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PSYCHOPHYSIOLOGICAL CORRELATES

OF ATTITUDES

by

MINDY PREGULMAN NATHANSON

A professional paper submitted in partial fulfillment
of the requirements for the degree

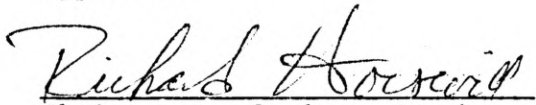
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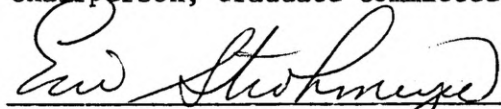
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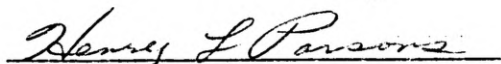
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ABSTRACT

In an attempt to increase understanding of individuals as total beings and thereby improve effectiveness of counseling services, this study examined the problem of whether or not there is a relationship between specific attitudes and specific physiological changes. Hand temperatures of fifteen participating Montana State University males enrolled in Introductory Psychology 103 were recorded by an Autogen 2000b Temperature Feedback unit and fed into an Autogen 5600 micro-processor for analysis as instructions aimed at inducing specific attitudes were given. The hypotheses tested statistically were: (1) there was no significant difference between the mean baseline hand temperatures for Group I and Group II; (2) there was no significant difference between the mean hand temperatures for baseline and the first intervention for Group I; (3) there was no significant difference between the mean hand temperatures for baseline and the second intervention for Group I; (4) there was no significant difference between the mean hand temperatures for baseline and the first intervention for Group II; (5) there was no significant difference between the mean hand temperatures for baseline and the second intervention for Group II; (6) there was no significant difference between the mean hand temperatures for the first and the second interventions for Group I; and (7) there was no significant difference between the mean hand temperatures for the first and the second interventions for Group II. The t-test for independent variables was used to test hypothesis 1, above, at the .05 level of significance. Hypotheses 2, 3, 4, 5, 6 and 7, above, were tested using the t-test for dependent variables, at the .05 level of significance.

The findings of this study were: (1) mean baseline hand temperatures for Group I and Group II were not significantly different; (2) differences between the hand temperature responses to the two life event situations presented to Group I and to Group II were not statistically significant; and (3) the order of presentation of life event situations did significantly affect the accompanying changes in hand temperature for Group II only. The following conclusions were drawn: (1) two forty minute baseline sessions allowed for hand temperatures of subjects to stabilize; (2) hand temperatures recorded during the initial attitude suggestion for hives (passive) and Raynaud's disease (active) did not reach points significantly different from the last control temperature recorded; that is, there were no apparent differences in physiological responses between attitudes; and (3) for the second treatment group, change in hand temperature upon presentation of the attitude associated with hives (passive) did differ significantly from the change upon presentation of the attitude associated with Raynaud's disease (active).

Chapter 1

INTRODUCTION

Psychological and physiological variables have long been the subject of philosophical inquiry and have been researched separately. There has been little research, however, concerning the relationship between them.

In 1952, Grace and Graham, D. T., proposed the "specificity of attitude theory"; that is, "each attitude is associated with its own unique set of bodily changes" (p. 248). This conclusion is in opposition to the widely held view that there is no relation between the "emotion" felt and the physiological changes which accompany it (Munn, 1946). A similar specificity hypothesis to that of Grace and Graham, D. T. (1952) has been advanced by Alexander (1950). The major difference in the "specificity of attitude theory" is that the symptom is said "to be primarily related, not to a nuclear conflict nor to a personality characteristic, but to the way an individual perceives and what he wants to do about, a precipitating event" (Stern, Winokur, Graham, D. T., & Graham, F. K., 1960, p. 73).

Tests of this prediction were made (Graham, D. T., Kabler & Graham, 1962; Graham, D. T., Stern & Winokur, 1958; Stern et al., 1960) through suggestion of specific attitudes to each subject and measurement of the appropriate physiological variable, i.e., change in skin temperature of the hand. The study of attitudes has assumed new significance

in the counseling profession with the increasing consensus of the investigators, of these and other innovative studies, as to their direct relationship to the physiological changes accompanying them.

For Rokeach (1968), additional facets of attitudes, i.e., "affective" and "evaluative" components, have suggested further areas of consideration. "Whether the preferential response will be positive or negative will depend on the relative strength of one's evaluative beliefs and one's positive and negative feelings" (p. 122). A number of other researchers (Fishbein & Raven, 1962; Krech & Crutchfield, 1948; and Krech, Crutchfield & Ballachey, 1962) have shared in this opinion.

More recent studies (Brown, 1974) have further revealed the "considerable influence of sub-conscious recognition and judgmental action on skin activity" (p. 94). "The story of the herioglyphic physiology of the skin has, to this point, revealed an array of clues to the health of the inner being that has a distinct potential for psychotherapy" (Ibid., p. 117).

Statement of the Problem

The problem of this study was to determine the relationship between two specific attitudes toward certain life event situations and the specific physiological responses which accompany each of them. A sample of Montana State University students enrolled in Introductory Psychology 103 fall quarter 1978 was surveyed.

Need for the Study

Whether or not a relationship exists between attitudes and their accompanying physiological changes may be of importance to a further understanding of the concept of attitudes, now characterized by obscurity and vagueness. "Attitudes lie behind many of the significant and dramatic instances of man's social behavior. It is for this reason that many psychologists regard the study of attitudes as the central problem of social psychology" (Krech & Crutchfield, 1948, p. 151).

The numerous studies of physiological differentiators of emotional states have, viewed en masse, yielded quite inconclusive results. If the correlation between the two variables in this study, as indicated by measurement of skin temperature of the hand, is significant, prediction of specific physiological responses from specific attitudes may be more reliable. "The skin is talking about the mind" (Brown, 1974, p. 50).

