Effects of Electromyographic Feedback Training on the Perception of Locus of Control and Accuracy of Person Perception of Externally Controlled Therapist Trainees

Vincent N. Scalese Jr.

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EFFECTS OF ELECTROMYOGRAPHIC FEEDBACK TRAINING
ON THE PERCEPTION OF LOCUS OF CONTROL
AND ACCURACY OF PERSON PERCEPTION
OF EXTERNALLY CONTROLLED THERAPIST TRAINEES

by

Vincent N. Scalese, Jr.

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EFFECTS OF ELECTROMYOGRAPHIC FEEDBACK TRAINING ON THE PERCEPTION OF LOCUS OF CONTROL AND ACCURACY OF PERSON PERCEPTION OF EXTERNALLY CONTROLLED THERAPIST TRAINEES

Vincent N. Scalese, Jr., Ed.D.
Western Michigan University, 1978

This study investigated the effects of electromyographic feedback training on therapist trainees' perception of generalized expectancy for internal or external control of reinforcement and their accuracy of person perception. Although accurate person perception has been firmly established in the literature as a necessary condition for an effective therapeutic relationship, and it has been hypothesized that an external locus of control can be an impairing factor in the ability of therapists to accurately perceive their clients, little attention has been paid to the relationship of locus of control and interpersonal perception. Also, previous research efforts to produce change of locus of control have not provided positive results. While the concept of contingency awareness is of critical importance, it has not been a focal point in previous research.

Advancements in the area of psychophysiology lead to the conclusion that the concepts of locus of control and environment are extended beneath a person's skin to include internal processes. Electromyographic feedback
training, by its very nature, provides a strong contingent experience in which individuals cognitively establish an awareness of the relationships between their behavior and the contingent electromyographic feedback. This awareness is then translated into action in which individuals can learn to control the feedback by consciously altering their control over the contingent relationship between behavior and outcome.

On the basis of this rationale, two questions were proposed for analysis: (1) Will EMG feedback training for therapist trainees produce change in their locus of control in the direction of internality? (2) Will EMG feedback training improve therapist trainees' person perception accuracy?

Twenty-five subjects who scored in the external range on a measure of locus of control were sampled randomly from among beginning Master of Arts students in the Counseling and Personnel Department of Western Michigan University. All subjects were randomly assigned to experimental or control groups and a measure of accuracy of person perception was made for all subjects. The experimental group, consisting of twelve subjects, experienced electromyographic feedback training. The control group, consisting of thirteen subjects, received no treatment condition attention. As a posttreatment condi-
tion, a measure of locus of control and accuracy of person perception was made for all subjects.

Analysis of the data yielded significant results in the predicted directions. Scores improved on both the measure of locus of control (p=.001) and the measure of person perception accuracy (p=.01). A statistically significant change did not occur for the control group. Additionally, significant changes between experimental and control group subjects were obtained along the dimensions of posttreatment scores of locus of control (p=.01) and perceptual accuracy (p=.05) in the predicted directions.

These results were interpreted as indicating reorganization of cognitive structures in the externally controlled subjects. When the contingent relationship of behavior and outcome entered awareness and control of these subjects, dissonance occurred. This experience was contrary to their past experiences and cognitive structures. The reduction of this error, due to the effect of electromyographic feedback training, was in the direction of reorganizing cognitive structures to accommodate this new awareness. Thus, perception of locus of control shifted in the direction of internality and with it a concomitant enhancement in accuracy of person perception occurred.
It appears, on the basis of this study, that a new area of investigation and practice can be built upon this demonstration of close relationship of physiological and cognitive states and the principle that change in one state can lead to change in the other state.
ACKNOWLEDGEMENTS

Throughout my program of doctoral studies and the work of this dissertation, many others have actively helped me. For Dr. Kenneth Bullmer's hours of patient advice and constructive criticism, I am especially grateful. Always available, whenever assistance was necessary, were Drs. Robert Hopkins, Chris Koronakos and George Sidney. Instrumental in this undertaking was the consultation and support of Dr. Richard Williams and his staff at the Biofeedback Center. The financial support offered by the Graduate College of Western Michigan University was of tremendous assistance in the implementation and completion of this research.

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Vincent N. Scalese, Jr.
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CHAPTER I

The Problem and Its Background

The purpose of this study is to explore the effects of Electromyographic (EMG) feedback training on effectiveness of therapist trainees. Specifically, it will examine the impact of EMG feedback training on the ability of therapists who have an external locus of control (Rotter, 1966) to accurately perceive client affective states. Furthermore, it will assess the effects of EMG training on the locus of control orientation of therapists.

Fiedler (1950) studied the ideal therapeutic relationship concluding that it demands total involvement and understanding by therapists of all client communication, feelings and lines of thought. A wellspring of research has since followed which has refined and strengthened this early conceptualization of accurate empathy. Wallen (1956) defines clinical sensitivity as a therapist’s ability to note significant features of behavior exhibited by clients and the ability to then draw useful inferences from it. Clinical sensitivity, or affective sensitivity, is further defined by Kagan, Krathwohl and Farquahar (1965) as a therapist’s ability to detect and describe the affective states of others. These definitions all require going beyond verbalizations to include a host of nonverbal cues. To be therapeutic, a therapist must be highly sensitive to the

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meaning of the ongoing experiences of clients (Rogers and Truax, 1966).

In the therapeutic process, the ability to perceive accurately the affective state of clients occupies a central role. Accurate person perception establishes the therapeutic environment within which a therapist will work and come to empathically understand a client's internal frame of references (Truax and Carkhuff, 1967). In other words, coming to know how clients think, feel and perceive their world is necessary for therapeutic effectiveness (Patterson, 1974). This process of perceiving the experiences of another's life allows therapists' feelings of respect and liking for a client to grow and allows them to begin to act congruently with these feelings (Truax and Carkhuff, 1967; Rogers, 1957). A therapist, according to Rogers (1957), must not only be able to receive this information-communication but must also be able to understand it and in turn communicate this understanding to a client. In this manner, empathic understanding is communicated to a client as well as conditions of warmth and genuineness (Rogers, 1957; Rogers and Truax, 1966; Truax and Carkhuff, 1967; Patterson, 1974; Wallen, 1956; Fiedler, 1950). This process increases a therapist's reinforcement value for clients (Truax and Carkhuff, 1967; Rotter, 1966) and enhances client expectations of
help, thus facilitating the process of behavior and attitude change (Frank, 1961; Collingwood et al., 1970, Rotter, 1966).

Research has generally demonstrated that there is considerable variance in therapeutic effectiveness among therapists. This difference can be attributed to the degree to which therapists display this necessary condition of clinical sensitivity. Those therapists displaying high levels of clinical sensitivity are generally shown to be more effective (Rogers, 1957; Truax and Carkhuff, 1967; Carkhuff, 1969; Wallen, 1956; Bergin and Jasper, 1969). Truly skillful therapists are those who can both conceptualize the clients' problems and translate their percepts into empathic interaction. These are core elements in the therapeutic relationship and form a precondition for therapeutic change (Goldfield and Davison, 1976; Truax and Carkhuff, 1967; Patterson, 1974).

Rogers (1951) views therapy as a perceptual process in which accurate perception of client affective states is a necessary condition for effective therapy. Incoming sensory data consists of complex and subtle interpersonal stimuli. Perceptions and therapist behavior are modified and altered as new data are gathered and given meaning (Rogers, 1951, 1957; Wallen, 1956). According to Blake and Ramsey (1951) a therapist's ability to tolerate this
sensory information is a crucial factor in accurate perception of client affective states. When therapists' percepts are not congruent with their personalities, uncertainty and ambiguity occur (Schacter, 1964; Festinger, 1957, 1964). Whether or not this sensory input will be perceived as threatening is dependent upon the interaction of personality and the created uncertainty (Hilgard, Jones and Kaplan, 1951; Schacter, 1964). Varying personality types have characteristic perceptual attitudes and response behaviors which are employed to cope with stimuli that threaten to cause uncertainty (Sullivan, 1954; Klein, 1951; Miller, 1951; Wallen, 1956) and exert a profound effect on perception (Miller, 1951). Therapists who cannot tolerate ambiguity well will be subject to disequilibrium and become perceptually restrictive (Wallen, 1956; Brunswick, 1942). They will be neither sensitive to stimuli nor accurate in the meaning assigned to stimuli which get through their filters (Hamlyn, 1957).

