)." Conversely, it is widely assumed that those physiological responses indicative of a shift toward parasympathetic dominance, which are frequently termed the "trophotropic response" (Hess, 1954) or the "relaxation response" (Benson, 1975), are incompatible with anxiety.

Uniformity of the emergency reaction. An implicit assumption made by many practitioners of somatic psychotherapy is that a uniform emergency reaction exists. Thus, the usual procedure in somatic psychotherapy is to train all subjects in the voluntary control of the same predetermined physiological responses. However, as Martin (1961) suggests, although the emergency reaction "may be largely innate...it is likely that as a result of learning or constitutional predisposition individuals tend to have variations in the manner in which the...reaction is expressed (p. 234)." In this regard, the findings of Lacey (1950), Lacey, Bateman, and Van Lehn (1953), Lacey and Lacey (1958) and Lacey and Van Lehn (1952) indicate that people do tend to demonstrate idiosyncratic patterns of physiological activity under stress. It is also consistent with the concept of individual variation in the expression of the emergency reaction that intercorrelations among physiological measures are frequently unsubstantial (Horvath & Fenz, 1971). Therefore, on the basis of the available empirical evidence, it appears reasonable to subscribe to Stoyva and Budzynski's (1974) conclusion that the assumption of uniformity of the emergency reaction represents an oversimplified interpretation of the concept. Of course, such a conclusion has serious implications for somatic psychotherapy as it is currently practiced.

Integration of voluntary and autonomic responding. Another common assumption underlying the use of several somatic alteration techniques is that the voluntary and autonomic nervous systems act in unison. Both progressive relaxation and EMG (electromyographic) feedback, for instance, focus exclusively on the reduction of tension in striate muscle, on the basis of the supposition that deep relaxation of the skeletal musculature is incompatible with autonomic arousal (Jacobson, 1967b; Wolpe, 1958). Some investigators, including Germana (1969) and Green (1972), consider the distinction between the voluntary and involuntary nervous systems to be a mere anatomical convenience which constitutes a gross over-simplification of central organization. In Germana's (1969) view, for example, the emergency response comprises a diffuse complex of autonomic and somatic events and includes general muscle tension as well as postural responses. However, although there is some evidence in support of the proposition that the voluntary and autonomic nervous systems generally act in tandem (Gellhorn, 1964; Germana, 1969; Hess, 1954; Obrist, Webb, Sutterer, & Howard, 1970), there is little reason to expect correlations between muscle tension and measures of autonomic arousal to be any more substantial than those between the various indicators of autonomic arousal. In fact, Cameron (1944) encountered subjects in whom the voluntary and autonomic nervous systems appeared to be only loosely coupled. Perhaps, as Budzynski and Stoyva (1972) suggest, these individuals are "the people for whom muscle relaxation does not diminish anxiety (p. 449)." Clearly, if muscle tension is not always a significant component of the response to stress, then muscle relaxation training techniques may not be particularly useful in the treatment of some individuals. Of additional interest, in this context, is the possible implication of sex differences in motor responses. Lundervold (1952), for example, found exaggerated skeletal muscular responses to be more characteristic of women than of men.

The Problem

In view of the fact that somatic psychotherapy techniques are becoming increasingly popular in the treatment of anxiety and stress-related disorders among children, and in consideration of the claims regarding the prophylactic value of somatic psychotherapy techniques, there appears to be a need for an empirical examination of the assumptions underlying the use of somatic alteration techniques with children.

As previously mentioned, a common assumption of somatic psychotherapy is that anxiety is invariably associated with certain physiological responses. Therefore, a major purpose of the present study is to test the assumption regarding the relationship between anxiety and physiological functioning. However, since somatic psychotherapy techniques are usually restricted to training in the relaxation of striate muscle and/or peripheral vasodilation, the specific intention is to examine the relationship between anxiety, on the one hand, and skeletal muscle tension and peripheral blood flow, on the other hand.

It has already been indicated that somatic psychotherapy is not infrequently limited to training in the relaxation of the skeletal musculature. This is particularly apparent with respect to children, where Jacobson's progressive relaxation and EMG feedback relaxation training typically constitute the preferred somatic psychotherapy techniques (Connoly, Desserman, & Kisschvink, 1974; Davis, Saunders, Creer, & Chai, 1973; Graziano & Kean, 1971; Jacobson, 1973). However, as previously noted, one of the questionable assumptions underlying the use of relaxation training in the treatment of anxiety is that of voluntary and autonomic integration. Thus, another main purpose of the current study is to examine the relationship between voluntary and autonomic responding. More specifically, the intention is to investigate the relationship between muscle tension and peripheral blood flow.

At the same time, a further concern of the present study is the influence of the sex variable on anxiety level and physiological functioning among children. As previously indicated, there is some evidence to suggest that sex differences are of significance in the physiological functioning of adults (Lundervold, 1952).

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Nature of Anxiety

Although the concept of anxiety assumes a significant position in most psychological theories, there is a conspicuous lack of concensus regarding the nature of anxiety (Fischer, 1970). It is generally accepted that anxiety is both psychological and physiological in nature, but the relative emphasis placed on each aspect varies according to the orientation of the theorist. Freud (1936), for example, stresses the psychological nature of anxiety when he maintains that it "is in the first place something felt (p. 69)." Wolpe (1958), on the other hand, focuses on the physiological nature of anxiety by defining it as "the autonomic response pattern or patterns that are characteristically part of the organism's response to noxious stimulation (p. 34)."

Similarly, when theorists consider the specific nature of the psychological and physiological aspects of anxiety, significant differences emerge between their views. For instance, some writers distinguish between the emotions of anxiety and fear (Lesse, 1970), while others make no such differentiation (Wolpe, 1958). By means of further illustration, some theorists consider muscle tension to be an integral part of the physiological response to anxiety evoking stimuli (Germana, 1969; Pelletier, 1977), whereas others believe that muscle tension is not necessarily involved (Wenger, Jones, & Jones, 1956).

Theorists are also divided with respect to the relationship between the psychological and physiological concomitants of anxiety. Some theorists subscribe to the James-Lange (1922) hypothesis, which proposes that the preceding experience of physiological arousal actually constitutes the emotional state. At this point, it should be observed that this view has been seriously undermined by the work of such investigators as Marañon (1924), who found that subjects injected with adrenalin did not report emotional arousal, and Cannon (1936), who observed that organisms deprived of interoceptive stimulation continued to manifest emotional behavior.

Some theorists favor Cannon's (1936) approach to the relationship between the emotional and physiological manifestations of anxiety. According to Cannon (1936), the emotional experience and physiological arousal occur simultaneously. In Cannon's (1936) view, this process is mediated by the thalamus and hypothalamus, and involves an orthosympathetic discharge from the hypothalamus and the secretion of epinephrine from the adrenal medulla. Consistent with Cannon's approach is research showing increased secretion of epinephrine and norepinephrine in anxious patients, and by healthy subjects under stress (Von Euler & Lundberg, 1954), and the induction of various psychological and physiological manifestations of anxiety through the administration of epinephrine (Rickles, 1965). However, as Martin (1961) cautions, this evidence is by no means unequivocal proof of Cannon's theory.