Further, skin temperature is a stochastic and highly variable function across and within individuals (Bazett, 1949), and the free-operant or normal resting behavior of this response remains poorly defined (Silberstein, Bahr, & Kattan, 1975). More basic information about the baseline response patterns of skin temperature is essential to establish confidence in the subsequent analysis of the relationship under study.

If evidence can be provided showing that attitudes and their accompanying physiological changes are directly related, knowledge of

this relationship may facilitate an improved understanding of human attitudes, and thus, better counseling services.

Questions to be Answered

1. Is there a significant difference between the mean baseline hand temperatures for Group I and Group II?
2. Is there a significant difference between the mean hand temperatures for baseline and the first intervention for Group I?
3. Is there a significant difference between the mean hand temperatures for baseline and the second intervention for Group I?
4. Is there a significant difference between the mean hand temperatures for baseline and the first intervention for Group II?
5. Is there a significant difference between the mean hand temperatures for baseline and the second intervention for Group II?
6. Is there a significant difference between the mean hand temperatures for the first and the second interventions for Group I?
7. Is there a significant difference between the mean hand temperatures for the first and the second interventions for Group II?

General Procedures

Fifteen male students were selected as the study sample from Introductory Psychology 103 classes at Montana State University fall quarter 1978. Three groups of subjects were defined. Group I received instructions aimed at inducing two specific attitudes. Group II

received the same instructions in the reverse order from Group I. Group III was instructed to relax while listening to music. Each group consisted of five subjects.

One thermistor was placed on the center of the digital pad of the index finger of the dominant hand. Temperature measures were recorded by an Autogen 2000 temperature unit and fed into an Autogen 5600 micro-processor for analysis. Hand temperature was measured and recorded for 40 minutes per day for two consecutive days prior to beginning the experiment. The hand temperature was recorded at 30 second intervals. On the third day, each subject was exposed to one of the experimental or the control conditions. The assignment of the subjects to the various conditions was done at random.

Limitations

The following factors may limit this study by affecting the validity of the study results:

1. Subjects were instructed to put themselves into the life event situations as they were described to them, to imagine that the events were happening to them at that moment. There was no way to determine to what extent this was accomplished.

2. The researcher could not control for the subjects' decidedly altering their responses so as to disconfirm their perceptions of the experimenter's expectancies.

Delimitations

1. The sample was delimited to those Montana State University students in Introductory Psychology 103 who volunteered to participate in the study. Therefore, inferences were restricted to similar populations and were not generalizable to the population at large.

2. Another consideration was that although all aspects of the procedure were standardized by the researcher, actual methods of presentation, i.e., facial cues, verbal cues, gestures, may have varied from subject to subject.

3. The researcher conducted all baseline and experimental sessions. This design did not control for possible interactions between a specific attribute of the experimenter and a specific attribute of an individual subject.

4. Each subject came to the biofeedback laboratory at the same time on three consecutive days. As there was not enough equipment to conduct all fifteen participants at the same time, there might be different influences acting upon the subjects who participated at different times of the day from each other.

Definition of Terms

Terms used in this study are those given by The Handbook of Physiological Feedback (1976) and by "The Concept of a Specific Set of Physiological Changes in Each Emotion" (1960):

The following term is defined in The Handbook of Physiological Feedback (1976):

Biofeedback. "Biological feedback is the process of monitoring a physiological function and feeding back its activity to the individual being monitored. The purpose of this procedure is to facilitate conscious recognition of the process being monitored, thereby creating a situation in which the individual can learn to self-regulate his own physiological activity (p. 5, Vol. I).

The following terms are defined in "The Concept of a Specific Set of Physiological Changes in Each Emotion" (1960):

Emotion. "We begin by regarding an emotion as a response to some event. This response has two different aspects. The first of these consists of the physiological changes occurring in the organism during the emotional response. The second aspect of the emotional response is how the person feels about the event which has produced it. This feeling about the precipitating event previously has been called an attitude. The definition of the emotion then, is an attitude with its accompanying physiological changes (p. 8).

Attitude. "The attitude, in this usage, consists of two parts: (1) how the person perceives his position in the situation, that is, what he considers is happening to him; and (2) what action tendencies he then develops, what he wants to do about the thing that has aroused the emotion" (p. 8).

Specificity of Attitude Hypothesis. "There is a specific relation between an attitude and the physiological changes which accompany it" (p. 9).

Summary

It was hoped that the present lack of knowledge in counseling concerning specific attitudes and their accompanying physiological responses could be filled to some extent by a look at their relationship. The

problem of this study was to determine whether or not a relationship exists. With this knowledge, counseling effectiveness may be improved.

During fall quarter 1978, hand temperatures of participating Montana State University students were recorded as instructions aimed at inducing specific attitudes were given. The researcher used the data to answer questions concerning the relationship between specific attitudes and their accompanying physiological responses.

Chapter 2

REVIEW OF LITERATURE

Within and among the fields which constitute the social sciences, there has been little agreement as to what elements comprise attitudes and physiological responses, if they are related, how they are measured or their place in the study of human behavior. Viewpoints have ranged from the idea that attitudes have no meaning in relation to physiological responses, to the opinion that physiological responses cannot be understood unless within the context of personal belief systems. With the development of instruments that measure physiological responses, recent studies reveal that attitudes and physiological responses have a quantifiable relationship. This review of literature will explore: (a) definitions of attitudes and how they are formed; (b) theories of physiological functions and their measurement; and (c) studies concerning specific relationships between attitudes and physiological responses.

Definition of Attitudes

Despite the central position of attitudes in social psychology and related fields, the concept has been plagued with ambiguity. Two critics have gone so far as to suggest that the concept be discarded. Doob (1947) argued that while "attitude" is a socially useful concept, it has no systematic status as a scientific construct. Writing from a sociological point of view, Blumer (1955) recommended abandoning the concept as its vagueness is a hindrance to the development of a solid

social psychological theory.