Rotter (1964) states that therapists should be free from distortions in their own personality or, at least, be thoroughly aware of them in order to guard against their perceptual effects. Therapists who are intolerant of ambiguity or threats to their need system will not be clinically sensitive to client affect (Brandes, 1967; Rotter, 1964; Wallen, 1956). These therapists will become...
preoccupied with their own personal issues in interpersonal situations (Wallen, 1956; Sullivan, 1954; Mendolsohn and Gall, 1970). Directly attributable to this intolerance is an increase in strivings for superficial clarity (Miller, 1951), premature conclusions, early termination (Festinger, 1957), and clinical bias (Wallen, 1956; Rogers, 1951). Brunswick (1942) stated that subjective factors will influence the perception of others by clinically trained observers. Wallen (1956) emphasizes the necessity to study the personality of clinicians. Therapists prone to such interpersonal anxiety effects cannot accurately focus their attention on clients and, instead, are involved in a compensatory process which focuses on their own need satisfaction. This process precludes effective use of previous clinical training. Furthermore, under conditions of ambiguity, therapists so prone lose their power to distinguish between threatening and non-threatening stimuli. They proceed to respond as if all stimuli were threatening (Hilgard, 1951). This response pattern is incongruent with the objectives of the therapeutic relationship. It violates those conditions that have been established as necessary for effective therapy.

The concept of locus of control provides a frame of reference which can be useful in identifying those therapists who may be more inaccurate in person perception.
Locus of control refers to the belief held by individuals as to where control over reinforcement of their behavior lies (Rotter, 1966). Those with an external locus of control perceive control of reinforcement as beyond their own control and the result of external forces, fate or other persons. Evidence in the literature has begun to demonstrate that therapists with an external locus of control would be handicapped (Majumder, McDonald and Greever, 1977). These therapists have a lower tolerance for ambiguity (Lefcourt and Wine, 1969; Julian and Katz, 1968; Platt and Eisman, 1968); are less able to perceive levels of meaning in received communications (Lefcourt, Gonnerand and McDonald, 1973); and tend not to seek out additional information which will enhance skill levels in responding to challenging situations (Phares, 1968; Davis and Phares, 1967). It would seem to follow that externally oriented therapists would be less able to perceive accurately client affective states.

According to Lefcourt (1976), training efforts to alter locus of control have met with only limited and short term successes. What appears to have been missing is a focused attempt to provide conditions in which externally oriented individuals must establish both the behavior and its reinforcement. It would seem that this is an essential condition for effective, generalizable change.
in locus of control. EMG feedback training provides an opportunity to establish a truly internally controlled experience by providing this new type of reinforcement situation. Such an experience may not only facilitate change from an external toward an internal locus of control (Fotopoulos, 1970; Brown, 1971; Goesling et al, 1974), but it may also enhance perceptual acuity (Brown, 1970; Shargass et al, 1968; Johnson and Meyers, 1974). Brown (1971) points out that past research is very limited, but what is available hints at this possibility.

In summary, accurate person perception has been established as a necessary, albeit not sufficient, condition for effective therapy. Any therapist traits which cause perceptual distortion will be detrimental in a therapeutic relationship. The literature on locus of control leads to the conclusion that therapists with an external locus of control will be subject to perceptual distortion. Of primary concern, then, is the need to explore possibilities for producing a shift in locus of control in the direction of internality and effects of this shift on an individual's perceptual accuracy. Because of the built in contingent relationship between behavior and outcome and the internal nature of the experience, EMG feedback training has been postulated to be an effective change technique.
The questions to be investigated by this study are whether or not EMG feedback training will produce a shift in locus of control of therapists with an external locus of control and will improve accuracy of their person perception.

In operational terms the following questions are to be studied:

1. Will EMG training produce a significant change in the measured locus of control of externally oriented therapists in the direction of internality?
2. Will EMG training enhance the accuracy of person perception of therapists with an external locus of control?

Review of Related Research and Literature

The survey of literature is presented to establish a conceptual framework which focuses on three areas: person perception, locus of control and biofeedback training.

Person Perception. Person perception has been defined variously in the literature. Forgus and Melamed (1966) have suggested that it is coming to know the psychological characteristics of others through a process of verbal and nonverbal communication. Warr and Knapper (1968) proposed that person perception is interpersonal interaction in which we come to know the internal states of another person. Tagiuri and Petrullo (1958) appear in agreement with these definitions with their definition of person
perception being, "...observations about the internal events of another person, i.e. intentions, emotions and strengths" (p.x). Rogers and Truax (1966) have defined person perception as an interactional process in which one person becomes aware of the meaning and significance of another person's experiences.

Person perception is the fundamental element in all interpersonal behavior (Warr and Knapper, 1968; McLeod, 1947; Sullivan, 1954). Stated differently, people relate to others in ways which are determined by their percepts of others. Most important for this research is the contention that learning to relate to others in a clinically effective manner is inexorably tied to the ability of therapists to accurately perceive clients (Warr and Knapper, 1968).

The process of person perception can be described by the following model of perception proposed by Schacter (1964):

```
SENSORY STIMULATION  ➔  PHYSIOLOGICAL AROUSAL  ➔
AFFECTIVE AND COGNITIVE ATTRIBUTION  ➔  PERCEPT
```

This model postulates that as nerve endings of a sensory mode are impinged upon by some stimulus event, a physiological response is activated and an electrical impulse...
is transmitted along the neural pathway. When this impulse enters an individual's awareness, a cognitive process occurs in which the electrical impulse is defined by attributing characteristics and an affective loading. A percept is the definition attributed to the electrical impulse. Though this model goes a long way towards providing a clear, yet simple picture of the perceptual process, it does fall short of being completely accurate.

To be truly reflective of the process of perception, a model must include a feedback loop which recycles the percept back into the process. At a point following physiological arousal and affective or cognitive arousal, a percept becomes part of the mediational process by which all future sensory input is to be transformed into another percept (Forgus and Melamed, 1966). Therefore, the model employed by this study to examine the process of person perception is as follows:

SENSORY STIMULATION → PHYSIOLOGICAL AROUSAL → MEDIATIONAL PROCESS → TRAIT ATTRIBUTION → PERCEPT

For the purpose of this study, the three features of person perception which require explication are: information extraction, perceptual set and attribution. As with all
forms of perception, person perception is a process of information extraction for either immediate use or memory storage for future use (Forgus and Melamed, 1966). Information thus stored can then be recalled at future times to mediate the perceptual process. Hamlyn (1957) suggests that the entire perceptual process is dependent upon stimulus discrimination. Information cannot be extracted from the environment if the stimuli impinging upon the sensory nerves are not attended to in an individual's awareness. If a stimulus is not distinguished from other stimuli, it cannot be perceived. The perceptual process is truncated at the sensory stimulation level.

Whether or not a stimulus will be attended to is a function of the perceptual set of an individual. Perceptual set is an individual's expectancy that stimuli will occur in the environment. This expectancy is the cumulative result of a perceiver's past learning and plays a crucial role in stimulus discrimination, learning and problem solving. Warr and Knapper (1968) suggest that the broader the perceptual set, the greater the capability an individual will have in attending to and discriminating among greater varieties of stimuli in the environment. This will result in more information being extracted thus providing a broader base for decision
making and problem solving.

Clearly stated in this model is a distinction between perception and physiological arousal. A percept is not an empirical fact. It is, rather, the result of affective and cognitive transformation of mechanical sensory arousal (Hamlyn, 1957; Schacter, 1964). Attributing characteristics and affective loading give meaning to raw sensory input data (Heider, 1958). This attributional process is based on expectancies, or perceptual set, and past experience of a perceiver (Warr and Knapper, 1968). Tagiuri (1968) labels this perceptual set, in the area of person perception, as a perceiver's implicit personality theory. Implicit personality theory causes perceivers to attribute characteristics of affecting loading to other persons for reasons beyond the perceiver's awareness. In the clinical setting, this implicit personality theory can be a source of error in perception as it is operating beyond the perceiver's awareness. Responses to percepts will not be based on the significance, or meaning, of patient behavior from the patient's frame of reference (Bullmer, 1972). This is clearly contradictory to the concept of person perception as a necessary condition for effective therapy. Rogers and Truax (1966) state that therapists must become aware of the significance and meaning of events in clients'
lives from the clients' internal frames of reference.

The roles of information extraction, perceptual set and attribution have been established. They are significantly interrelated with lines of distinction being only faintly drawn. These features do not state that given a stimulus the resultant percept will not be the same for all perceivers. Individual differences among perceivers will significantly alter percepts and the degree to which they reflect objective reality. Koffka (1935) states that attention, state of mind, personality and affective state, all interact to exert an influence on a stimulus as it moves from electrical impulse to percept. In other words, these characteristics influence an interpretation which gives meaning to an impulse.