Other theorists do not think that it is possible to relate the emotion of anxiety to a unique pattern of physiological arousal (Duffy, 1962; Mandler, 1962). Duffy (1962), for example, maintains that any emotional condition comprises both a state, which is physiological and nonspecific, and a direction, which is psychological or cognitive. From this perspective, there should be no difference between the physiological concomitants of such diverse emotions as anxiety and euphoria, the subjective experience of such states being determined by cognitions arising from the immediate situation. Congruent with this view is research showing that such disparate feelings as joy and anger can be experimentally induced in subjects infused with epinephrine, without any explanation of its physiological effects (Schachter & Singer, 1968). On the other hand, a number of investigators have provided evidence of differential physiological responses in emotions (Ax, 1953; Engel, 1959; Wolf & Wolff, 1947). However, as Spielberger (1966) aptly observes, the diversity of emotional states is not paralleled by an equal number of visceral and endocrinological patterns, or if this is the case, these patterns have neither been isolated nor identified. Perhaps the most reasonable approach to this matter, in terms of the apparently conflicting evidence, is that taken by Lang, Rice, and Sternbach (1972), who maintain that physiological "patterning does occur within the nonspecific activation framework and that it takes the form of a specificity of response patterns, according to the demands of the stimulus situation on the subject (p. 632)."

Origins of Anxiety

A review of the relevant literature indicates that most investigators are not concerned with the origin of anxiety, per se, but with the etiology of neurotic anxiety, that is, anxiety that is disproportionate or inappropriate to the situation. Different theorists tend to emphasize different causes of neurotic anxiety, including stimulus generalization and classical conditioning (Wolpe, 1958), modelling and operant conditioning (Bandura & Walters, 1963), prolonged stress (Selye, 1975), unresolved intrapsychic conflict (Freud, 1936) and deficiencies in the nervous system (Eysenck, 1967; Malmo, 1970). Nevertheless, it is generally accepted that neurotic anxiety is both genetically and environmentally determined, and there is ample evidence that both heredity (Braconi, 1966; Jost & Sontag, 1944; Shields & Slater, 1960) and environment (Bandura & Rosenthal, 1966; Selye, 1975; Watson & Rayner, 1920) are implicated in the development of neurotic anxiety.

Eysenck's (1967) views on the origin of neurotic anxiety are of particular interest in the present context, because the neuroticism scale of the Junior Eysenck Personality Inventory was used as a measure of anxiety in the current study. On the basis of factor analysis, Eysenck (1970) conceptualizes personality in terms of two major, independent dimensions, namely neuroticism-stability and extraversion-introversion. Eysenck (1969) explains that "neuroticism refers to the general emotional lability of a person...and his liability to neurotic breakdown under stress (p. 3)." Neurotic, or emotionally unstable individuals are characterized by a tendency to be emotionally overresponsive and to have difficulties in returning to normal after emotional experiences, while emotionally stable persons are calm and even tempered (Eysenck & Eysenck, 1968). However, as Eysenck (1963) indicates, it is not assumed that everyone will be either neurotic or stable. On the contrary, the evidence suggests that the distribution on the neuroticism dimension is approximately normal (Eysenck, 1947, 1952). In attempting to account for the differences between neurotic and stable individuals, Eysenck (1967) postulates "differential thresholds of arousal in the visceral brain (p. 230)." More specifically, Eysenck (1967) proposes that, on the basis of certain inherited differences in the neurophysiological structure of the visceral brain, neurotics are more sensitive, emotionally, than stable persons. At this point, it should be mentioned that Eysenck (1967) also subscribes to the idea that neurotic anxiety can be conditioned. Since anxious individuals condition more readily than their less anxious counterparts (Bandura & Rosenthal, 1966), neurotics can be expected to suffer from both severe and pervasive anxiety. It should also be noted that neuroticism appears to be related to sex, with females tending to be more neurotic than males (Eysenck, 1963; Eysenck & Eysenck, 1968).

Measurement of Anxiety

As Martin (1961) observes, "one's theoretical approach to anxiety affects how one goes about measuring it (p. 234)." Over the years, anxiety research has employed a host of biochemical, physiological, personality, self-report and behavioral measures of anxiety. Not surprisingly, in view of the preceding discussion, intercorrelations between, and even within, these different types of measures have not been impressive (Martin, 1961). As previously indicated, the neuroticism scale of the Junior Eysenck Personality Inventory was used as a measure of anxiety in the present study. This choice was influenced by the idea that this instrument might prove to be a convenient aid in identifying children likely to benefit from early training in physiological self control.

Measurement of Muscle Tension

In research, and to an increasing extent in clinical settings, electromyography has replaced the estimation of muscle tension, or muscular contraction, by subjective report, visual inspection or palpation. Electromyography entails the detection, amplification and recording of the muscle action potentials (MAPs) that are produced when motor units fire (Goldstein, 1972). Of course, the electromyograph does not provide a direct measure of muscle tension, since the MAPs occur prior to the contraction of the muscle. Nevertheless, in studies relating variations in muscular contraction to changes in EMG amplitude the resulting correlations have been high. Wilcott and Beenken (1957), for example, have reported correlations in the 0.80s and 0.90s between muscle tension and EMG amplitude. With respect to the sensitivity of electromyography, which constitutes one of the main advantages of this technique over other types of measurement, Green, Green, and Walters (1970) indicate that "an electromyographic (EMG) electrode...will usually detect a continuous firing of motor fibres, even though visible signs of tension may not exist and muscular feelings of tension may not exist (p. 7)." While electromyography may be applied to any accessible muscle, the frontalis (forehead) region is a common site, because it appears to be an especially sensitive indicator of muscle tension (Luce & Peper, 1971).

Measurement of Peripheral Blood Flow

Peripheral blood flow can be measured directly only by means of invasive techniques that entail the penetration of tissue. Since all the blood flow devices that are currently available require surgical implantation, the direct measurement of peripheral blood flow is rarely undertaken with normal human subjects (Brown, 1972). Nevertheless, alterations in peripheral blood flow are related to physical changes that can be monitored at the surface of the skin. These physical changes include alterations in the volume of body compartments, tissue opacity and skin temperature, which are typically measured by means of volume plethysmography, photoplethysmography and thermometry, respectively (Taub, 1975). Although changes in peripheral blood flow are reflected more rapidly in plethysmographic records than in tissue temperature, thermometry tends to be the preferred measurement technique. The popularity of thermometry is based on a number of practical considerations, including its applicability to many regions of the body, its convenience, the relatively low cost of the instrumentation and the portability of the equipment (Taub, 1975). However, in recognition of the limitations of the familiar mercury in glass thermometer, which include undue restriction of the activity of the subject and the absence of a continuous, remotely recordable signal, current temperature sensing and recording devices for research use either thermistors or thermocouples as sensing elements. In the present study a thermistor was used.