Although these views are in the minority, the status of the concept remains confused. According to Rokeach (1968) "all writers agree that attitudes are learned" (p. 112). Yet there is an "evaluative dimension" (Fishbein & Raven, 1962) to the concept which is innate. "In the beginning the infant has two primordial, nonspecific attitudes, namely, approaching and avoiding" (Allport, 1935, p. 810). Krech, Crutchfield and Ballachey (1962) considered attitudes to play a major role in governing judgments. They are "an enduring system of positive and negative evaluations, emotional feelings, and pro or con action tendencies with respect to a social object (p. 177).

Throughout the life process an individual adopts preferences or attitudes - a concept signifying "the relation of some aspect of reality to man (or to some other living entity)"; i.e., "for me" or "against me" (Brandon, 1969, p. 61). Rokeach spoke of these preferences as "evaluative beliefs" (1973, p. 113). Gendlin concurred, stating that the process is determined "by its own experiential felt data to which the individual inwardly infers". We differentiate the incoming information and symbolize the "felt meanings" which emerge (1967, p. 184). He viewed "body meanings", in this context, as a result of "body life, an interaction with the people and things around us" (Ibid., p. 188). As a result of this "bodily living" of different situations, a "very striking inward attitude develops" (Ibid., p. 339).

Recent studies (Allport, 1935; Osgood, Suci & Tannenbaum, 1957; Rokeach, 1968), have agreed that attitudes are "predispositions to respond", and further that they differ from other states of readiness in that they "predispose toward an evaluative response" (Osgood, Suci & Tannenbaum, 1957, p. 189), are a "preferential response" (Rokeach, 1968, p. 121), and are necessary before "suitable judgment" can be passed (Allport, 1935, p. 806). "There is a pervasive, evaluative factor in human judgment" (Osgood, Suci & Tannenbaum, 1957, p. 41).

Incorporated into this concept of attitude are particularly enduring sets formed by past experiences. (Asch, 1952, p. 585) "Past experience is summed, stored, and organized in the individual as he approaches any new situation" (Newcomb, Turner & Converse, 1965, pp. 41-42).

Rokeach (1968) agreed that evaluations of proposed activity are made "upon the basis of past experience" (p. 11). Krech and Crutchfield (1948) go even further to say that "our perceptions and therefore judgments are usually determined by more than the immediate stimuli being judged. The whole range of stimuli that affect us - 'the frame of reference' - determines any given judgment" (p. 157).

In defining attitude, Osgood, Suci and Tannenbaum (1957) suggested that it is "part of the internal mediational activity that operates between most stimulus and response patterns" (p. 189). Discussing this perception, Newcomb, Turner and Converse (1965) referred "literally to the individual's organization of sensory input - that is, to what he

does, psychologically, with the stimuli currently impinging upon his sense organs" (p. 34). Nathaniel Brandon (1969) spoke of the sequence of psychological events as "from perception to evaluation to emotional response" (p. 69). "That a person may fail to identify either the judgment or the factors involved in it, that he may be conscious only of the perception and of his emotional response, is the fact which makes possible men's confusion about the nature and source of emotions" (Ibid., p. 69).

Another facet of the attitude concept is its inclusion in the definition of emotion - "a response to some event" (Graham, D. T., Stern, & Winokur, 1960, p. 8). This response has two different aspects, the first being the physiological changes which occur in the individual during the emotional response. The second is how the person feels about the event which has caused it. This feeling about the "precipitating event" is called an attitude and is defined, in this usage, as (1) how the person perceives his position in the situation, that is, what he considers is happening to him; and (2) what action tendencies he then develops, what he wants to do about the thing that has aroused the emotion" (Graham, D. T., Stern, & Winokur, 1960, p. 8).

Throughout the literature, attitudes have been employed in a variety of ways. This has made it difficult to assign them consistent and precise standards.

Theories and Measurement of Physiological Functions

Ideas concerning physiological structures have been found quite early in Western thought. Traditionally, they have been considered visceral processes "which are viewed with some degree of negativity or distaste, which are believed to be distinct from the substratum of rational thought, and which are thought to be shared by animals and man" (Averill, 1974, p. 157). Similarly, Darwin held that emotions, as products of our evolutionary past, demonstrated the continuity between humankind and animals. Physiological structures have "come to be viewed as noncognitive, as not requiring a great deal of intellectual competence", and "as being different from those which subserve 'higher' mental processes" (Ibid., p. 153). During the 4th century B.C., Plato, in his concern with "localization of function", placed the "immortal, rational soul in the head" (Ibid., p. 155). In order not to pollute the rational soul any more than necessary, the mortal, affective soul was placed in the trunk of the body.

The work of William James (1890) was influential in the redefinition of physiological structures. His research suggested the "bodily changes follow directly the perception of the exciting fact, and that our feeling of the same changes as they occur is the emotion" (p. 13). Yet, the belief persisted that "the same visceral changes occur in very different emotional states" (Cannon, 1936, p. 351). Alexander (1950) substantiated this claim, as evidenced in the "older view": "Any emotion may

contribute to any organic disturbance and the local vulnerability of the affected organ is responsible for the localization of disease" (p. 69). Selye (1946) too supported Cannon's notion of generalized response to threat. Various kinds of stressors employed, i.e., cold, exercise, fasting, drugs, promoted a similar pattern of response. This conception reflected a lingering influence of the ancient doctrine of mass sympathy among the organs. Yet, Cannon's views did provide a scientifically respectable rationale for the traditional association between affective and visceral activity. Realizing the importance of further investigation, despite the number of skeptics, he urged that "interest in this realm of medicine should not be relegated to cults, mental healers and the clergy" (Cannon, 1928, p. 884).

The trend of the previous study findings tended to discourage those looking for different patterns of physiological responses in different emotions. Sternbach (1966), in his conviction that a holistic approach was vital in our thinking about human functions, persisted in his belief that feelings could not be so misleading. "Fear and anger, love and hate, joy and grief - these feel different - physically different" (p. 79). He coined the term "psychosomatic" to emphasize that "mind (psyche) and body (soma) are interacting processes, not separate entities" (Ibid., p. 139).