The emotions of another person are discernible to the extent that a perceiver is fully aware of both their content and context. Brunner and Tagiuri (1954) postulate that perception of affective states of another person is a process that is dependent on interaction between the emoting person's internal states and the traits and states of the perceiver. Authoritarianism, openness, cognitive complexity, self concept, detachment and social adjustment are dimensions of individual difference along which a variety of research has been conducted to assess their relationship to accuracy of
person perception.

Cognitive complexity, an offshoot of research on intelligence, plays an important role in perceptual accuracy. Forgus and Melamed (1966) found that cognitively complex persons engage in more perceptual scanning and are more open to discrimination of a greater variety of stimuli. This openness to discriminating a wider range of stimuli has been associated with perceptual accuracy (Tagiuri and Petrullo, 1958; Heider, 1958; Tagiuri, 1968). It appears that such cognitively complex persons are sensitized by their experiences to attend to a wider range of stimuli. Central to degree of openness is an individual's ability to deal with discrepant information. A commonly accepted psychological fact is that there is an organismic tendency to maintain homeostasis. Complex persons appear to be able to take in discrepant information and broaden their cognitive set to maintain this stasis by not discriminating these stimuli and they develop a higher threshold of sensitivity. Degree of cognitive complexity is one perceiver trait that has been found to influence stimulus selection and processing (Warr and Knapper, 1968) and is, therefore, related to accuracy of person perception.

Information from which inferences will be made about a person who is a perceptual object begins as sensory
input data which must be given meaning. What results is a product of the attributional process (Heider, 1958). In this process the raw data becomes subject to attribution of characteristics based on judgements of classification, comparison and evaluation (Warr and Knapper, 1968; Holmes and Berkowitz, 1961). These judgements are followed by attribution of intention and sentiment. The attributional process is based on expectancies about stimuli which are rooted in a perceiver's perceptual set or implicit personality theory (Warr and Knapper, 1968; Tagiuri, 1968). This implicit personality theory plays a role not only in attribution of characteristics, but is also instrumental in stimulus discrimination (Hamlyn, 1957; Forgus and Melamed, 1966). Percepts in the present serve as reference points for future perception and prediction (Heider, 1958).

The relationship of accuracy of perception to clinical sensitivity and prediction is obvious. Luft (1950) and Tagiuri (1968) agree that clinical prediction involves two processes. These processes are, first, prediction from known to unknown behavior, and second, use of implicit personality theory. The effectiveness of therapists is dependent upon their tolerance of sensory information to which they are exposed and accuracy of their perceptions (Blake and Ramsey, 1951). As with all
other classes of perceptual activity, these variables are dependent upon a clinician's personality (Brunner, 1951; Brunswick, 1942; Tagiuri, 1954). There are perceiver variables which influence perception of others even in clinically trained observers (Brunswick, 1942). Each clinician has a subjective equation by which perceptive and interpretive judgements are made.

The literature recognizes that these individual differences, as reflected in a perceiver's personality, play a major role in accuracy of person perception. It has not, however, been demonstrated that extremes on any one dimension, with the exception of greater intelligence, lead to more accurate percepts (Tagiuri, 1968). Warr and Knapper (1968) suggest that research must move away from the study of single traits to investigate multi-level interpersonal traits which involve personality-situation interaction. Mischel (1977) in support of this position states that, "...complex human behavior tends to be influenced by many determinants and reflects the almost inseparable and continuous interaction of a host of variables both in the person and in the situation" (p.246). It may well be impossible to isolate individual components of the personality-situation interaction and determine the significance of the role each plays. The significant effect lies in the interaction
of these components and not in their isolation. Logically, the only alternative approach to the study of individual differences and their effect on the accuracy of person perception is development of conceptual frameworks based on some personality-situation interaction variable. Individuals' personalities are mirrored in their perceptions of environments and persons around them (Shrauger and Altrocchi, 1964). It follows that locus of control may be one of the variables being sought after.

**Locus of Control.** The construct of locus of control and its dimensions of internality and externality are derived from Social Learning Theory (Rotter, 1966; Rotter, Chance and Phares, 1972). This theory postulates that peoples' actions are predicated on their values, expectations and situations in which they find themselves. All three parts of this equation are assigned equal weight. The potential for any behavior to occur is a function of an individual's expectancy of reinforcement which is the cumulative result of an individual's past experience and learning that a behavior will be reinforced in a valued direction. The potential for a behavior occurring is the expectancy of success which is the result of a lifetime of predication and outcome processes. Perceived locus of control is the generalized
expectancy for internal or external control of reinforcement. The generalized expectancy of internal control refers to the perception of reinforcement as the effect of one's own actions and, therefore, potentially under one's control. The converse then becomes the orientation of external control where reinforcement is perceived as unrelated to one's own behavior and is, therefore, beyond one's control.

The primary focus of most research and literature on locus of control has been in the area of skill acquisition and performance. Conceptually, hypotheses presented and tested followed from a belief that individuals who are internally controlled feel as if their behavior is causally related to outcome and are, therefore, more likely to engage in behavior which will allow them to cope with events around them better than those who are externally controlled (Rotter, 1966). Thus, they actively learn coping skills in new situations (Phares, 1962). With locus of control as a basis for distinction among individuals, it appears that internally controlled persons are more open to learn from past experience than are externally controlled persons (Rotter, 1966). The latter group tends to discount experience and attributes consequences of behavior to fate or others. Unless their experiences are perceived as resulting from their own
actions, they will not be able to alter their perceptions or behavior to reflect changes in the situation (Lefcourt, 1976). If events are paired with chance then there is little reason to attend to them with the intent to learn. Rotter (1966) further suggests that perceived strength of the causal relationship between behavior and outcome has a positive relationship to: (1) alertness to environmental factors which have potential of yielding information relevant to future behavior and outcome; (2) an assumption of an active role in self-improvement; (3) degree of value attached to skill and achievement; and (4) concern about success and failure. The implication of all this is that as degree of internal control increases, strength of perceived causal relationship increases. It follows, therefore, that there is an increase along all four of the above dimensions which result in improved learning and performance. Research by Rotter and Mulry (1965) and Julian and Katz (1968) supports the above hypothesis with results indicating that internals respond to skill task situations with greater attentiveness, concern, interest and success than externals.

Seeman's (1963) research involving prison inmates revealed that internals will recall more parole relevant information than will externals. This lends further
credibility to the contention that perceived locus of control is an important variable in attention and acquisition processes.

A problem with previous research on locus of control is that it is only tangentially related to the variables associated with this study. In sum, it presents us with possible hypotheses for research rather than confirms hypotheses. Most importantly for this study, little attention has been paid to the relationship of locus of control and interpersonal perception. In a study exploring this particular concern, Lefcourt and Wine (1969) observed that persons with external loci of control had difficulty with and attended less to persons who were not predictable and presented increased uncertainty and potential for threat. According to Phares, Ritchie and Davis (1968), internals, on the other hand, are more likely to attend to cues which will help resolve these uncertainties and will use their arousal to increase their sensitivity to these cues. Internals are, therefore, not as defensive as externals in interpersonal situations.

As established, therapy is an interpersonal relationship which demands high order cognitive activity and accurate person perception. Locus of control may be an important variable which has potential for being either
facilitating or hindering. Persons defined as open or nondefensive (Rogers, 1961), self-actualizing (Maslow, 1954), possessing ego strength (Rotter, 1966), are viewed as being open to experience and able to assimilate new information about themselves and their environment. In terms of the dimensions of internality and externality, these types of individuals appear to be in possession of internal loci of control.

Given the nature of available literature, it is possible to hypothesize that locus of control may be an important therapist variable. One research study by Majumder, McDonald and Greever (1977) deals with this issue. It concludes that externality may be a detraction to therapeutic effectiveness in that externally controlled rehabilitation counselors were found to be less satisfied with their work and working conditions, they received lower performance ratings and they had more negative attitudes towards the impoverished than counselors with internal loci of control.