Muscle Tension and Anxiety

While the precise nature of the relationship between skeletal muscle tension and anxiety is debatable, the existence of a strong, positive relationship between these two variables is frequently assumed. Jacobson (1938), for instance, subscribes to the popular notion that "the subjective experience of emotion is largely derived from intense proprioceptive impulses (p. 218)." More specifically, Jacobson (1967b) maintains that proprioceptive impulses stimulate the sympathetic division of the hypothalamus and cerebral cortex, thereby increasing emotionality and other mental activities. In Jacobson's (1938) view, "an emotional state fails to exist in the presence of the complete relaxation of the peripheral parts involved (p. 218)." This focus on the vital role of afferent feedback from the skeletal musculature is also apparent in the relaxation therapies of Haugen et al. (1958), Schultz and Luthe (1959) and Wolpe (1973), all of whom regard anxiety and skeletal muscle relaxation as antagonistic states.

The scientific investigation of the relationship between muscle tension and anxiety, which has mainly involved adult subjects, has taken numerous forms. One approach has entailed comparisons of the muscle tension of normal and anxious subjects under resting conditions and experimental stress (Malmo, 1957; Malmo & Shagass, 1949; Malmo & Smith, 1955; Martin, 1956; Sainsbury, 1964; Wing, 1964). A somewhat similar line of investigation has been concerned with differences in muscle tension between controls and various types of clinical groups, such as depressed and schizophrenic patients, who are presumed to be generally more anxious than normals (Davis, Malmo, &

Shagass, 1954; Goldstein, 1965; Malmo, Shagass, & Davis, 1951; Martin & Davies, 1965). Other investigations have studied the effects of different types of relaxation training on anxiety (Engelhardt, 1978; Johnson & Spielberger, 1968; Raskin et al., 1973) and anxiety mediated symptoms (Freedman & Papsdorf, 1976; Raskin et al., 1973). In addition, the effects of anxiety inhibiting drugs on muscle tension (Lader & Mathews, 1970; Martin & Davies, 1965) and the influence of muscle relaxants on anxiety (Davison, 1966) have also been studied.

Although numerous investigators have provided evidence of a positive relationship between anxiety and muscle tension (Haynes, Moseley, & McGowan, 1975; Malmo & Shagass, 1949; Malmo & Smith, 1955; Sainsbury, 1964; Sherman & Jost, 1942), the obtained correlations have frequently been low and findings in the area tend to be inconsistent (Lader & Mathews, 1971). Wing (1964), for example, reported that anxious subjects demonstrated higher levels of muscular tension than controls before and after, but not during, a difficult color naming task. Conversely, Martin (1956) found a significant difference in levels of muscular tension between anxious subjects and controls during, but not before or after, a stressful interview. Furthermore, some studies have discovered no difference with respect to muscle tension between anxious subjects and controls

(Mathews & Gelder, 1969; Lader & Wing, 1966).

Similarly, conflicting findings commonly emerge from studies conducted with clinical groups presumed to be generally more anxious than normals. For example, whereas some investigators have found muscle tension to be elevated in depressed patients (Goldstein, 1965; Martin & Davies, 1965; Whatmore & Ellis, 1959, 1962), others have discovered no clear relationship between depression and muscle tension (Goldstein, Grinker, Heath, Oken, & Shipman, 1964; Heath, Oken, & Shipman, 1967; Lader & Wing, 1969). There has been less systematic work in the area with schizophrenics (Lader & Mathews, 1971). Nevertheless, there is some evidence to suggest that both acute and chronic schizophrenics tend to have elevated levels of tension in the skeletal musculature (Davis et al., 1954; Jurko, Jost, & Hill, 1952; Malmo et al., 1951). Of course, the finding of a positive relationship between muscle tension and schizophrenia cannot be taken as sound evidence of a positive relationship between muscle tension and anxiety.

With respect to the effects of different types of relaxation training on anxiety, the vast majority of investigators indicate that training in muscle relaxation reduces anxiety. However, extreme caution is required in interpreting this finding as evidence of a strong, positive relationship between muscle tension and anxiety, because many studies in this area lack adequate controls (Budzynski & Stoyva, 1972; Haugen et al., 1958; Jacobson, 1967a, 1970; Johnson & Spielberger, 1968; Raskin et al., 1973; Schultz & Luthe, 1959) and it is not uncommon for investigators to fail to measure muscle tension when assessing the effectiveness of relaxation training in anxiety resolution (Benjamins, 1976; Johnson & Spielberger, 1968; Kondo, Canter, & Knott, 1975; Payne, 1970; Wolpe, 1958, 1973). The results of the relatively small number of controlled studies that include objective measures of muscle tension tend to question, rather than clearly confirm, the existence of a strong, positive relationship between muscle tension and anxiety. Thus, while some studies have provided evidence of a significant reduction in both muscle tension and anxiety during relaxation training (Canter, Kondo, & Knott, 1975; Townsend, House, & Addario, 1975), some have shown that a significant decrease in muscle tension is not necessarily accompanied by a significant decrement in anxiety (Le Boeuf, 1974; Miller, Murphy, Miller, & Smouse, 1976) and others have indicated that failure to achieve a significant reduction in muscle tension does not necessarily preclude the attainment of significant subjective benefits (Reinking & Kohl, 1975). In this context it is interesting to note that Breeden, Bean, Scandrett, and Kondo (1975) found some evidence of an inverse relationship between reduction in muscle tension and relief from anxiety among a group of chronically tense patients.

Studies concerned with the effects of different types of relaxation training on anxiety mediated symptoms, such as asthma, insomnia and tension headaches, tend to exhibit the same deficiencies as those concerned with the effects of relaxation training techniques on anxiety. Thus, many experiments in this area lack adequate controls (Budzynski, Stoyva, & Adler, 1969; Dickel, Dixon, Shanklin, & Phillips, 1967; Jacobson, 1938, 1967a; Raskin et al., 1973; Schultz & Luthe, 1959) and/or objective measures of muscle tension (Chesney & Shelton, 1976; Feldman, 1976; Gershman & Clouser, 1974; Nicassio & Bootzin, 1974). In addition, and of equal significance, studies in this area rarely include measures of anxiety. Therefore, despite ample evidence that relaxation training is beneficial in the treatment of numerous psychosomatic disorders, this information cannot be taken as proof of a strong, positive relationship between muscle tension and anxiety.