"The current keynote", as defined by Hinsie (1945), "is the inseparability during early infancy of the psyche and the soma. The one

looks like the other; the one has many characteristics of the other" (p. 34). Because the mind does not have a definitive location in the body, "it is difficult for many people to understand it as an aggregate of functions that are conveyed from the brain to various parts of the body, thence to the environment" (Ibid., p. 41). Throughout the period of growth in children, there is an "inseparable coordination of mind and body" (Ibid., p. 59).

Graham, D. T. (1967), also in recognition of the mind-body problem, stated that "the difference between 'mental' and 'physical' (or 'psychic' and 'somatic', or any of the other corresponding pairs of words in common use) is not the events observed, but rather is the languages in which they are discussed. Mind-body dualism is in the languages used" (p. 66).

Another support for the holistic approach to the study of humankind, came through the use of instruments, for the most part borrowed from physiology, in the measurement of body functions. Their common usage had been the investigation of bodily changes for their own sake, without reference to conscious experience. Recently, biofeedback has become a very important process, aiding in a clearer understanding of affective states and their accompanying physiological functions. "For the most effective use of biofeedback it is important to know how the body expresses its physiologic functioning" (Brown, 1974, p. 14).

Finally, there has been support for the idea that physiological

changes cannot be assumed simply to reflect some psychological state, but must be interpreted in terms of the transactions of total individuals within the context of their environments. These few examples from the literature suffice to make the general point: Once freed of its prejudicial link with irrational, noncognitive instincts, physiological functions may serve as an important tool in the investigation of mental and emotional, as well as physical, processes of the total human being.

Relationships between Attitudes and Physiological Responses

Recent studies have produced empirical evidence to support the theory of specificity in physiological response patterns. Two stimulus conditions, one "anger-producing" and the other "fear-producing", employed by Ax (1953), were found to be "accompanied by simultaneously recorded physiological reaction patterns which, on the average, were clearly different for the two stimuli" (p. 441). Lacey and Lacey (1958), in particular, emphasized the role of individual differences, and Malmö's, Shagass's and Davis's work (1950) also suggested that individuals are prone to react with a pattern specific to themselves in a variety of stress situations. Schnore's results (1959) confirmed that "during qualitatively and quantitatively different stimulus situations individuals exhibited idiosyncratic but highly stereotyped patterns of somatic and autonomic activity" (p. 127). More specifically, "Individuals have patterns particular to themselves because they are more likely to adopt certain attitudes than others" (Graham, D. T., Kabler, & Graham,

F. K., 1962, p. 166).

A further statement by Graham, D. T. (1962) specified "one meaningful psychological concept, by the use of which specific psychophysiological correlation can be obtained, is that of attitude" (p. 222). This "specificity of attitude" theory was first hypothesized by Grace and Graham, D. T. (1952). The results of this study suggested that each attitude is associated with its own unique set of bodily changes. All patients with the same symptom-complex described their attitudes toward the situation which precipitated it in essentially the same way. Attitude, in this instance, is defined to mean "a person's statement of what he feels to be happening to him, and what he wants to do about it. An attitude develops in response to a stimulus; another aspect of the response is physiological" (Graham, D. T., 1962, p. 222).

An experimental test of the specificity of attitude theory was made through the suggestion of attitudes to normal subjects along with the simultaneous measurement of changes in skin temperature of the hand. The hypothesis, stating that each attitude toward a disturbing situation is associated with its own specific disease or set of physiological changes, was supported (Graham, D. T., Stern & Winokur, 1958). The hypothesis tested here produced further evidence for the SR (stimulus response) specificity theory purported by Greenfield and Sternbach (1972). "SR specificity refers to the tendency that a stimulus or situation has to evoke characteristic responses from most subjects"

(Ibid., p. 572). "The same stimuli elicit the same diseases in different persons" (Ibid., p. 852). In further experimentation (Stern, Winokur, Graham, D. T. & Graham, F. K., 1960), a successful attempt was made to replicate the results of the first experiment under relatively unfavorable conditions - that is, to determine whether attitude suggestions could successfully reverse strong trends in the opposed direction.

A third study (Graham, D. T., Kabler & Graham, F. K., 1962) gave further support to the hypothesis, although order of presentation, the independent variable, did not affect significantly the physiological response to the attitudes. To replicate the work of Grace and Graham, D. T. (1952), Gottlieb, Gleser and Gottschalk (1967) found evidence to support the general theory of specificity and point up the relevance of the interpersonal setting within which attitudes are experienced. In two different experiments, Graham, F. K. & Kunish (1965), concluded that differentiation in physiological responses was not obtainable in the awakened state unless suggestions were modified to elicit greater involvement of the subjects. Finally, the specificity of attitude theory was tested by determining whether the attitudes which judges selected as characteristic of patients were, in fact, the attitudes predicted by the hypothesis (Graham, D. T., Lundy, Benjamin, Kabler, Lewis, Kunish & Graham, F. K., 1962). Even with naive interviewers and judges, the theory proved true.

A question underlying the specificity of attitude studies asked "whether different emotions have different and consistent physiological concomitants; that is, whether we can define emotions in psychological terms, independent of the physiological description, in such a way that relations are found, different for each emotion" (Graham, D. T., 1962, pp. 221-222). The conclusion was drawn that "each psychosomatic disease is part of a specific emotion" and that "each emotion has its own specific and unique physiological components" (p. 237). "Every emotional state has its own physiological syndrome" (Alexander, 1950, p. 68). Bull (1945) suggested the same in her statement of the mind-body connection; that is, "the feeling of mental attitude can thus be thought of as part of the consciousness of motor attitude" (p. 212). In her definition of emotion, Arnold (1960) described the "felt tendency" toward or away from anything appraised as beneficial or harmful. "This attraction or aversion is accompanied by a pattern of physiological changes organized toward approach or withdrawal. The patterns differ for different emotions" (p. 182). In regarding an emotion as a "response to some event", "an attitude with its accompanying physiological changes" (Graham, D. T., Stern, & Winokur, 1960, p. 8), a new approach to emotions i.e., the attitude approach, may represent a new avenue for experimentation and discovery.