One critical factor in recognition of affective states is ability to effectively go beyond superficial verbal and non-verbal behaviors (Brunner and Tagiuri, 1954). This internal state of a perceiver influences both input selection and input processing (Warr and Knapper, 1968). It can be hypothesized that perceptual accuracy of exter-
nally controlled therapists may be impaired in the following three ways: (1) cognitive set which plays a directional role in perceptual selectivity of externally controlled therapists (Forgus and Melamed, 1966), is preoccupied with maximizing balance and minimizing dissonance (Seeman and Evans, 1962), which in effect cause perceptual scanning to avoid dealing with discrepant information; (2) an external locus of control will constrict a therapist's personality theory thus distorting the cognitive process of accurate empathy (Tagiuri, 1968); (3) perceptual defenses of externally controlled therapists will cause distortion in the maintenance of cognitive congruence through the mechanisms of perceptual selectivity (Forgus and Melamed, 1966), reduced tolerance to trait inconsistency (Warr and Knapper, 1968), distortions of client affect based on a therapist's past personal experience (Holmes and Berkowitz, 1961), repression as accomplished through avoidance or increased recognition thresholds (Forgus and Melamed, 1966; Brunner and Tagiuri, 1954) and increased sensitization as accompanied by lower recognition thresholds and increased vigilance (Forgus and Melamed, 1966).

Central to this entire discussion about locus of control has been the impact of individuals' perception of casual relationship between their behavior and the con-
sequent effect (Rotter, 1966). This is the heart of locus of control. From his observations and experience with children, Watson (1967) concluded that if provided with a contingency experience, an increase in the sense of instrumentality will result. Contingency awareness, or perception of a causal link between behavior and outcome, is the key to distinguishing between internal and external locus of control.

A thorough review of the literature has not produced any real support for the potential to produce change in locus of control. It appears that researchers have not capitalized on the notion of contingency awareness as a key to the change process and have generally met with only limited success (deCharms, 1972; Martin and Shepel, 1974; Diamond and Shapiro, 1973).

Advancements in the area of psychophysicsology have led Johnson and Meyer (1974) to the conclusion that the concepts of locus of control and environment are extended beneath a person's skin to include his internal processes. Following this line of thought, a whole new change technique which focuses on contingency awareness becomes available. Biofeedback training procedures by their own nature provide us with a link between behavior and outcome. Herein may lie the crucial contingency experience necessary for causation of change from an external locus

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of control in the direction of internality.

**Electromyographic Feedback Training.** Establishment of voluntary control over internal physiological processes is postulated herein to be causally linked to changes in both locus of control and accuracy of person perception of therapist trainees. Theoretical constructs supporting this position, however, have not been empirically established. Although literature surveyed for this study did not formally address itself to this issue, the literature does contain empirical and theoretical references which lead in this direction.

Feedback from one's environment plays an integral role in learning. It provides data regarding the consequent reinforcers and punishers of a behavior. Biofeedback procedures are those in which an individual receives this information regarding internal bodily processes. Brown (1970) and Lazarus (1973) state that interactions with this feedback can lead to the learning of voluntary control of physical functions. Although specific mechanisms involved in this process are not known (Lazarus, 1975; Brundy et al., 1976), several explanations have been hypothesized and can be unified. A subject's attention is focused on the perception of meaningful data from their environment which results in heightened awareness with feedback being defined as a reinforcer (Brown, 1970).
This becomes a process of controlling one's own reinforcement. In the absence of control over internal physiological functions, one has a self dialogue of helplessness (Meichenbaum, 1976). Establishing voluntary control overcomes this through a process of increasing awareness of internal states and learning cognitive and behavioral skills which will produce change in that internal state (Lazarus, 1976). Electromyographic feedback training produces auditory and/or visual stimulation which results in excitation of the sensorininator cortex. That is, stimuli interact with existing sensorininator and neurological feedback loops to produce a change in the motoric response pattern. Initially this is a random process. Through trial and error it becomes consistent and controlled as a result of the effects of cognitive mediation whereby an individual develops meaningful strategies for controlling the response and defines the feedback as possessing reinforcement value (Brown, 1970; Mason, 1971; Budzynski, 1973; Lazarus, 1976; Brundy et al, 1976). This newly acquired response pattern may be considered to have been brought under voluntary control only when it can be replicated in the absence of feedback present during acquisition (Bosmajian, 1963; Budzynski, 1973; Brenner, 1974; Stoyva and Budzynski, 1975). It can be hypothesized then that learning of voluntary control of
physiological functions is a process of increasing awareness and developing cognitive and behavioral skills necessary for controlling physiological functions. This learning process is the same as the contingency training process referred to in the preceding discussion of locus of control.

EMG feedback has been widely researched and its clinical effectiveness tested in areas of tension reduction, relaxation training, muscle reeducation and for relationships with other neurophysical systems with generally favorable results (Luce and Peper, 1971; Malm, 1965; Fuster and Uyeda, 1962; Budzynski, 1974; Brown, 1977). In response to the proliferation of biofeedback instrumentation, Blanchard and Young (1974) conducted a review of biofeedback research for the American Medical Association. Fourteen research reports in which EMG feedback was used to achieve some clinical effect were studied. Blanchard and Young (1974) concluded that the state of the art of biofeedback research has two important limitations. These limitations being that there are too few good controlled group outcome studies in the literature and design deficiencies in the form of lack of control and lack of documentation hinder complete evaluation of the results. In spite of these limitations they found application of EMG feedback training to be among the
soundest in the area of biofeedback training. Regrettably, the literature does not address itself to cognitive changes which may occur as a result of changes in physical response or coping style.

EMG feedback training passes through a conceptualization phase as well as a skill acquisition phase (Meichenbaum, 1976) and thus it is operating at both cognitive and physical levels simultaneously. The changes which occur at the cognitive level seem to be of three types. First, there is an attachment of meaning to new physiological sensations (Schacter, 1964). Second, there appears to be an enhancement of awareness which may be linked to an enlargement of the perceptual set (Brown, 1977). Third, the skill acquisition process alters individuals' perception of their ability to exert control over influences in their lives (Meichenbaum, 1976). Meichenbaum (1976) further hypothesized that these changes move persons from a posture of helplessness to resourcefulness as they respond to the same cues differently. Individuals come to believe that they have developed instrumental control over their lives.

The concept of locus of control can be examined from the perspective of a cognitive process in which individuals view themselves as either being able to or powerless to control environmental influences in their lives.
(Rotter, 1964). When the traditional definition of environment is broadened to include physiological processes beneath one's skin (Johnson and Meyer, 1974), EMG feedback training can then be seen as an intervention to produce change in locus of control orientation through the mechanisms previously presented. In other words, EMG feedback training offers an opportunity to produce change in locus of control by offering contingency training directly.

This survey of biofeedback literature has uncovered research in which locus of control was a variable but none of the research included perceptual accuracy as a variable. The conclusions reached in these reports, which involve a variety of modes of biofeedback as well as EMG, show that locus of control orientation is considered an important variable in operant learning (Goesling et al, 1974). Most of the research and literature reviewed dealt with skill acquisition. Lacey, Kagan, Lacey and Moss (1963) and Ray (1974) concluded that externally controlled individuals exhibit a resignation syndrome which inhibits the skill acquisition process. A paradoxical result did occur in a study of heart rate control conducted by both of the above groups of researchers. In their studies, externals learned to control decreasing heart rate better than internals. Self report data led to the conclusion that, in the case of heart rate decrease, the resignation
syndrome was manifested by nonattention to the task. The
individuals in these studies focused their attention on
objects in the room in which they were seated, causing
an adaptation effect which, in turn, resulted in heart
rate decrease. Also, some research, though limited, does
exist in which the possibility of change in locus of con-
trol by means of biofeedback training techniques is
supported (Johnson and Meyer, 1974; Cox, Freundlich and
Meyer, 1975; Stern and Berrenberg, 1977). These results,
however, cannot be considered conclusive. Two design
flaws cause them to be questioned: (1) samples were
case study aggregates, and (2) the Rotter Internal-Ex-
ternal Locus of Control Scale was altered to maximize
potential effects of treatment.

The training stages of awareness and conceptualiza-
tion have not been used in research to study their effects
on perceptual accuracy. Shargass et al (1968) suggest
that improvement in stimulus discrimination as a result
of biofeedback training should generalize to produce an
improvement in perceptual performance. Expectancy of
control of reinforcement is fundamental in biofeedback
training (Fotopoulos, 1970; Rotter, 1964). Electro-
myographic feedback training should develop contingency
awareness and, as established, facilitate change in locus
of control in the direction of internality. Under electro-
myographic feedback training conditions, therefore, it is suggested that as locus of control changes in the direction of internality, accuracy of person perception will be enhanced.

What is apparent from this review of the related literature is that emotions are a product of interaction of individuals and their environment. In this interaction, cognitive style shapes both the way in which events are interpreted and subsequent responses (Lazarus, 1975). By altering expectancies that individuals hold regarding the locus of control of reinforcement and their power to deal with the environment, individual cognitive style becomes a style which is open to experience, learning and accurate perception of information from the environment. These traits were earlier identified as essential therapist characteristics.