As previously noted, a number of studies have explored the relationship between muscle tension and anxiety by investigating the effects of muscle relaxants on anxiety and the influence of sedatives on muscle tension. One of the most significant findings of research in this area is that muscle tension and anxiety can become completely dissociated. As Lader and Mathews (1971) indicate, the reports of subjects suggest that muscular paralysis with curare increases, rather than decreases, anxiety. In addition, various studies have used paralytic drugs, primarily d-tubocurarine chloride, to demonstrate the acquisition of phobias under complete skeletal muscle paralysis (Gerall & Obrist, 1962; Leaf, 1964; Solomon & Turner, 1962). With respect to the dissociation of muscle tension and anxiety that can occur in certain states of sedation, Martin and Davies (1965) found that amylobarbitone sodium failed to have any significant effect on muscle tension, despite the fact that it did produce behavioral drowsiness. Similarly, Lader and Mathews (1970) found methohexitone sodium no more effective than instructions to relax in reducing muscle tension, despite behavioral drowsiness in some patients. While these findings provide no information about the degree of association between muscle tension and anxiety in the absence of chemical intervention, they do form the most direct evidence against the simple, causal type of relationship postulated by Jacobson (1967b).

From the foregoing discussion, it is apparent that research concerned with the relationship between muscle tension and anxiety has tended to result in somewhat discrepant findings. Some of the more obvious sources of inconsistency may include difficulties associated with the assessment of anxiety and muscle tension. Anxiety is a controversial concept and, as Martin (1961) correctly observes, how one goes about measuring anxiety depends on one's theoretical approach to it. Since intercorrelations among different anxiety measures are typically unimpressive, some discrepancies between the findings of studies using different measures of anxiety may be anticipated. Inconsistent results may also be expected from studies wherein the subjects are merely presumed to be anxious on the basis of the presence of psychiatric syndromes or psychosomatic symptoms. Those studies in which laboratory stresses are used have their own peculiar problems, which may lead to inconsistent findings. As Schachter and Singer (1962) indicate, many of the stimuli used to evoke anxiety are not easily standardized and may be significantly affected by the varying attitudes and expectations of the subjects. Although the nature of muscle tension is not generally in dispute, and despite the fact that the electromyograph is widely accepted as the most sensitive measure of muscle tension, some disagreement exists regarding the muscle groups from which recordings should be taken (Balshan, 1962). Certainly, there is some evidence to suggest that choice of muscle groups may be a significant variable in studies of the relationship between muscle tension and anxiety (Malmo & Smith, 1955). Another possible source of discrepancy, for which there is some supporting data, is the variable of sex. It will be recalled that Lundervold (1952) found exaggerated skeletal muscular responses to be more characteristic of women than of men. A further source of variation, for which there is also supporting data, is that of individual differences with respect to the degree of involvement of the skeletal musculature in stress reactions. Cameron (1944), and, more recently, Le Boeuf (1974) have both indicated that muscular symptoms are predominant for some, and insignificant for other anxious subjects. On this basis, alone, correlations between anxiety and muscle tension can be expected to be low.

Peripheral Blood Flow and Anxiety

The relationship between peripheral blood flow and anxiety has not been studied as extensively as that between muscle tension and anxiety. However, the empirical evidence that is available does support the existence of an inverse relationship between peripheral blood flow and anxiety (Ackner, 1956). For instance, decreases in peripheral blood flow have been observed in response to induced stress (Crawford, Friesen, & Tomlinson-Keasey, 1977; Crawford &

Tomlinson-Keasey, 1976; Eng, 1925; Mittelmann & Wolff, 1939; Morton & Scott, 1930; Sturup, Bolton, Williams, & Carmichael, 1935). Conversely, increases in peripheral blood flow have been shown to occur with relaxation and sleep (Russell, 1972; Steele, 1934; Talbot, 1931). Differences in peripheral blood flow between anxious subjects and normals have also been noted (Mittelmann & Wolff, 1939; Thompson & Russell, 1976).

Some data pertaining to the relationship between peripheral blood flow and anxiety has come from studies of Raynaud's disease. This typically female affliction is characterized by attacks of coldness and pallor of the extremities, reflecting a marked reduction in peripheral blood flow (Graham, 1972). Of particular interest, in the present context, are reports that Raynaud's disease develops in response to stressful life situations (Mittelmann & Wolff, 1939; Mufson, 1944; Graham, 1955). Of additional interest is Mufson's (1944, 1953) observation that patients with Raynaud's disease are susceptible to a variety of fears, which, presumably, render them chronically anxious.

Although research in the area supports the existence of an inverse relationship between peripheral blood flow and anxiety, correlations between these two variables can, nevertheless, be expected to be relatively low. As Montgomery (1976) has shown, people have individual physiological response patterns, only some of which include significant reactivity in the vascular system.

Hypotheses

On the basis of the preceding discussion, the following hypotheses were delineated for empirical investigation:

1. Anxious children will exhibit higher levels of muscle tension than those low in anxiety.
2. Peripheral blood flow will be less for anxious children than for those low in anxiety.
3. There will be a low negative correlation between muscle tension and peripheral blood flow.
4. Girls will be more anxious than boys.
5. Girls will exhibit higher levels of muscle tension than boys.
6. Peripheral blood flow will be less for girls than for boys.

CHAPTER III

DESIGN AND PROCEDURE

Sample

Subjects for this study were drawn from the 117 grade six students attending an elementary school in a city of approximately 500,000 residents in northern Alberta. Parental permission for participation in the study, which was conducted as part of a screening program for a relaxation training course, was obtained for all the grade six students. The original sample consisted of 48 male subjects, randomly selected from the 59 grade six boys, and 48 female subjects, randomly selected from the 58 grade six girls. However, after the study had been initiated, one female subject became unavailable for completion of the testing, thereby reducing the size of the experimental group to a total of 95 subjects.

Procedure

At the beginning of the study, the neuroticism (N) scale of the Junior Eysenck Personality Inventory (JEPI) was administered as a group test to all the grade six students in their respective classrooms. However, since the items of the N scale are integrated with those of the extraversion (E) and lie (L) scales of the JEPI, the students were also required to respond to the items of the E and L scales (see Appendix A for items of the JEPI). To assist the students in meeting the demands of the JEPI, which include the command to work quickly without thinking too long about the exact meaning of each question, and in order to accommodate poor readers, each item was read aloud by the examiner as it was separately projected for 15 seconds onto a screen at the front of the classroom. The students were required to record their responses to the questions on data sheets (see Appendix B for sample of data sheet). Interaction effects between the examiner and student groups were controlled through the use of standardized instructions, which were given following distribution of the data sheets: "Please fill in your name and age in the spaces provided at the top of the sheet. Then indicate your sex by putting a check mark in the appropriate box." (Pause.) "I want your answers to a number of questions, to assist in the establishment of the relaxation training program. Your answer sheets are for my use only and will not be shown to anyone else. Please listen carefully to each question as I read it aloud from the screen, and put a check mark in the 'yes' or 'no' box corresponding to the number of the question. There are no right or wrong answers, and no trick questions. Work quickly and do not think too long about the exact meaning of each question. Remember to answer every question."