Summary

Review of the literature has illustrated that attitudes and

physiological responses are defined and employed in numerous ways. The questions: What are attitudes and how are they formed? Can measurement of specific physiological responses indicate specific attitudes? What relationship exists between attitudes and the physiological changes that accompany them? The results having been found to be inconclusive. This researcher suggests: (a) an understanding of a person's attitudes is central to an understanding of that person's behavior; (b) individuals form attitudes concerning stimuli with which they come into contact; (c) a physiological response can only be understood within the context of a person's belief system; and (d) while measurement of physiological functions has yielded inconclusive results, perfection of biofeedback instruments and research designs may lend further, more reliable support to the prediction of specific physiological responses from specific attitudes.

Chapter 3

PROCEDURES

The present study has dealt with the idea that the physiological changes associated with an attitude are specific for that attitude. In that emotions are defined here as the combination of attitudes plus physiological changes, the study attempted to determine that there is a specific set of physiological changes in each emotion and that emotions can be differentiated in terms of their bodily expressions. Stabilization of baseline hand temperature was established to determine its effect on the relationship between specific attitudes and specific physiological changes.

Contained in this chapter is a description of the study sample, the treatment, and the methods used for data collection. Also presented is a brief explanation of the biofeedback process and equipment used plus the method for organization of the data. The null hypotheses for the study are included here along with an explanation of what use was made of the data. In addition, precautions taken for accuracy are specified.

Population Description

The population sampled consisted of all male Montana State University students enrolled in Introductory Psychology 103 fall quarter 1978. Each professor teaching an Introductory class was given a brief explanation of the study plus sign up sheets. The names and phone numbers of

those students who volunteered to participate were collected. Fifteen males were then selected from the list at random to serve as the study sample. The researcher contacted these students to establish meeting times for the three consecutive laboratory sessions.

Method of Collecting Data and Treatment

All laboratory sessions were conducted by the researcher, along with an assistant who helped record the data. There were two baseline sessions and one treatment session for every subject. Subjects who participated did so with informed consent.

The 2.3 x 1.4 m. carpeted chamber in which the sessions took place was kept at 70°F. to 74°F. Room temperature was monitored before, during and after each session by attaching a temperature probe to a fixed point in the room near the subject and taking a reading on the Autogen 1000b. The subjects remained in the room prior to the session for 5-10 minutes so that their skin temperatures and associated physiological control mechanisms could adapt to the room temperature. The exact period of time necessary for this adjustment varies according to the degree of climatic change and the individual's particular adaptive mechanisms (Jankel & Trusk, 1978). After the temperature probes were attached, an initial period of 1-2 minutes was allowed to pass before any measurements were taken, so that the probe had sufficient time to stabilize.

The format for the first baseline session was as follows: The session took place in the biofeedback cubicle, with the subject sitting

comfortably in a semi-recumbent position in a reclining chair. Greeting, explanation of the biofeedback process and equipment and initial instructions were made. These methods, along with answers to anticipated questions were standardized and closely followed for each participant.

In more detail, the mechanisms in the cardiovascular system which regulate skin temperature in the hands are tied closely with the sympathetic section of the autonomic nervous system. (This process evolves in relation to the higher brain centers associated with emotional responses.) When the sympathetic function is activated, the smooth muscles surrounding the blood vessels near the skin surface are likely to contract, increasing the pressure on the vessels. The diameter of these vessels then decreases, resulting in a decreased flow of blood, called vasoconstriction to the area. As less blood flows through the capillaries to the tissues near the skin surface, the skin temperature will drop.

Conversely, an increase in hand temperature is brought about by vasodilation (a relaxation of the smooth muscles surrounding the surface blood vessels of the hands).

At this point, the subject was instructed to relax. One thermistor, or temperature probe, was attached with porous paper tape to the center of the digital pad of the index finger of the dominant hand. Then the lights were turned off. Temperature measures were recorded by

an Autogen 2000b Temperature Feedback unit and fed into an Autogen 5600 microprocessor for analysis. The temperature data was integrated and displayed every 30 seconds over a period of 40 minutes.

The second baseline day followed the same procedural outline as that of day one. At the end of each baseline session, the experimenter conducted a brief interview with each subject to discover possible contaminating variables due to external influences.

At this point, three groups of five subjects each were randomly defined. Group I received two sets of instructions aimed at creating two specific attitudes. Group II received the same instructions in the reverse order of Group I, to control for the order effect. Group III (control) listened to music during the session.

The present study adapted the method employed by Grace and Graham, D. T. (1952), who specified attitudes associated with hives and with Raynaud's disease. For hives, "the attitude is that the person sees himself as being mistreated, receiving injury without developing even a wish to take any action himself. The person with Raynaud's disease, on the other hand, wishes to take some direct, hostile action" (Graham, D. T., Stern & Winokur, 1958, p. 447). Since warming of the skin is part of the physiology of hives whereas cooling of the skin is characteristic of Raynaud's disease there is a sharp physiological distinction which makes these two attitudes convenient for experimental purposes.

Each experimental session (session 3 for each subject) took place

in the biofeedback laboratory cubicle with the subject relaxing comfortably in the easy chair. Again, one thermistor was attached to the digital pad of the index finger of the dominant hand. Temperature measures were recorded and analyzed in the same manner as for the baseline sessions. After the lights were turned out, tape recorded instructions began for Group I (See Appendix A). Group II heard the same tape with the first two interventions reversed. Group III listened to a tape of music.

Finally, the experimenter conducted a brief interview with each subject to discover possible contaminating variables due to external influences.

Irrelevant and Contaminating Variables

Use of the biofeedback equipment dictated that the study be conducted in the laboratory. The lack of familiarity with the measuring devices and surroundings may initially generate a certain amount of performance anxiety and self-consciousness on the part of the subjects. To minimize this anxiety, the experimenter explained the use of the equipment to each subject at the beginning of the first session.