Purpose of this Study

The purpose of this study is to examine the effects of electromyographic feedback training on both locus of control and accuracy of person perception. The literature suggests that relationships exist between an individual's accuracy of perception and perception of locus of control, and that external locus of control is a handicapping variable and may introduce inaccuracies into the process of person perception. This relationship does not appear to
have been subjected to rigorous study in psychological literature or research. Further, it appears that an effort has not been made to develop techniques which may produce change in locus of control in the direction of internality and simultaneously enhance accuracy of person perception. This, then, is the purpose of this study.

**General Research Hypothesis**

It is hypothesized that EMG feedback training will produce change in the locus of control of therapist trainees in the direction of internality and, also, that it will improve their person perception accuracy.

**Limitations of the Study**

1. Instruments available for measuring locus of control are somewhat limited as identified in its discriminative power and generalizability.

2. As has been found in much of the previous research on person perception/affective sensitivity, single trait research has not been effective in producing significant results. It is possible that the construct of locus of control is not sufficiently broad to achieve the desired results.

These limitations do not seem sufficient to prevent the study from being conducted as planned.
CHAPTER II
Method
Population and Subjects

The population selected for this study was defined as beginning master's degree students in the Counseling and Personnel Department at Western Michigan University during the winter semester of 1978. These students could generally be described as not having completed more than the introductory first third of their graduate training.

Twenty-five subjects having an external locus of control (Rotter, 1966) were randomly selected from this population. These subjects were then randomly assigned to experimental and control groups.

Random Assignment

All students in the selected population were administered the Rotter Internal-External Locus of Control Scale (Rotter, 1966) and those found to have an external locus of control were assigned a two digit code number. The code numbers identifying the twenty-five subjects for the sample were drawn from a table of random numbers (Kirlinger, 1964). Twelve subjects were randomly assigned to an experimental group and thirteen to a control group. Random assignment to each of the two groups was accomplished by assigning alternating code
numbers of each of the twenty-five subjects. The decision to which group the first number drawn was to be assigned was made by a toss of a coin. Assignment to the experimental group occurred if a head came up. Assignment to the control group occurred if a tail came up.

Criteria Instruments

Rotter Internal-External Locus of Control Scale. This scale was developed by Rotter (1966) to measure locus of control. The scale is a twenty-three item, forced choice opinionnaire which is scored in the direction of externality. Rotter's research established the internal consistency of the scale to be high with most reliability coefficients in the .70 to .79 range. The only two scores which did not fall into this range were .65 and .69. Test-retest reliability was found to be high at a one-month interval with most reliability scores ranging between .72 and .83. The only score not in this range was .60. Rotter reported that reliability decreases substantially over a two-month interval to a range of .49 to .66. Discriminant validity has not been consistently evaluated by the research. Recently, however, the work of Wolk and DuCette (1973) seems to bolster support for its validity. Each choice reflects the respondent's perception of where control over life
events rest (see Appendix I).

Affective Sensitivity Scale. This instrument was developed as part of the Studies in Human Interaction project conducted by Kagan and Krathwohl (1967) at Michigan State University. This scale was employed to assess subjects' accuracy of person perception. Form C of this scale consists of sixty-six multiple choice questions of two types. The first type deals with client affective states and the second reflects client feeling toward the therapist. Each multiple choice question elicits a response choice from among three alternatives: one correct response and two distractors. The scale is administered by having the subjects respond to each item as it corresponds to the concurrently projected videotape excerpts from counseling interviews. The reliability of the instrument is reported as .70 to .80 for the items over a two-week interval. Validity is rated at .75 (Campbell, 1967; Danish and Kagan, 1971).

Criteria Measurements

All subjects received pretreatment and posttreatment administrations of the Affective Sensitivity Scale. In addition, all subjects received a posttreatment administration of the Rotter Internal-External Locus of Control Scale.
Procedures

The population of beginning master's degree students was administered the Rotter Internal-External Locus of Control Scale in classroom settings. Subjects with an external locus of control who were selected were contacted by telephone to obtain an agreement to participate, informed of the required degree of participation and that they would receive a ten dollar honorarium. Twenty-five subjects were selected for the sample and assigned to experimental or control groups. All subjects were brought together at the same time and in the same room for a group administration of the Affective Sensitivity Scale and to sign the appropriate informed consent forms (see Appendix II). After administration of the Affective Sensitivity Scale, control group subjects were given a card with the time of their next appointment in two and a half weeks for the post-treatment administration of the Affective Sensitivity Scale. Experimental group subjects were given a card with an appointment for their first EMG feedback training session which was scheduled within two days. Control group subjects did not receive any information relative to the nature of the research until after the post-treatment testing session. Immediately upon the completion of the six scheduled feedback training sessions,
both groups were again brought together for a group administration of both the Rotter Internal-External Locus of Control Scale and the Affective Sensitivity Scale.

**Electromyographic Feedback Training**

All EMG training sessions were conducted at the Western Michigan University Biofeedback Research Center. Each of the twelve subjects experienced their training in the same room for all six sessions. These sessions were held three times a week, every other day, for two weeks.

All training was conducted with a J&J M-55 Electromyograph which provided auditory feedback in the form of a tone. The filter was set to monitor the 100-200 Hz band range as suggested by the manufacturer. The pitch of this tone varied analogously to the amount of EMG activity above the threshold established for each subject. Silver-chloride electrodes were attached to the frontalis muscle. The two active electrodes were positioned one inch above the center of each eyebrow. The ground was positioned one inch above the nasion at the midpoint between each of the active sensors. Skin preparation consisted of washing the entire forehead with rubbing alcohol. Beckman electrode cream was the conductant.

The threshold level was initially set at the baseline EMG level for each session. This threshold level was
reduced by a .2 of a microvolt when a subject was able to maintain EMG activity beneath this threshold 75% of the time for each of the two consecutive 120 second epochs. Readings of EMG activity in average microvolts per epoch were obtained on a J&J LGS-150 Digital Scorekeeper. Average microvolts per epoch readings were made from the displayed digit LED display. In this manner, all baseline levels were obtained. Additionally, the equipment provided data on the amount of time each subject was able to maintain an EMG level below threshold. A trained operator employed by the Biofeedback Center at Western Michigan University monitored the equipment for all training sessions for all subjects.

The first training session was approximately forty minutes in duration. After the electrodes had been connected, the subjects were asked to sit in whatever way they felt comfortable. A ten minute adaptation period occurred during which subjects were encouraged to talk about the equipment in order to reduce any anxiety created by the presence of electronic equipment and any cognitive sets on the part of the subjects which may have inhibited their responses. At the end of this interval a second ten minute period was utilized to take baseline data on EMG activity level as represented by the mean microvolt level as recorded on the digital scorekeeper.
The next four EMG feedback training sessions occurred at a frequency of twice a week. Each training session lasted forty minutes and was structured according to the following schedule:

1. attachment of electrodes: five minutes
2. baseline data collection: five minutes
3. EMG feedback training: ten minutes
4. rest break: five minutes
5. EMG feedback training: ten minutes
6. baseline data collection: five minutes

For the baseline interval, subjects were instructed to sit in any way comfortable to them. Feedback was not provided during these sessions. At the end of the five-minute baseline interval of each session, all subjects were instructed to reduce the frequency of the auditory feedback. Brown (1970) suggests this procedure so that subjects are required to discover a means by which they can control the feedback.

During the rest break subjects were informed that the feedback signal was turned off and were encouraged to get up and stretch. At the end of the break the same instructions which preceded the first training interval were repeated and the feedback device activated.

At the end of the session a second baseline measure was obtained. Subjects were informed that auditory feed-
back was being turned off and that they should remain seated in any way comfortable for a few minutes.

The end of each EMG feedback training session was marked by arranging an appointment for the next session. All discussion was kept at a superficial level focused away from the feedback training.

To enhance EMG feedback training an adaptation of adjunctive autogenic and progressive relaxation tapes was employed (Budzynski and Stoyva, 1971). On a card indicating the time of the next appointment the following message was typed:

Researchers and clinicians using the techniques which you are learning have discovered a significant enhancement effect when home practice is regularly engaged in. You are encouraged to facilitate your own learning by practicing the method(s) which you are using to reduce the frequency of the auditory signal during the training sessions for at least ten to fifteen minutes per day.

Prior to the attachment of electrodes each subject was asked whether or not home practice occurred and, if so, how frequently. If practicing did not occur the brief question "What seemed to prevent you?" was asked.

