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PGR RATIO AND THE MMPI IR. AN EXPERIMENTAL
APPROACH AS TO HOW A PERSON HANDLES HIS EMOTIONS

by

Robert E. Hoene, S.J.

A Thesis Submitted to the Faculty of the Graduate
School of Loyola University in Partial
Fulfillment of the Requirements
for the Degree of
Master of Arts

January 1962

Robert E. Hoene, S.J., was born in Duluth, Minnesota, March 21, 1920. After three years of the pre-medical course at Marquette University, Milwaukee, he entered the novitiate of the Society of Jesus.

He spent the years 1944-1947 at St. Louis University, from which were granted the Master of Arts in Latin, and the Licentiate of Philosophy degree. For three years he gave himself to teaching, in St. John's College, Belize, British Honduras. Four years of theology came next, with the degree of Bachelor of Sacred Theology conferred. One final year of training in ascetical and pastoral theology followed; then a year as the assistant principal at Campion High School; two years spent in gaining a Master of Science degree in Biology at Marquette University; and two years of teaching chemistry and religion and acting as athletic director at Marquette U. High School.

During these years he was gaining the background study for work in psychology, especially through counselling, through the interviewing entailed in the Human Genetics research conducted for the Atomic Energy Commission and through co-operation with Dr. Raymond McCall of Marquette University in a research project.

He attended psychology courses at Marquette University part time; in the summer of 1960 he continued the work in psychology at Loyola University, and has acted as part-time lecturer.

TABLE OF CONTENTS

Chapter		Page
I.	INTRODUCTION	1
	Projected correlation of MMPI and PGR Test	
II.	THEORIES OF PERSONALITY AND METHODS OF MEASUREMENT	2
	Allport's views on personality, and summary of methods for measuring personality. Hall and Lindzey on various theories. Klubertanz's definition of theory. McClelland's personality variables. Eysenck's stratification theory. Gasson's hierarchical theory. Cleckley's dimensions of personality based on emotional characteristics. Arnold's discussion of personality research and characteristic ways of handling emotion; theory of brain function in emotion.	
III.	THE MMPI FACTOR OF INTERNALIZATION: REVIEW OF THE LITERATURE	20
	Description. Validity. Reliability. Anxiety Index. Assessment of emotional control: single dimensional approaches; configural approaches. Welsh's internalization ratio, and its use in research.	
IV.	THE HERR-KOBLE PGR TEST: REVIEW OF THE LITERATURE	29
	The use of PGR in research; apparatus and technique; theories of PGR function; unit of measure; variables; research in emotion, in voluntary control, in mental states, in personality testing.	
V.	THE PROBLEM: PURPOSE, METHOD, HYPOTHESIS	46
	Purpose, method, the Loyola psychogalvanometer, subjects, stimulus list, computation, hypothesis.	
VI.	PRELIMINARY EXPERIMENTATION	55
	Development of the PGR Ratio; Loyola investigation of PGR; study with women subjects in I.Q. and total PGR; questions raised concerning emotional control.	

TABLE OF CONTENTS

Chapter	Page
VII. THE MAIN EXPERIMENTATION: RESULTS	59
PGR Ratio analysis; Welsh Internalization Ratio of the MMPI; correlation of PGR Ratio scores with MMPI IR scores; hypothesis confirmed; other comparisons.	
VIII. CONCLUSION AND DISCUSSION	70
Why a negative correlation; why ES and AI not as apt; why the need of consistent theory; theory pertaining to PGR and MMPI IR.	
IX. SUMMARY	77
BIBLIOGRAPHY	79

LIST OF TABLES

Table	Page
1. Comparison of MMPI internalization ratio means and PGR ratio means of three studies	53
2. PGR R, MMPI IR and AI mean score of previous studies compared with the present study.	60
3. Scattergram correlation and rank correlation of IR and PGR R, with tests of significance.	62
4. Rank correlation of PGR R, AI and ES; with IR.	63
5. Correlation of a variety of measures with the PGR Ratio scores of twenty-two women.	64
6. Rank correlations of four studies based on mean response to the sixteen emotionally-toned words.	65
7. Subjects grouped by mean PGR ratio scores and correlated with two studies as to PGR mean response to sixteen words.	66
8. A comparison of the mean PGR values for the sixteen stimulus words as reported in four different studies. . .	67
9. Comparison of working girls with college women, showing similar configurations following similar IR's.	69

LIST OF FIGURES

Figure	Page
1. Allport's circular arrangement of methods for measuring personality.	3
2. Hall and Lindzey's dimensional comparison of theories of personality.	6
3. Graphic presentation of dimensions of abnormal personality based on ways of coping with difficulties (following Cleckley).	14
4. Diagram of circuits in the Loyola psychogalvanometer. .	49
5. Herr-Kobler (1953) comparison of mean and SD differences	109

CHAPTER I

INTRODUCTION

The purpose of this thesis is to seek correspondence between the MMPI, a standardized personality test of 566 statements, and the Herr-Kobler PGR Test. A relationship is suspected between MMPI and PGR since both aim at evaluating the deeper emotional strata of the total personality, yet few such correlations have been discovered up to the present time. If the connection between the two could be established, the vast research on both might be brought together. Again, it is hoped that through this PGR test being better standardized, its use during interview will make this preliminary "testing situation" of much greater diagnostic value. It has the advantage of directness and the cultivation of rapport, as well as being short (a half hour in length) and not too threatening. It may become a more precise means for the study of emotion and personality.