Following the administration of the JEPI, individual measures of muscle tension and peripheral blood flow were obtained for each subject. Measurement of these physiological variables was made in a quiet, well lit room, designated for the purpose. This room was approximately 7 x 9 ft. and was maintained at a constant temperature of 70'F (Autogenic Systems Incorporated, 1976). The times of day at which the measurements were made, were balanced for the male and female subjects, in order to control for the possible effects of daily biological rhythms and daily fluctuations in environmental conditions. Thus, the subjects were tested in a boy-girl sequence one day and in a girl-boy sequence the next day.

Each individual session was of approximately 40 minutes duration, comprising an initial phase of subject preparation, followed by a 30 minute measuring and recording phase. Upon entering the experimental room, each subject received the following verbal instructions: "Please sit in this chair. Rest your hands on your lap, palms up, and place your feet flat on the footprints. Now sit still while I attach these sensors to you. They won't hurt you at all. They are just used to tell what various parts of your body are doing. The information will be used in setting up the relaxation training program. Which hand do you usually write with?" (Temperature probe attached.) "Please make sure that you do not touch the sensor on your finger." (EMG electrodes attached.) "Your task for the next 30 minutes is just to sit quietly with your eyes open. I shall not be saying anything to you, so just sit still and wait until I tell you that we are finished." At the indicated points, during the instructions, the temperature probe was attached to the palmar surface of the first digit of the middle finger of the dominant hand (Autogenic Systems Incorporated, 1976), and the two active EMG electrodes were attached 1 inch above the eyebrows, with a reference electrode between them in the center of the forehead (Davis, 1959). The sitting position of the subjects was standardized by having the exact location of the chair marked on the floor, and by having the subjects place their feet on two footprints fixed on the floor in front of the chair.

During the measuring and recording phase, average EMG activity from the frontal region, and average skin temperature from the tip of the middle finger, were measured in alternating sequence. Average EMG activity was measured for five 2 minute periods, each 4 minutes apart, commencing at the beginning of the measuring and recording phase. Average skin temperature was measured for five 2 minute periods, each 4 minutes apart, commencing after the first 3 minutes of the measuring and recording phase. Following each 2 minute measuring period was a 1 minute rest period, during which the examiner transferred the data for the preceding measurement period to the subject's data sheet, and adjusted the equipment to monitor the appropriate function. At this point, it should be noted that the subject was not in a position to observe the readouts of the instruments, nor was the subject able to see the examiner recording the data. It should also be observed that the EMG activity-skin temperature sequence was adopted because EMG activity is a more immediate measure of muscle tension than skin temperature is of peripheral blood flow.

Instrumentation

JEPI, N scale. The N scale of Eysenck's (1963) JEPI was used as a measure of anxiety in the present study. This scale is a modification and downward extention of the N scale of the Eysenck Personality Inventory for adults, which has been found to be highly related to the IPAT anxiety scale (Eysenck & Eysenck, 1968). Selection of the 24 items of the N scale of the JEPI was based on the loadings of the items on the N factor and their lack of loading on other factors (Eysenck, 1963). In relation to the concurrent validity of the N scale of the JEPI, Eysenck (1963) indicates that a group of 229 guidance clinic subjects was "very significantly above the standardization group with respect to neuroticism (p. 9)." Corrected split-half reliabilities, based on the N scores of 3,388 girls and 3,372 boys aged 7 to 16 years, range from .80 to .89 for girls and from .74 to .85 for boys (Eysenck, 1963). Test-retest reliabilities, based on the N scores of 1,074 girls and 1,056 boys aged 7 to 16 years, range from .53 to .88 for girls and from .63 to .87 for boys (Eysenck, 1963). As Eysenck (1963) points out, there is no great change in reliability with age for the N scale.

Electromyograph. An Autogen 1500 feedback myograph, which was capable of registering EMG activity changes within the amplitude range of 0.1 to 2000 µV, was used to monitor EMG activity. The main component of the electromyograph was a differential amplifier with low internal noise levels (0.1 µV noise). Incorporated into the electromyograph was a band pass filter for the rejection of electroencephalographic and electrocardiographic artifacts. The electromyograph had high common mode and 60 Hz rejection characteristics, and was equipped with shielded electrode cables, to reduce external electrical interference. Silver/silver chloride electrodes, embedded in plastic insulator discs, were used to detect the muscle potentials.

Biogel biopotential contact medium was used in the cups of the electrodes, which were attached to the skin by means of donut shaped adhesive discs.

Thermometer. An Autogen 2000 feedback thermometer, capable of accurately registering temperature changes of less than .02 of a degree Fahrenheit, was used to monitor skin temperature. A Yellow Springs Instrument Company temperature probe was used with the thermometer. At the tip of the temperature probe was an epoxy coated thermistor, which served as a temperature sensor. Micropore tape was used to attach the temperature probe to the first digit of the middle finger.

Digital integrator. An Autogen 5100 digital integrator was used to compute, in alternating sequence, average EMG activity in microvolts and average skin temperature in degrees Fahrenheit, ver the selected time intervals. Functions 2 and 3 of the integrator were used for the inputs of the electromyograph and thermometer, respectively. Standard RCA phono male cables were used to connect the electromyograph and thermometer to the integrator. The integrator presented average EMG activity in microvolts and average skin temperature in degrees Fahrenheit on a digital readout.

CHAPTER IV

ANALYSIS, FINDINGS AND CONCLUSIONS

Basically, Chapter IV comprises a restatement of the hypotheses delineated in Chapter II, together with a presentation of the related findings, and conclusions. In order to test the hypotheses concerned with the relationship between anxiety, on the one hand, and muscle tension and peripheral blood flow, on the other hand (Hypotheses 1 and 2), the subjects were divided into high and low anxious groups, according to whether they scored above or below the mean on the N scale of the JEPI. Then the significance of the differences between the EMG activity means and the skin temperature means for the high and low anxious groups was calculated by applying the appropriate t test. To test the hypothesis concerned with the relationship between muscle tension and peripheral blood flow (Hypothesis 3), the correlation between the EMG activity and skin temperature data was determined by calculating the Pearson product-moment correlation coefficient (Ferguson, 1971, p. 99). Finally, in order to test the hypotheses concerning the effect of the sex variable on anxiety, muscle tension and peripheral blood flow (Hypotheses 4,5 and 6), the significance of the differences between the neuroticism (N) means, the EMG activity means and the skin temperature means, for the male and female groups, was calculated by applying the appropriate t test.

HYPOTHESIS 1

Anxious children will exhibit higher levels of muscle tension than those low in anxiety.