The sixth and final EMG feedback training session was different from all the rest. After attachment of the electrodes, subjects were asked to sit in any way comfortable to them for several minutes. At this point, a five minute adaptation period occurred followed by a five minute
baseline interval. At the end of this baseline interval, instructions were given to each subject to engage in the method they were employing to reduce the frequency of the auditory feedback which they had customarily been receiving. As in all sessions, a recording of microvolt levels in 120 second epochs was made. Each subject was considered to have achieved voluntary control if he was able to reduce the microvolt level in the absence of auditory feedback and maintain it over a ten minute interval. Following this test for voluntary control, a final baseline recording over a five-minute interval followed.

**Posttreatment Data Collection**

Upon completion of the EMG training sessions, all subjects from both the experimental and control groups were again brought together for a group administration of the Rotter Internal-External Locus of Control Scale and the Affective Sensitivity Scale. The scales were presented in this manner to eliminate biasing effects of separating experimental and control group subjects for separate administrations, to preserve the order of testing as established, and to reduce bias on the Rotter Internal-External Locus of Control Scale caused by first responding to the Affective Sensitivity Scale.
Research Design

The research in this study was conducted in a pretest-posttest two group design to study change within each of the treatment groups and a posttest only two group design to study the difference between the two groups.

Only one of the groups, the experimental group, was subject to the treatment of EMG feedback training. The second, or control group, received no treatment. Both groups received pretreatment and posttreatment condition administrations of the Rotter Internal-External Locus of Control Scale. This design is presented in schematic form in Table 1.

Table 1
Pretest-Posttest Two Group Design

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>T1&amp;T2</td>
<td>X1</td>
<td>T1&amp;T2</td>
</tr>
<tr>
<td>Group 2</td>
<td>T1&amp;T2</td>
<td>X2</td>
<td>T1&amp;T2</td>
</tr>
</tbody>
</table>

Note: T1: Rotter Internal-External Locus of Control Scale
      T2: Affective Sensitivity Scale
      X1: EMG Feedback Training
      X2: No Treatment
Statistical Hypotheses

The original research question posed postulated that EMG feedback training would produce a change in locus of control in the direction of internality and would enhance the accuracy of person perception. The following hypotheses are formulated from this basic question and are presented here in the null form.

Hypothesis One. Those subjects who received EMG feedback training will not differ significantly from those who did not receive EMG feedback training as measured by post-treatment scores on the Rotter Internal-External Locus of Control Scale.

Hypothesis Two. Those subjects who received EMG feedback training will not differ significantly from those who did not receive EMG feedback training as measured by post-treatment scores on the Affective Sensitivity Scale.

Statistical Analysis

The intent of this research was to study the changes in both locus of control and accuracy of person perception as a consequence of EMG feedback training. The most commonly used change analysis is an analysis of variance on the raw gain scores. This procedure has a serious flaw due to the unreliability associated to the raw gain score (Hummel-Rossi and Weinberg, 1973; Kirlinger, 1964). To compensate for the above problem it was decided that both
hypotheses would be tested with an analysis of variance on the posttest scores (Glass and Stanley, 1970). This statistic was chosen on the basis that all subjects were randomly selected and assigned to treatment and control groups and were subject to the same experience of the pretest (Kirlinger, 1964).

Analysis of variance with repeated measures as programmed in the Western Michigan University's STAT PAK 4 was employed for both experimental and control groups to assess within group change between the pretreatment and posttreatment tests (Brunning and Kintz, 1968).

This type of statistical analysis is generally not recommended due to sensitization of subjects as a result of pretest exposure (Kirlinger, 1964; Hummel-Rossi and Weinberg, 1973). It is my feeling that, given the controls offered by randomization and both experimental and control groups having been exposed to the same experience (Kirlinger, 1964), this method of analysis offers an opportunity to answer two questions: (1) Do the experimental and control groups differ on the posttest measure as a result of EMG feedback training? (2) Is there a significant change within each group? This second question is vitally important. Its answer provides insight into the area of clinical significance as only a repeated measures design can (Brunning and Kintz, 1968).
To analyze data concerning the question of differences between groups on posttreatment scores, one way analysis of variance was used as programmed in Western Michigan University's STAT PAK 4.

The problem raised may pose some limitation in external validity (Kirlinger, 1964; Campbell and Stanley, 1970; Hummel-Rossi and Weinberg, 1973). This limitation is minimal since sensitization is often minimal when subjects are familiar with testing situations (Campbell and Stanley, 1963). Also, repeated measures design is the best method for studying the effects of a treatment over time (Brunning and Kintz, 1968). The significance level for rejection of the null hypotheses will be $p = 0.05$.

**Assumptions on the Data.** It is important at this juncture to establish the nature of the parametric assumptions being made for the statistical analysis of this data (Seigal, 1957; Glass and Stanley, 1970; Kirlinger, 1973).

The assumptions are as follows:

1) The independent variables are measured on a nominal scale.
2) The dependent variables are measured in interval scales.
3) The samples are randomly drawn from what are assumed to be normally distributed populations with equal variance.
CHAPTER III

Results

The purpose of this study was to evaluate effects of EMG feedback training on therapists' locus of control and accuracy of perception of client affective states. It was hypothesized that when given EMG feedback training therapists with an external locus of control would experience a shift in the direction of internal control and an increase in accuracy of person perception. Data gathered for the purpose of testing the hypotheses developed and their analyses are presented in this chapter.

The Data and Their Analyses

Table 2 and Table 3 show the obtained results from pretreatment and posttreatment measures on the Locus of Control Scale and the Affective Sensitivity Scale for both experimental and control groups.
Table 2
Means and Standard Deviations for Pretreatment and Post-treatment Rotter Internal-External Locus of Control Scale Scores

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretreatment</td>
<td>Pretreatment</td>
</tr>
<tr>
<td>$\bar{X} = 12.33$</td>
<td>$\bar{X} = 12.69$</td>
</tr>
<tr>
<td>SD = 1.72</td>
<td>SD = 2.95</td>
</tr>
<tr>
<td>n = 12</td>
<td>n = 13</td>
</tr>
</tbody>
</table>

Table 3
Means and Standard Deviations for Pretreatment and Post-treatment Affective Sensitivity Scale Scores

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretreatment</td>
<td>Pretreatment</td>
</tr>
<tr>
<td>$\bar{X} = 34.83$</td>
<td>$\bar{X} = 35.92$</td>
</tr>
<tr>
<td>SD = 7.47</td>
<td>SD = 5.68</td>
</tr>
<tr>
<td>n = 12</td>
<td>n = 13</td>
</tr>
</tbody>
</table>
Hypothesis One. Those subjects who received EMG feedback training will not differ significantly from those who did not receive EMG feedback training as measured by post-treatment scores on the Rotter Internal-External Locus of Control Scale.

Analysis of variance for repeated measures was used to test this hypothesis. Results of the test indicate that the null hypothesis should be rejected. Data supporting this conclusion are presented in Table 4 and Table 5.

Table 4
One Way Analysis of Variance with Repeated Measures of Rotter Internal-External Locus of Control Scale Scores for the Experimental Group

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>54.00</td>
<td>19.80*</td>
</tr>
<tr>
<td>Residuals</td>
<td>11</td>
<td>2.73</td>
<td></td>
</tr>
</tbody>
</table>

*p < .001

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Table 5
One Way Analysis of Variance with Repeated Measures of Rotter Internal-External Locus of Control Scale Scores for the Control Group

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>12</td>
<td>1.62</td>
<td></td>
</tr>
<tr>
<td>Within</td>
<td>13</td>
<td>.55*</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>Residuals</td>
<td>13</td>
<td>1.12</td>
<td></td>
</tr>
</tbody>
</table>

*p > .05

Hypothesis Two. Those subjects who received EMG feedback training will not differ significantly from those who did not receive EMG feedback training as measured by post-treatment scores on the Affective Sensitivity Scale.

Analysis of variance for repeated measures was used to test this hypothesis. Results of the test indicate that the null hypothesis should be rejected. Data supporting this conclusion are presented in Table 6 and Table 7.