Another potential contaminating variable was that due to the sensitive nature of the biofeedback equipment, external influences, i.e., physical/social/environmental factors, may have an influence on the temperature recordings. The researcher attempted to control for this by means of the brief individual interviews conducted at the end

of each session.

In addition, skin temperature may be influenced by several factors, i.e., climate, blood viscosity, skin condition, and the presence or absence of certain chemicals in the blood. These conditions, however, will most likely remain constant during a given biofeedback session, so the momentary temperature changes recorded will be a function of immediate psychophysiological changes.

Reliability and Validity

In the present study, a specificity of attitude hypothesis, developed originally from the clinical study of patients with various psychosomatic diseases (Grace & Graham, D. T., 1952), was tested experimentally by suggesting specific attitudes to subjects and measuring accompanying changes in hand temperature. This method was one of three found in a previous clinical study by Graham, D. T., Stern and Winokur (1958) in which various methods for induction of the desired attitude were tried. Further experimentation was done under unfavorable conditions (Stern, Winokur, Graham, D. T., and Graham, F. K., 1960). Although the procedure was established and tested in these two studies, reliability was not reported.

There not being a ready-made external criterion with which to measure it, validity of the biofeedback session and interview was based on several factors. First, content validity was determined through approval of the format, taken from the literature, by authorities in the

fields of psychology and psychosomatic medicine. Second, interview validity was determined by authorities in the specific area of biofeedback methodology employed, i.e., measurement of hand temperature. Third, validity of the entire study was inferred from the need for the study. If evidence could be provided showing that attitudes and their accompanying physiological functions were directly related, knowledge of this relationship could facilitate an improved understanding of attitudes, and thus, more effective counseling services.

Method of Organizing the Data

Data were assembled in tabular form and appear in Tables 1 through 8 of Chapter 4. These data were organized in terms of mean hand temperatures for Groups I, II and III for baseline, first intervention, second intervention, third intervention and fourth intervention.

Statistical Hypotheses

The first null hypothesis tested was that there was no significant difference between the mean baseline hand temperatures for Group I and Group II. The alternative hypothesis stated that there was a significant difference between the mean baseline hand temperatures for Group I and Group II.

The second null hypothesis tested was that there was no significant difference between the mean hand temperatures for baseline and the first intervention for Group I. The alternative hypothesis stated that the

mean hand temperature for the first intervention was significantly lower than that of the baseline for Group I.

The third null hypothesis tested was that there was no significant difference between the mean hand temperatures for baseline and the second intervention for Group I. The alternative hypothesis stated that the mean hand temperature for the second intervention was significantly higher than that of the baseline for Group I.

The fourth null hypothesis tested was that there was no significant difference between the mean hand temperatures for baseline and the first intervention for Group II. The alternative hypothesis stated that the mean hand temperature for the first intervention was significantly higher than that of the baseline for Group II.

The fifth null hypothesis tested was that there was no significant difference between the mean hand temperatures for baseline and the second intervention for Group II. The alternative hypothesis stated that the mean hand temperature for the second intervention was significantly lower than that of the baseline for Group II.

The sixth null hypothesis tested was that there was no significant difference between the mean hand temperatures for the first and the second interventions for Group I. The alternative hypothesis stated that there was a significant difference between the mean hand temperatures for the first and the second interventions for Group I.

The seventh null hypothesis tested was that there was no

significant difference between the mean hand temperatures for the first and the second interventions for Group II. The alternative hypothesis stated that there was a significant difference between the mean hand temperatures for the first and the second interventions for Group II. All hypotheses were tested at the .05 level of significance.

Analysis of the Data

Differences between the mean hand temperatures for the baseline sessions for Group I and Group II were calculated using the t-test for significance of the difference between two means for independent samples (Hypothesis 1). This t-test enabled the researcher to determine the stability of hand temperature over the baseline sessions, from which evidence of experimental manipulation could be provided.

Measurements of mean hand temperature changes due to treatment were provided by the t-test for significance of the difference between two means for correlated samples (Hypotheses 2-7). Through use of this t-test, the researcher was able to measure the differences in hand temperature between attitude groups.

Precautions Taken for Accuracy

A computer was used to calculate the t-test for independent variables and the t-test for dependent variables. All data were processed at Montana State University under the direction of Dr. Eric Strohmeyer.

Means were computed by hand. These were rechecked but they

constitute a possible source of error.

Summary

Fifteen male students in Introductory Psychology 103 participated in the present study fall quarter 1978 at Montana State University. Each subject participated in three biofeedback sessions including two baseline sessions and one treatment session in which presentations of specific life situations were made and measurements of accompanying changes in hand temperature were recorded.

Mean hand temperatures were obtained for Groups I, II and III for baseline, first intervention, second intervention, third intervention and fourth intervention. The t-test for independent variables was used to determine the stability of hand temperatures over the baseline sessions. Differences in hand temperatures within each of the three experimental groups due to the various interventions were measured using the t-test for dependent variables.

It was hypothesized that the physiological changes characteristic of two specific psychosomatic diseases, hives and Raynaud's disease, would occur when the attitudes associated with them were suggested. Specifically, skin temperature would rise with the hives attitude and fall with the Raynaud's attitude. It was further hypothesized that, with stabilization of baseline hand temperature, clearer evidence of experimental manipulation could be provided. Finally, it was hypothesized that the order of presentation of the life event situations would

affect the accompanying changes in hand temperature.

Chapter 4

ANALYSIS OF DATA

The data concerning attitudes and their accompanying physiological changes were computed in terms of the following categories: (1) Group I (male students receiving two sets of instructions aimed at creating two specific attitudes); (2) Group II (male students receiving the same instructions as Group I in the reverse order); (3) Group III (control); (4) mean baseline hand temperature for each group; (5) mean hand temperature for the first intervention for each group; (6) mean hand temperature for the second intervention for each group; (7) mean hand temperature for the third intervention for each group; (8) mean hand temperature for the fourth intervention for each group.