<u>Findings</u>

The average EMG activity for those subjects scoring above and those subjects scoring below the mean on the N scale of the JEPI, provided the data for testing Hypothesis 1. Prior to testing Hypothesis 1, the F test for homogeneity of variance (Ferguson, 1971, p. 164) was applied to the EMG activity data. Since the F test revealed a significant difference between the variances ($F = 2.15$, $p < .05$), the Welch t test (Ferguson, 1971, p. 155), rather than the ordinary t test, was used to test Hypothesis 1. As Table 1 indicates, this analysis confirmed the existence of a significant difference, in the predicted direction, between the EMG activity means for the high N and low N subjects ($t = 1.78$, $p < .05$).

<u>Conclusion</u>

Statistical analysis of the data confirmed Hypothesis 1.

TABLE 1

SUMMARY OF PHYSIOLOGICAL DIFFERENCES BETWEEN HIGH AND LOW ANXIOUS CHILDREN

PHYSIOLOGICAL	HIGH ANXIOUS			LOW ANXIOUS					
MEASURES	Mean	S D	N	Mean	S D	N	df	t	p
EMG ACTIVITY (μV)	6.18	3.35	49	5.13	2.29	46	86	1.78	$<.05$
SKIN TEMPERATURE (°F)	95.76	2.92	49	95.62	2.51	46	93	-0.25	$>.05$

HYPOTHESIS 2

Peripheral blood flow will be less for anxious children than for those low in anxiety.

Findings

Average skin temperature for those subjects scoring above and those subjects scoring below the mean on the N scale of the JEPI, provided the data for testing Hypothesis 2. Before testing this hypothesis, the F test was applied to the skin temperature data, in order to test for homogeneity of variance. The F test revealed no significant difference between the variances ($F = 1.35$, $p > .05$). Since the assumption of homogeneity of variance was met, the t test (Ferguson, 1971, p. 269) was used to test Hypothesis 2. With reference to Table 1, the t test revealed no significant difference between the skin temperature means of the high N and low N subjects ($t = -.25$, $p > .05$).

Conclusion

On the basis of this analysis, Hypothesis 2 was rejected.

HYPOTHESIS 3

There will be a low negative correlation between muscle tension and peripheral blood flow.

Findings

To test Hypothesis 3, the Pearson product-moment correlation coefficient was used as the measure of correlation between the EMG activity and skin temperature data for all subjects. The results of this analysis confirmed the existence of a negative relationship between EMG activity and skin temperature ($r = -.39$, $p < .01$). As Table 2 shows, the predicted negative relationship also held when the EMG activity and skin temperature data were analysed, separately, for the males ($r = -.28$, $p < .05$) and females ($r = -.45$, $p < .01$). There was no significant difference between the correlation coefficients for the males and females ($z = .93$, $p > .05$).

Conclusion

On the basis of this statistical analysis, Hypothesis 3 was confirmed.

HYPOTHESIS 4

Girls will be more anxious than boys.

Findings

The scores obtained on the N scale of the JEPI, by the male and female subjects, provided the data to test Hypothesis 4. The F test revealed no significant difference between the variances ($F = 1.30$, $p > .05$). Therefore, the t test was used

TABLE 2

SUMMARY OF CORRELATIONS BETWEEN
EMG ACTIVITY AND SKIN TEMPERATURE

GROUPS	EMG ACTIVITY (μV)			SKIN TEMPERATURE (°F)					
	Mean	S D	N	Mean	S D	N	df	r	p
ALL SUBJECTS	5.67	2.90	95	95.69	2.69	95	93	-0.39	<.01
MALES	5.39	2.61	48	95.88	2.08	48	46	-0.28	<.05
FEMALES	5.96	3.15	47	95.50	3.18	47	45	-0.45	<.01

to test Hypothesis 4. As Table 3 shows, this analysis indicated a significant difference, in the predicted direction, between the means of the N scores for the male and female subjects ($t = 4.55$, $p < .01$).

Conclusion

On the basis of this analysis, Hypothesis 4 was confirmed.

HYPOTHESIS 5

Girls will exhibit higher levels of muscle tension than boys.

Findings

The average EMG activity obtained for the male and female subjects provided the data for testing Hypothesis 5. Prior to testing Hypothesis 5, the F test for homogeneity of variance was applied to the EMG activity data for the two groups. Since the F test revealed no significant difference between the variances ($F = 1.46$, $p > .05$), the t test was used to test Hypothesis 5. Contrary to prediction, as Table 3 shows, there was no significant difference between the EMG activity means for the males and females ($t = .96$, $p > .05$).

Conclusion

On the basis of this statistical analysis,

TABLE 3

SUMMARY OF DIFFERENCES BETWEEN FEMALES AND MALES

MEASURES	FEMALES			MALES					
	Mean	S D	N	Mean	S D	N	df	t	p
JEPI N SCALE	17.40	4.01	47	13.38	4.58	48	93	4.55	$<.01$
EMG ACTIVITY (μV)	5.96	3.19	47	5.39	2.63	48	93	0.96	$>.05$
SKIN TEMPERATURE ('F)	95.50	3.22	47	95.88	2.12	48	80	-0.68	$>.05$

Hypothesis 5 was rejected.

HYPOTHESIS 6

Peripheral blood flow will be less for girls than for boys.

<u>Findings</u>

Average skin temperature, for the male and female subjects, provided the data to test Hypothesis 6. The F test for homogeneity of variance revealed a significant difference between the variances ($F = 2.31$, $p < .01$). Therefore, the Welch t test was used to test Hypothesis 6. As Table 3 indicates, and contrary to prediction, there was no significant difference between the skin temperature means for the male and female subjects ($t = -.68$, $p > .05$).

<u>Conclusion</u>

On the basis of this analysis, Hypothesis 6 was rejected.

CONCLUSIONS

In summary, the above findings suggest the following conclusions:

1. Anxious children exhibit higher levels of muscular tension than children low in anxiety.
2. Peripheral blood flow is not less for anxious children than for those low in anxiety.
3. There is a low negative correlation between muscle

tension and peripheral blood flow.

4. Girls are more anxious than boys.
5. Girls do not exhibit higher levels of muscle tension than boys.
6. Peripheral blood flow is not less for girls than for boys.

CHAPTER V

DISCUSSION AND IMPLICATIONS

In general terms, the main purpose of this research was to test some of the assumptions underlying the use of somatic psychotherapy with children, and to consider the influence of sex on anxiety and physiological functioning. More specifically, the primary objectives of this study were to examine the relationship between anxiety and physiological functioning, to investigate the relationship between voluntary and autonomic responding and to explore the effect of sex differences on anxiety, muscle tension and peripheral blood flow. In Chapter V, the results of this study are discussed, both in terms of the research objectives and in relation to some of the theoretical and practical issues in the area of somatic psychotherapy for children. Following the discussion, some implications for further research and for the practice of somatic psychotherapy are delineated.