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Table 6
One Way Analysis of Variance with Repeated Measures of Affective Sensitivity Scale Scores for the Experimental Group

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>108.4</td>
<td>9.02*</td>
</tr>
<tr>
<td>Residuals</td>
<td>11</td>
<td>12.01</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01

Table 7
One Way Analysis of Variance with Repeated Measures of Affective Sensitivity Scale Scores for the Control Group

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
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<tbody>
<tr>
<td>Between</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>15.38</td>
<td>1.47*</td>
</tr>
<tr>
<td>Residuals</td>
<td>12</td>
<td>10.47</td>
<td></td>
</tr>
</tbody>
</table>

*p > .05

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**Additional Data Analysis.** A one way analysis of variance was used to assess the magnitude of the difference of posttreatment scores on the Rotter Internal-External Locus of Control Scale and the Affective Sensitivity Scale between experimental and control groups. Results of this test indicate that a significant difference between the experimental and control group scores exist. Data supporting this conclusion are presented in Table 8 and Table 9.

Table 8
One Way Analysis of Variance of Posttreatment Rotter Internal-External Locus of Control Scale Scores of Experimental and Control Groups

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>1</td>
<td>60.53</td>
<td>8.17*</td>
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<tr>
<td>Within</td>
<td>24</td>
<td>7.41</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01

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Table 9

One Way Analysis of Variance of Posttreatment Affective Sensitivity Scale Scores of Experimental and Control Groups

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>1</td>
<td>143.5</td>
<td>4.03*</td>
</tr>
<tr>
<td>Within</td>
<td>24</td>
<td>35.58</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05

Discussion

The preceding analysis of statistical data has shown that the change in the experimental group in the predicted direction for both the Rotter Internal-External Locus of Control Scale and the Affective Sensitivity Scale was significant. There was not a significant change in the control group. Furthermore, an analysis of posttreatment data revealed a significant difference between the experimental and control groups across both dimensions.

Following from these results is the conclusion that EMG feedback training can shift locus of control in the direction of internality and enhance accuracy of therapists' perceptions of client affective states. The following possible causes of these changes are proposed.
Relationship of Cognitive Complexity, Locus of Control and Perception. Cognitive structure is the system by which people, in this case therapists, formulate relationships among the elements of their environments. One dimension of cognitive structure is a continuum of cognitive simplicity-complexity. Developmentally, growth in cognitive structure occurs in the direction of increasing complexity. Bieri (1975) states that cognitive complexity is:

...the capacity to construe social behavior in a multidimensional way. A more cognitively complex person has available a more differentiated system of dimensions for perceiving others' behavior than does a less cognitively complex individual. (p. 185)

More cognitively complex perceivers are better able to discriminate differences among perceptual objects and will utilize discrepant information to form more comprehensive views of objects to be perceived. Ambivalence introduced by discrepant information is not threatening for complex perceivers. It is included in their multidimensional percepts. Conversely, more cognitively simple perceivers tend to perceive greater similarities, whether real or not, among perceptual objects and are less able to deal with discrepant information. When confronted with discrepant information, more cognitively simple perceivers will either maintain or change their impression based
on observable qualities of objects.

In terms of therapists' perceptions of clients, Bieri (1975) suggests that more cognitively complex therapists tend to focus on their clients' internal states and will work to achieve as accurate a percept as possible while more cognitively simple therapists will make judgements based on superficial qualities of clients. More cognitively complex therapists have greater capacity to construe social behavior multidimensionally and, therefore, more accurately (Bieri, 1975). In essence, a larger variety of stimuli are considered relevant to clients' behavior and are discriminated. Once discriminated, stimuli are differentiated and relationships are formed among them. Meaning is ascribed to the patterns of percepts which emerge from this process according to therapists' perceptions of their clients' internal frames of reference. Feedback from clients is utilized to assess accuracy of percepts thus formed and either reinforces these percepts or lead to their change and refinement.

Traits used to distinguish between cognitive simplicity and cognitive complexity are the same traits described earlier to explain differences between externally and internally controlled perceivers. Externally controlled perceivers appear to possess traits attributed to cognitively simple perceivers. They do not discriminate or
differentiate perceptual stimuli as accurately as internally controlled or more cognitively complex therapists. The mechanism involved in inhibiting perceptual accuracy in externally controlled therapists is their belief that power over the outcome of any behavior lies in the hands of fate or other persons. Externally controlled therapists do not believe that they have instrumental control over environmental events. Stimuli which lead to an understanding of a client's frame of reference are, therefore, not considered relevant. As Meichenbaum (1976) theorizes, externally controlled therapists seem to engage in a dialogue of helplessness. In this dialogue it appears that externally controlled therapists tell themselves that understanding the meaning of stimuli from clients' frames of reference will not really facilitate therapy. These therapists do not believe that anyone really has the power to change their life. According to Bieri (1975), because accurate perception is considered irrelevant, accurate discrimination and differentiation will not occur.

As a result of the findings of this research the following relationship is proposed among cognitive complexity, locus of control and accurate person perception in therapists. An external locus of control restricts full development of cognitive structure resulting in a cognitively
simplex structure in which accurate person perception is not considered relevant. An internal locus of control allows cognitive structure to develop into a more cognitively complex structure which demands accurate person perception to embrace a variety of unique relationships which may exist among perceptual stimuli emitted by clients.

The Process of Altering Locus of Control and Enhancing the Accuracy of Person Perception. It is concluded that two elements account for changes in locus of control and accuracy of person perception for subjects who received EMG feedback training in this study. These two elements are dissonance and reinforcement.

EMG feedback training is a process which expands subjects' levels of awareness. Stimuli presented to subjects in EMG feedback training are electromechanical representations of internal psychophysiological states. In this research, auditory feedback received by subjects was an electromechanical representation of tension. As reported earlier, each subject who received EMG feedback training was instructed to reduce the level of the feedback tone. The only way in which this would occur was the production of a relaxation response. Subjects were not given any instructions or information to help them determine the response needed to accomplish the task. The only feedback as to the success of their efforts was the auditory feed-
back tone controlled by their electromyographic feedback level. Initial random successes at reducing the level of the feedback tone resulted in an awareness of the physiological response which produced the desired effect. Thus, relaxation responses were associated with reduction of the feedback tone level. Subjects then developed strategies by which they could produce the desired effect of relaxing in order to reduce the level of the feedback tone.

In summary, random successful lowering of the feedback tone level resulted in the association of physiological relaxation and tone level lowering and a strategy to control feedback was generated. Relaxation caused the tone level to decrease and decreases in tone level acquired reinforcement value for the relaxation response. In order to be reinforced, subjects developed cognitive strategies to produce a relaxation response at will.

The concept of control over behavior and reinforcement was validated by the relationship of internal and external events. For subjects in this study who were externally controlled, error was introduced when they developed awareness of their control. This experience is contradictory to a perception of an external locus of control.

Intrinsic error results in cognitive dissonance (Festinger, 1967). This dissonance generates a drive for re-
organization until consonance or homeostasis occurs (Festinger, 1967; Powers, 1973). In order to reduce dissonance, individuals in this situation must either deny their experience of control or reorganize their cognitive structure to make it congruent with their experience of control. The results of this study indicate that awareness of growing control possesses a powerful reinforcing value. Error, therefore, was reduced by altering cognitive structure to include new experience, and subjects' perceptions of locus of control were altered in the direction of internality. Without the limitations imposed by an external orientation, cognitive structure became more complex as it embraced new dimensions along which relationships among components of one's environment can be construed. An important result of this change in locus of control in the direction of an internal orientation is, as predicted, an increased accuracy in person perception. 

**Implications**

This study has demonstrated that EMG feedback training will enhance therapist trainee effectiveness by causing a shift in perceived locus of control in the direction of internality and an improvement in accuracy of person perception. Based on these results, it is proposed that EMG feedback training be included in therapist training programs. Two important results can be achieved.
in this way. First, it can improve accuracy of person perception of future therapists by expanding their cognitive structure so that they are more open to discrimination of stimuli and are able to more fully use knowledge available to them. Second, it can serve to familiarize therapists with the techniques of biofeedback which they may at some future point include in their practice.

Beyond the realm of therapist training the results of this research serve to build upon theories of cognitive processes postulated by Meichenbaum, Bieri and Powers by accounting for the body-brain interaction and stimuli-organism interactions. EMG and other biofeedback techniques may also serve to increase the power of research in the field of cognitive psychology since we are no longer limited to studying only the characteristics of input and output. A technology is now available which can allow for an examination of events which occur inside the human organism. Through the use of biofeedback techniques, we can study the effects of stimuli on the human organism and individual differences among individuals in a concrete and quantifiable manner. Furthermore, a powerful intervention device is available to change cognitive structures directly by intervening in the body-brain interaction. Biofeedback can change specific psychobiological response patterns as has been hitherto reported in
the literature. This research demonstrated that it can also alter the cognitive structure which assigns meaning to stimuli. The alteration is in the highly desireable direction toward increasing cognitive complexity. The implications for research and "in-the-field" applications are enormous. Perhaps the most important aspect of this research lies in the fact that it opens the door to creative application of technological advancements to problems which had not been thought possible. We can now come to more fully understand what is occurring inside the individual as the body and brain interact. Strength is being added to the new and growing conceptualization of mind as a function of the body-brain interaction. New growth producing interventions become possible. Many implications remain to be discovered as this concept becomes more widely studied.