Mean hand temperatures for baseline and for the four interventions were obtained by hand. The t-test for independent variables was used to determine the differences between mean hand temperatures for baseline sessions across groups. Differences in mean hand temperatures between baseline and the four interventions within groups were determined by t-tests for dependent variables. Significance for the proposed study was measured at the .05 level.

Questions to be Answered

The first question to be answered was: is there a significant difference between mean hand temperatures for baseline for Group I and Group II? The t-test score for these two measures can be found in

Table 1.

Table 1
Independent t-test Scores between Mean Hand Temperatures
for Baseline for Group I and Group II

	N	Mean	SD	t-test
Group I				
Baseline	5	90.09	9.93	.69
Group II				
Baseline	5	93.25	2.85	

A significant difference between the mean baseline hand temperatures for Group I and Group II was not found. Based on these findings, the null hypothesis for this question was retained. An extremely low mean hand temperature was recorded for one subject in Group I, accounting for the difference that did occur. The t-test for this hypothesis was significant at 2.306.

The second question to be answered was: is there a significant difference between mean hand temperatures for baseline and the first intervention for Group I? Table 2 contains the t-test score for these two measures.

Table 2
Dependent t-test Scores between Mean Hand Temperatures
for Baseline and the First Intervention for Group I

	N	Mean	SD	t-test
Group I Baseline	5	90.09	9.93	.93
Group I First Intervention	5	87.37		

No difference was significant between the mean baseline and first intervention hand temperatures for Group I. Therefore, the null hypothesis was retained. Table 3 shows that there was a cooling trend, although it was not statistically significant.

Table 3
Mean Hand Temperatures for Baseline and the Four
Interventions for Group I, Group II and Group III

	Group I	Group II	Group III
Baseline			
Sessions 1 and 2	90.086	93.254	89.631
First Intervention	87.3666 (A)	90.1078 (P)	93.7448
Second Intervention	88.3046 (P)	91.9828 (A)	93.0702
Third Intervention	89.8476 (A)	92.2338 (A)	93.0454
Fourth Intervention	90.2142 (P)	92.5246 (P)	92.8256

The third question to be answered was: is there a significant difference between the mean hand temperatures for baseline and the second intervention for Group I? The difference between these two measures of hand temperature can be found in Table 4.

Table 4
Dependent t-test Scores between Mean Hand Temperatures
for Baseline and the Second Intervention for Group I

	N	Mean	SD.	t-test
Group I Baseline	5	90.09	9.93	.83
Group I Second Intervention	5	88.30	10.59	

No significant difference was found between the mean hand temperatures for baseline and the second intervention for Group I. The null hypothesis was retained according to these findings. Table 3 shows that the mean hand temperature had begun to rise at the second intervention, but did not rise to a level at which the difference was statistically significant.

The fourth question to be answered was: is there a significant difference between the mean hand temperatures for baseline and the first intervention for Group II? Table 5 contains the differences between the mean baseline and second intervention hand temperatures.

Table 5

Dependent t-test Scores between Mean Hand Temperatures
for Baseline and the First Intervention for Group II

	N	Mean	SD	t-test
Group II Baseline	5	93.25	2.85	.57
Group II First Intervention	5	91.98	3.62	

A significant difference between the mean baseline and first intervention hand temperatures for Group II was not found. Based on the above findings, the null hypothesis was retained for this question.

The fifth question to be answered was: is there a significant difference between the mean hand temperatures for baseline and the second intervention for Group II? The t-test score for these two measures can be found in Table 6.

Table 6

Dependent t-test Scores between Mean Hand Temperatures
for Baseline and the Second Intervention for Group II

	N	Mean	SD	t-test
Group II Baseline	5	93.25	2.85	1.34
Group II Second Intervention	5	90.11	4.62	

Table 8

Dependent t-test Scores between Mean Hand Temperatures for
the First and the Second Interventions for Group II

	N	Mean	SD	t-test
Group II				
First Intervention	5	91.98	3.62	2.20
Group II				
Second Intervention	5	90.11	4.62	

A significant difference between the first and the second intervention hand temperatures for Group II was found. The null hypothesis for this question was rejected, based on these findings. The t-tests for hypotheses 2, 3, 4, 5, 6, 7 and 8 were significant at 2.132.

All hypotheses were tested at the .05 level of significance.

Summary

According to the findings of this study, mean baseline hand temperatures for Group I and Group II were not significantly different. The control of initial hand temperature in this investigation allowed for stabilization to occur and, thus, for a more reliable investigation of attitude and accompanying physiological state to be made.

The t-test for dependent variables was applied to determine the difference between mean baseline hand temperatures for baseline and the first intervention and for baseline and the second intervention for Group I. They did not differ significantly from one another in regards

to their cooling of hand temperature and warming of hand temperature, respectively, in response to the life event situations presented.

No significant differences were determined between mean hand temperatures for baseline and the first intervention and for baseline and the second intervention for Group II. Each of these two differences in response to the life event situations presented, i.e., warming of hand temperature and cooling of hand temperature, respectively, were not found to be significant.

Findings of this study indicated that the order of the presentation of the life event situations did significantly affect the accompanying changes in hand temperature for Group II. The differences between the first intervention (hives - passive) and the second intervention (Raynaud's disease - active) were found to be significant. This finding is not consistent with the suggestion of Graham, D. T., Stern and Winokur (1958) and the somewhat comparable procedures of Ax (1953).

Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

At the present a gap exists in the field of counseling with respect to knowledge of and interest in the physiological functions of human beings. Recent studies have attempted to give credence to the measurement of physiological responses as a reflection of inner states. In that attempt, researchers have explored the areas of specific attitudes and their accompanying physiological changes. The objective of this study was to determine whether or not a relationship existed between these two variables. Knowledge of this relationship could prove an aid to more effective counseling.

Fifteen male Montana State University students enrolled in Introductory Psychology 103 participated in three forty minute biofeedback laboratory sessions in which hand temperature was recorded as a response to the presentation of specific life event situations aimed at inducing specific attitudes. Differences between mean hand temperatures (a) within the three groups for each of the four interventions, and (b) among the three groups for the baseline measures were determined.