DISCUSSION

Anxiety and Physiological Functioning

As previously n[illegible]d, a common assumption of somatic psychothe[illegible]y is that anxiety is invariably accompanied by physiological responses that are in the di ection of heightened arousal. On this basis, it was hypothesized that anxious children would exhibit elevated levels of muscle tension and diminished peripheral blood flow. However, while the results of the present study supported the existence of a positive relationship between anxiety and muscle tension, no relationship between anxiety and peripheral blood flow was apparent.

One plausible explanation for these apparently discrepant findings, which is consistent with the concept of resonse specificity, is that anxious children tend to respond in the motor, rather than in the vascular, system. This suggestion is congruent with Sherman and Jost's (1942) findings that a group of neurotic children had more resting level hand tremors than a group of well-adjusted children, but that there were no differences between the groups with respect to heart rate and blood pressure. The idea that anxious children tend to respond in the motor system is also consistent with the findings of Engelhardt (1978), who reported that elementary school children experienced a significant reduction in anxiety as a result of relaxation training.

Of course, it is possible that the results of the present study would have been different if the subjects had been exposed to experimental stress.

As it was, although the experimental situation was novel to the subjects, an effort was made to dispel any fears the subjects may have had regarding the experimental procedure. However, in terms of previous research findings, it appears unlikely that different results would have emerged under conditions of stress. In the previously cited study of neurotic and well adjusted children, conducted by Sherman and Jost (1942), the results remained constant over a series of seven different experimental conditions. Nevertheless, in view of the paucity of recent research in the area, further studies of children under stress appear to be warranted.

Voluntary and Autonomic Responding

Another common assumption of somatic psychotherapy is that of integration of voluntary and autonomic responding. However, as previously cited research suggests, the degree to which voluntary and autonomic responding is integrated may be a dimension according to which individuals vary. On this basis, it was hypothesized that there would be a low negative correlation between muscle tension and peripheral blood flow among children. As predicted, the results of the present study supported the existence of a low negative correlation between the specified voluntary and autonomic variables ($r = -.39$, $p < .01$).

Expressed differently, only 15% of the variance of muscle tension was predictable from the variance of peripheral blood flow, and vice versa ($r = -.39$, $r^2 = .15$). A visual inspection of the EMG activity and skin temperature data showed that approximately 15% of the subjects scored below the mean for both EMG activity and skin temperature and that about 23% of the subjects scored above the mean for both EMG activity and skin temperature. These percentages suggest that approximately 15% of the subjects were autonomic responders and that about 23% were voluntary responders, making a total of 38% in whom the voluntary and involuntary nervous systems were only loosely coupled.

These findings have serious implications for somatic psychotherapy as it is generally practiced, especially in relation to the treatment of psychosomatic disorders in the motor or vascular systems. Clearly, somatic psychotherapy techniques that focus exclusively on the reduction of tension in the skeletal musculature are unsuitable for autonomic responders, while those which concentrate solely on peripheral vasodilation are inappropriate for voluntary responders. In terms of effective therapy, these findings suggest that the specific somatic psychotherapy technique to be used should be determined on the basis of an assessment of the individual's pattern of physiological responding (Stoyva & Budzynski, 1974).

Of course, it is possible that the results of the present study would have been different if EMG activity and skin temperature had been monitored simultaneously, rather than in alternating sequence. However, such a study would be of limited usefulness, because it would not circumvent the difficulty associated with the fact that skin temperature is a less immediate measure of peripheral blood flow than EMG activity is of muscle tension. What would be extremely useful is a study to determine the average time lag between changes in peripheral blood flow and corresponding changes in skin temperature.

The Influence of Sex on Anxiety and Physiological Functioning

As previously cited research indicates, women tend to be more anxious, and to exhibit higher levels of physiological arousal, than men. On these grounds, it was hypothesized that girls would be more anxious and tense than boys, and that peripheral blood flow would be less for girls than for boys. However, while results of the present study support the hypothesized relationship between sex and anxiety, there were no significant differences between the girls and boys with respect to muscle tension and peripheral blood flow.

The absence of any relationship between sex and muscle tension was somewhat surprising, in view of the findings that the girls were more anxious than the boys and that the anxious children were more tense than their less anxious counterparts. The most plausible explanation for this somewhat unexpected result is that the difference in anxiety levels between the girls and boys, although statistically significant ($p < .01$), was not sufficient to be associated with any significant difference in levels of muscle tension. This explanation is consistent both with Eysenck's (1963) observation that the difference in neuroticism between girls and boys increases with age and with research indicating that women tend to be more tense than men (Lundervold, 1952).

Although contrary to prediction, the absence of any relationship between sex and peripheral blood flow was consistent with the finding of no significant relationship between anxiety and peripheral blood flow. Since it appears that anxious children tend to respond in the motor, rather than in the vascular, system, no significant difference in peripheral blood flow between girls and boys could be expected.

Clearly, the results of the present study suggest that the differences in physiological functioning associated with sex differences in adults, do not apply to children. However, there is presumably some point at which such differences do emerge in young people. It would be useful, therefore, to conduct a study to determine the age at which differences in physiological functioning associated with sex do appear.

IMPLICATIONS

Research Implications

During the preceding discussion, a number of implications for further research were suggested. These may be delineated as follows:

1. It would be useful to conduct further research in which the physiological variables, traditionally associated with anxiety, are monitored in children under conditions of stress.
2. A study to determine the average time lag between changes in peripheral blood flow and corresponding changes in skin temperature, would be helpful to researchers who use skin temperature as an indicator of peripheral blood flow.
3. Research indicating the age at which sex differences tend to become a factor in physiological responding would be of practical interest to both clinicians and investigators in the area of somatic psychotherapy.

Practical Implications

The results of the present study also entail the following practical implications:

1. Somatic psychotherapy techniques which focus on the reduction of tension in the skeletal musculature would appear to be generally suitable for use in the treatment of anxiety among children.
2. The N scale of the JEPI appears to be a useful aid in identifying children likely to benefit from relaxation training.
3. Somatic psychotherapy techniques which are concerned solely with the motor system would seem to be inappropriate for use with children who suffer from psychosomatic disorders of the vascular system.
4. Somatic psychotherapy techniques which focus exclusively on peripheral vasodilation would appear to be unsuitable for use with children who suffer from psychosomatic disorders of the motor system.
5. Somatic psychotherapy techniques should not be selected for children on the basis of sex.
6. Ideally, the selection of a specific somatic psychotherapy technique should be made on the basis of an assessment of the individual's pattern of physiological responding.