Prior to closing this discussion two recommendations for future research are suggested. First, the relationship among locus of control, accuracy of person perception and cognitive complexity should be explored in depth. Research along this vain can assess the degrees of relationship and under what conditions relationships can be found to exist. Second, based on the results of this research and the strength of the proposed relationships, research can be conducted to assess effectiveness of bio-
feedback as a change agent in a variety of training and clinical environments with a variety of populations.
CHAPTER IV

Summary

Accurate person perception is a necessary, albeit not sufficient, condition of an effective therapeutic relationship. It enables therapists to understand events from clients' frames of reference. The effect of this necessary condition of therapeutic relationships is that it serves to enhance the reinforcement value of therapists who clients come to regard as able to offer help. Research has demonstrated accurate person perception to be a variable in therapist effectiveness. Those therapists who are more accurate in their perceptions of client affective states have been shown to be more therapeutically effective.

As in any perceptual process, therapist personality is an integral factor in accuracy. Sensory stimuli must first be discriminated in order to be distinguished from all the other stimuli impinging on the organism. A percept is not an empirical fact. Its meaning is mediated by attention, emotion, motivation and personality of perceivers.

External locus of control is a variable which can inhibit accurate perception. An external locus of control is the perception of control of reinforcement as beyond one's own control and under the control of chance or other
people. Evidence in the literature has indicated that an external locus of control can be a handicapping factor for therapists as it results in a lower tolerance for ambiguity, less differentiation among levels of meaning in received communications, and a tendency not to seek out additional information in order to enhance skill performance. Many of the stimuli available to externally controlled therapists are considered irrelevant and, therefore, are not attended to or are distorted. This orientation can be associated with cognitive complexity. Therapists with an external locus of control resemble in characteristics those persons described as being cognitively simplex. This has been associated with perceptual inaccuracy for very similar reasons.

Increasing therapists' perceptual accuracy is highly important because it is a necessary condition of therapeutic effectiveness. Efforts to investigate this variable on a basis of single personality traits have not been effective. However, cognitive complexity and locus of control do not represent a single trait but rather the structure by which individuals establish relationships with the world around them. Previous attempts to change locus of control have not been highly successful. Also, past research has failed to focus on contingency awareness as the key variable. Since the technique of EMG
feedback training is a contingent experience, it is hypothesized that it can be employed as a change agent.

Following from these statements is the assumption that EMG feedback training can be employed to cause a shift in locus of control in the direction of internality and improve accuracy of person perception. The hypothesis tested by this study was that there would be a change in locus of control in the direction of internality and amelioration of person perception accuracy as a result of EMG feedback training.

Students beginning the Master of Arts degree program in the Counseling and Personnel Department at Western Michigan University were sampled at random for participation in this study. The total sample size was twenty-five with twelve subjects in an experimental group and thirteen in a control group. Experimental group subjects received six EMG feedback training sessions in which electrodes were attached to the frontalis muscle in order to measure electromyographic levels. Feedback was provided to subjects in the auditory mode. Auditory feedback levels were set to diminish as the EMG level diminished. A threshold level was set which would turn off when the EMG level dropped below the tone. These subjects were instructed only that, "...the tone you will hear will be feedback on your efforts to manipulate the
level of the tone. Your goal is to reduce the tone to a point where it will turn off and keep it off for as long as possible." Control group subjects received no treatment.

All subjects received pretreatment and posttreatment administrations of the Rotter Internal-External Locus of Control Scale as a measure of locus of control and the Affective Sensitivity Scale as a measure of perceptual accuracy.

Statistical analysis of the data obtained yielded significantly improved posttreatment scores on both the Rotter Internal-External Locus of Control Scale and the Affective Sensitivity Scale for the experimental group. The control group did not show significant differences on these measures. Also, there was a significant difference between posttreatment test scores for experimental and control groups on both measures in the predicted directions.

It is concluded that these changes in both locus of control and accuracy of person perception are the result of a reorganization of subjects' cognitive structure. This reorganization is explained as an effect of EMG feedback training in which externally controlled individuals reduce dissonance created by the contradictory experience of control.
EMG feedback training is a powerful tool in the preparation of future therapists and especially for those with an external locus of control. Such training as an addition to existing therapist training programs should prepare future therapists to more fully use their perceptual abilities. These results have an additional impact of allowing researchers to study events inside the mediator. Past research has had to be satisfied with studying changes in input and output. The outcome of this research demonstrates that meaning attributed to behavior can now be studied in terms of its effect on an individual's physiology.
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APPENDIX I

ROTTER INTERNAL-EXTERNAL LOCUS OF CONTROL SCALE
AND SCORING KEY
OPINIONNAIRE

1. a. Children get into trouble because their parents punish them too much.
b. The trouble with most children nowadays is that their parents are too easy with them.

2. E a. Many of the unhappy things in people's lives are partly due to bad luck.
b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.
b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

5. a. The idea that teachers are unfair to students is nonsense.
b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6. E a. Without the right breaks one cannot be an effective leader.
b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. E a. No matter how hard you try some people just don't like you.
b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality.
b. It is one's experiences in life which determine what they're like.

9. E a. I have often found that what is going to happen will happen.
b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
10. a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
    E b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    E b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
    E b. This world is run by the few people in power, and there is not much the little guy can do about it.

13. a. When I make plans, I am almost certain that I can make them work.
    E b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.
    b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
    E b. Many times we might just as well decide what to do by flipping a coin.

16. E a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
    b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

17. E a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
    b. By taking an active part in political and social affairs the people can control world events.

18. E a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    b. There really is no such thing as "luck."

19. a. One should always be willing to admit mistakes.
    b. It is usually best to cover up one's mistakes.
20. E a. It is hard to know whether or not a person really likes you.
   b. How many friends you have depends upon how nice a person you are.

21. E a. In the long run the bad things that happen to us are balanced by the good ones.
   b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.
   E b. It is difficult for people to have much control over the things politicians do in office.

23. E a. Sometimes I can't understand how teachers arrive at the grades they give.
   b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.
   b. A good leader makes it clear to everybody what their jobs are.

25. E a. Often I feel that I have little influence over the things that happen to me.
   b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.
   E b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.
   b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
   E b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. E a. Most of the time I can't understand why politicians behave the way they do.
   b. In the long run the people are responsible for bad government on a national as well as on a local level.
SCORING KEY:

Each response alternative preceded by an "E" indicates the external response selection. The number of agreements between those responses given and the external responses is added to yield the raw score for the scale. Scoring is in the direction of externality. The higher the score, the greater the degree of external control.

Items 1, 8, 14, 19, 24, and 27 are filler items and are not used in scoring.
APPENDIX II

INFORMED CONSENT FORMS
INFORMED CONSENT FORM

FORM 1

I, the undersigned, voluntarily agree to participate in the study to be conducted by Mr. Vincent Scalese. Further, it is my understanding that my participation will include the following procedures and entitlements:

1. the administration of certain paper and pencil research instruments as will be described at the time of administration. The result of these administrations will be kept strictly confidential.

2. the attachment of sensors to the frontalis muscle in order to monitor certain physiological functions.

3. that there exists only the discomfort of having the sensors attached with adhesive tape. There are no unreasonable risks to health or well being as there will be no physically or psychologically intrusive manipulations.

4. that a complete feedback which may be beneficial concerning performance and the results of the experiment will be provided me at the conclusion of the experiment.

5. that at the conclusion of the experiment all questions concerning the experiment will be answered.

6. that I may, at any time, withdraw my consent and discontinue my participation in the study.

signature ____________________________ date ____________

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INFORMED CONSENT FORM

FORM 2

I, the undersigned, voluntarily agree to participate in the study to be conducted by Mr. Vincent Scalese. Further, it is my understanding that my participation will include the following procedures and entitlements:

1. the administration of certain paper and pencil research instruments as will be described at the time of administration. The results of these administrations will be kept strictly confidential.

2. that a complete feedback which may be beneficial concerning performance and the results of the experiment will be provided at the conclusion of the experiment.

3. that at the conclusion of the experiment all questions concerning the experiment will be answered.

4. that I may at any time withdraw my consent and discontinue my participation in the study.

signature __________________________ date ____________