The review of literature has illustrated a wide range of thought regarding attitudes and their reflection in accompanying physiological functions. From this review it can be suggested that: (1) individuals' behaviors are understood in terms of their attitudes;

(2) attitudes are formed when people come into contact with stimuli in their environments; (3) a physiological response cannot be fully understood unless within the context of a person's total belief system; and (4) the conclusions that may be drawn from the literature on the coordinated study of emotional and physiological phenomena in individuals remain controversial and open to different interpretations.

The null hypotheses tested statistically were: (1) there was no significant difference between the mean hand temperatures for baseline for Group I and Group II; (2) there was no significant difference between the mean hand temperatures for baseline and the first intervention for Group I; (3) there was no significant difference between the mean hand temperatures for baseline and the second intervention for Group I; (4) there was no significant difference between the mean hand temperatures for baseline and the first intervention for Group II; (5) there was no significant difference between the mean hand temperatures for baseline and the second intervention for Group II; (6) there was no significant difference between the mean hand temperatures for the first and the second interventions for Group I; (7) there was no significant difference between the mean hand temperatures for the first and the second interventions for Group II. A t-test for independent variables was used to test hypothesis 1, above, and significance was noted at the .05 level. Differences were determined with a t-test for dependent variables for hypotheses 2, 3, 4, 5, 6 and 7, above, at the .05 level of

significance.

Findings showed no significant differences in mean baseline hand temperatures for Group I and Group II. Mean hand temperatures for baseline and the first intervention and for baseline and the second intervention for Group I did not differ significantly. No significant differences were determined between mean hand temperatures for baseline and the first intervention and for baseline and the second intervention for Group II. Finally, the order of the presentation of the life event situations did significantly affect the accompanying changes in hand temperature for Group II only.

Conclusions

1. The results of the statistical analysis of the data show that mean baseline hand temperatures for Group I and Group II were not significantly different; that is, although the amount of time necessary for stabilization of hand temperature is quite variable, subjects in this investigation showed stabilization within two forty minute baseline sessions.

2. The difference between the hand temperature responses to the two different life event situations presented was not statistically significant. The temperatures during the initial interventions for the attitude associated with hives (passive) and for the attitude associated with Raynaud's disease (active) did not reach points significantly different from the last control temperature. There were no significant

differences in physiological response between attitudes.

3. There is an apparent difference in hand temperature response to the change in order of presentation of life event situations. For the second treatment group, change in hand temperature upon presentation of the attitude associated with hives (passive) differ significantly from the change upon presentation of the attitude associated with Raynaud's disease (active).

Statistically, the results of the experiment are not in conformity with the predictions of the "specificity of attitude" hypothesis.

Recommendations

In order to better understand the effect of attitudes on physiological functions, several recommendations are offered here.

It is suggested that this study be duplicated with a different and larger sample. Of interest would be to determine whether or not the findings of the present study apply to other populations.

This study could be repeated with modification of the presentation of the life event situations aimed at inducing specific attitudes. Perhaps statistically significant differentiation in physiological response would be obtainable in the awakened state (i.e., without the use of hypnosis) if the situations were modified to elicit greater involvement of the subjects.

Further exploration of the consideration that different emotions have different and consistent physiological concomitants is also

recommended; that is, whether emotion can be defined in psychological terms independent of the physiological description in such a way that relations are found different for each emotion.

Finally, it is suggested that the "specificity of attitude" hypothesis be tested in light of the relevance of the total interpersonal setting within which the attitudes are experienced. This would add another dimension to and strengthen the understanding of all aspects of this complex relationship.

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APPENDIX

APPENDIX A

Protocol: Treatment - Group I

"We are going to create a situation for you. Try to use the words to form a picture in your mind. . . There are no right or wrong answers. Imagine that the situation is happening to you right now. . . Try to put yourself in the situation as it is being described to you. . ."

"Now just sit back and relax. We will continue in a few minutes."

10 minutes of baseline

First Intervention

"You see two people in a room, an office. They are sitting face-to-face. One of them is sitting behind a desk and the other is there to be interviewed for a job, which he desperately needs. The person behind the desk strikes a match and, for no apparent reason, burns the hand of the other person, which is you. It burns! You feel very much mistreated, very unfairly treated, and even though you need the job desperately, you slap the interviewer in the face and leave. All you can think about is how someone has hurt you."

4 minutes of relaxation

Second Intervention

"Again you see two people in a room, an office. They are sitting face-to-face. One of them is sitting behind a desk and the other is there to be interviewed for a job, which he desperately needs. The

person behind the desk strikes a match and, for no apparent reason, burns the hand of the other person, which is you. It burns! You feel very much mistreated, very unfairly treated, but you can't do a thing about it, since you need the job so desperately. All you can think about is how someone has hurt you and there is nothing you can do about it."

4 minutes of relaxation

"Now just sit back and relax. We will continue in a few minutes."

10 minutes of baseline

Third Intervention

"Two people are again sitting in an office, a professor's office. One is the professor and the other is you, his graduate student. You have just described your research proposal, which you spent a month researching and organizing. Other professors have said that the project is very interesting, very creative and an important advancement in your field. The professor looks at your proposal and then says, 'This looks very interesting and I'm sure you would get a great deal out of the research, but here's what you're going to do. . .' You're stunned! All you can think about is how unfair this is and how you would like to slap his face and leave, or strangle him or something."

4 minutes of relaxation

Fourth Intervention

"Two people are again sitting in an office, a professor's office. One is the professor and the other is you, his graduate student. You have just described your research proposal, which you spent a month researching and organizing. Other professors have said that the project is very interesting, very creative and an important advancement in your field. The professor looks at your proposal and then says, 'This looks very interesting and I'm sure you would get a great deal out of the research, but here's what you're going to do. . .' You're stunned! All you can think about is how unfair this is, and there's nothing you can do about it. All you can think about is what is happening to you and there is nothing you can do about it."

4 minutes of relaxation

"Now just sit back and relax. We will finish in a few minutes."