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APPENDICES

A. Items of the JEPI

1. Do you like plenty of excitement going on around you? . . . . YES ☐ NO ☐
2. Do you often need kind friends to cheer you up? . . . . YES ☐ NO ☐
3. Do you nearly always have a quick answer when people talk to you? . . . . YES ☐ NO ☐
4. Do you sometimes get cross? . . . . YES ☐ NO ☐
5. Are you moody? . . . . YES ☐ NO ☐
6. Would you rather be alone instead of meeting other children? . . . . YES ☐ NO ☐
7. Do ideas run through your head so that you cannot sleep? . . . . . YES ☐ NO ☐
8. Do you always do as you are told at once? . . . . YES ☐ NO ☐
9. Do you like practical jokes? . . . . YES ☐ NO ☐
10. Do you ever feel "just miserable" for no good reason? . . . . . . YES ☐ NO ☐
11. Are you rather lively? . . . . YES ☐ NO ☐
12. Have you ever broken any rules at school? . . . . YES ☐ NO ☐
13. Do lots of things annoy you? . . . . YES ☐ NO ☐
14. Do you like doing things where you have to act quickly? . . . . . YES ☐ NO ☐
15. Do you worry about awful things that might happen? . . . . . . YES ☐ NO ☐
16. Can you always keep every secret? . . . . YES ☐ NO ☐
17. Can you get a party going? . . . . YES ☐ NO ☐
18. Do you get thumping in your heart? . . . . YES ☐ NO ☐
19. When you make new friends do you usually make the first move? . . . . YES ☐ NO ☐
20. Have you ever told a lie? . . . . YES ☐ NO ☐
21. Are you easily hurt when people find fault with you or the work you do? . . YES ☐ NO ☐
22. Do you like telling jokes or funny stories to your friends? . . . . . . YES ☐ NO ☐
23. Do you often feel tired for no good reason? . . . . YES ☐ NO ☐
24. Do you always finish your homework before you play? . . . . YES ☐ NO ☐
25. Are you usually happy and cheerful? . . . . YES ☐ NO ☐
26. Are you touchy about some things? . . . . YES ☐ NO ☐
27. Do you like mixing with other children? . . . . YES ☐ NO ☐
28. Do you say your prayers every night? . . . . YES ☐ NO ☐
29. Do you have "dizzy spells"? . . . . YES ☐ NO ☐
30. Do you like playing pranks on others? . . . . YES ☐ NO ☐
31. Do you often feel fed-up? . . . . YES ☐ NO ☐

32. Do you sometimes boast a little? . . . . YES ☐ NO ☐
33. Are you mostly quiet when you are with others? . . . . YES ☐ NO ☐
34. Do you sometimes get so restless that you cannot sit in a chair long? . . . YES ☐ NO ☐
35. Do you often make up your mind to do things suddenly? . . . . YES ☐ NO ☐
36. Are you always quiet in class, even when the teacher is out of the room? . YES ☐ NO ☐
37. Do you have many frightening dreams? . . . . YES ☐ NO ☐
38. Can you usually let yourself go and enjoy yourself at a gay party? . . . . YES ☐ NO ☐
39. Are your feelings rather easily hurt? . . . . YES ☐ NO ☐
40. Have you ever said anything bad or nasty about anyone? . . . . YES ☐ NO ☐
41. Would you call yourself happy-go-lucky? . . . . YES ☐ NO ☐
42. Do you worry for a long while if you feel you have made a fool of yourself? . YES ☐ NO ☐
43. Do you often like a rough and tumble game? . . . . YES ☐ NO ☐
44. Do you always eat everything you are given at meals? . . . . YES ☐ NO ☐
45. Do you find it very hard to take no for an answer? . . . . YES ☐ NO ☐
46. Do you like going out a lot? . . . . YES ☐ NO ☐
47. Do you sometimes feel life is just not worth living? . . . . YES ☐ NO ☐
48. Have you ever been insulting to your parents? . . . . YES ☐ NO ☐
49. Do other people think of you as being very lively? . . . . YES ☐ NO ☐
50. Does your mind often wander off when you are doing a job? . . . . . . YES ☐ NO ☐
51. Would you rather sit and watch than play at parties? . . . . YES ☐ NO ☐
52. Do you find it hard to get to sleep at nights because you are worrying about things? . . . . YES ☐ NO ☐
53. Do you usually feel fairly sure you can do the things you have to? . . . . YES ☐ NO ☐
54. Do you often feel lonely? . . . . YES ☐ NO ☐
55. Are you shy of speaking first when you meet new people? . . . . YES ☐ NO ☐
56. Do you often make up your mind when it is too late? . . . . YES ☐ NO ☐
57. When children shout at you, do you shout back? . . . . YES ☐ NO ☐
58. Do you sometimes feel specially cheerful and at other times sad without any good reason? . . . . YES ☐ NO ☐
59. Do you find it hard to really enjoy yourself at a lively party? . . . . . YES ☐ NO ☐
60. Do you often get into trouble because you do things without thinking first? . YES ☐ NO ☐

B. Sample of Data Sheet

NAME: ______________________________

AGE : Years [ ] Months [ ]   Male [ ] Female [ ]

DB : ______________

E [ ] N [ ] L [ ]

MT	ST
[ ]	[ ]
[ ]	[ ]
[ ]	[ ]
[ ]	[ ]
[ ]	[ ]
[ ]	[ ]

	YES	NO		YES	NO		YES	NO		YES	NO
1.	[ ]	[ ]	16.	[ ]	[ ]	31.	[ ]	[ ]	46.	[ ]	[ ]
2.	[ ]	[ ]	17.	[ ]	[ ]	32.	[ ]	[ ]	47.	[ ]	[ ]
3.	[ ]	[ ]	18.	[ ]	[ ]	33.	[ ]	[ ]	48.	[ ]	[ ]
4.	[ ]	[ ]	19.	[ ]	[ ]	34.	[ ]	[ ]	49.	[ ]	[ ]
5.	[ ]	[ ]	20.	[ ]	[ ]	35.	[ ]	[ ]	50.	[ ]	[ ]
6.	[ ]	[ ]	21.	[ ]	[ ]	36.	[ ]	[ ]	51.	[ ]	[ ]
7.	[ ]	[ ]	22.	[ ]	[ ]	37.	[ ]	[ ]	52.	[ ]	[ ]
8.	[ ]	[ ]	23.	[ ]	[ ]	38.	[ ]	[ ]	53.	[ ]	[ ]
9.	[ ]	[ ]	24.	[ ]	[ ]	39.	[ ]	[ ]	54.	[ ]	[ ]
10.	[ ]	[ ]	25.	[ ]	[ ]	40.	[ ]	[ ]	55.	[ ]	[ ]
11.	[ ]	[ ]	26.	[ ]	[ ]	41.	[ ]	[ ]	56.	[ ]	[ ]
12.	[ ]	[ ]	27.	[ ]	[ ]	42.	[ ]	[ ]	57.	[ ]	[ ]
13.	[ ]	[ ]	28.	[ ]	[ ]	43.	[ ]	[ ]	58.	[ ]	[ ]
14.	[ ]	[ ]	29.	[ ]	[ ]	44.	[ ]	[ ]	59.	[ ]	[ ]
15.	[ ]	[ ]	30.	[ ]	[ ]	45.	[ ]	[ ]	60.	[ ]	[ ]