CHAPTER II

THEORIES OF PERSONALITY AND METHODS OF MEASUREMENT

In order to evaluate the results of this study, the context must be laid out. The broadest background is that of personality theory, while the foreground is colored with emotion and the way people characteristically handle their emotions. To speak of personality theory and the measure of personality first, Allport (1937) receives the foremost reference.

Defining personality, Allport says:

Another variant of definitions of this type (in terms of distinctiveness) is Woodworth's (1929). This author believes that every act of the individual is colored by personality. Personality is not substantive, it is adverbial; it is the style of life. 'Personality refers not to any particular sort of activity, such as talking, remembering, thinking or loving, but an individual can reveal his personality in the way he does any of these things.' . . . More helpful are those conceptions that ascribe to personality a solid organization of dispositions and sentiments. Valuable likewise are definitions that refer to the style of life, to modes of adaptation to one's surroundings, to progressive growth and development and to distinctiveness.

Allport's argument puts emphasis on the individual:

More important . . . are those movements arising within the broad province of psychology as a protest against the prevalent neglect of the individual. Each of these movements, in greater or less degree, has attempted to improve the situation, and has exerted marked influence: differential psychology, psychography, psychoanalysis, typology, Gestalt psychology, the psychology of Verstehen, purposive psychology, and personalistic psychology.

Regarding the measuring of personality (cf. Fig. 1), Allport says:

The circular arrangement is a convenient way of representing a

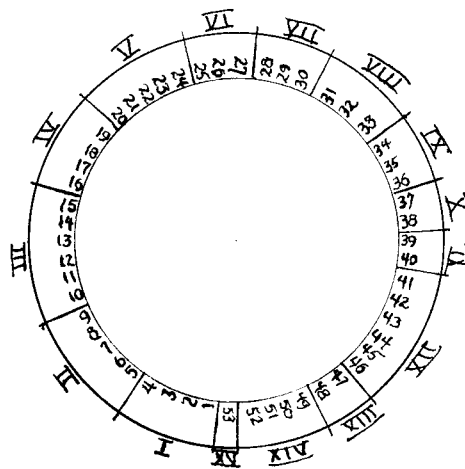


Fig. 1

- | | |
|-------------------------------------|--------------------------------------|
| I. Studies of Cultural Setting | VII. Standardized Tests |
| 1. analysis of social norms | 28. standardized questionnaires |
| 2. ethology | 29. psychometric scales |
| 3. syntactical analogy | 30. behavioral scales |
| 4. psycho-lexical analysis | VIII. Statistical Analysis |
| II. Physical Records | 31. differential psychology |
| 5. analysis of heredity | 32. factor analysis |
| 6. biochemical correlates | 33. inverted factor analysis |
| 7. endocrinology | IX. Miniature Life Situations |
| 8. constitutional types | 34. time-sample |
| 9. physiognomy | 35. vocational miniature |
| III. Social Records | 36. trap-situation |
| 10. documentary sources | X. Laboratory Experiments |
| 11. work analysis | 37. records of single functions |
| 12. time budget | 38. records of complex functions |
| 13. conduct frequency | XI. Prediction |
| 14. sociometrics | 39. explicit forecasting |
| 15. topological psychology | 40. forecasting of trends |
| IV. Personal Records | XII. Depth Analysis |
| 16. diaries | 41. psychiatric interview |
| 17. systematic guides to self-study | 42. free associations |
| 18. personal correspondence | 43. dream analysis |
| 19. thematic writing | 44. hypnotism |
| V. Expressive Movement | 45. automatic writing |
| 20. first impressions | 46. analysis of fantasies |
| 21. detailed analysis | XIII. Ideal Types |
| 22. pattern analysis | 47. schemata of comprehensibility |
| 23. graphology | 48. literary characterology |
| 24. style analysis | XIV. Synthetic Methods |
| VI. Rating | 49. identification |
| 25. rank order scale | 50. matching |
| 26. scoring scale | 51. complete psychological interview |
| 27. psychography | 52. case study |
| | XV. Common Sense "Intuition" |

Figure 1. Allport's Circular Arrangements.

rough continuum of methods ranging from those that are, generally speaking, external to the person to those that are internal, and at the same time differentiating those that deal with partial records of behavior from those concerned with the homogeneity and congruence of the personality as a whole. No strict logic of progression is implied, but it seems convenient to list the methods under fourteen main rubrics, proceeding roughly in the order just described: (1) studies of cultural setting; (2) physical records; (3) social records; (4) personal records; (5) expressive movement; (6) ratings; (7) standardized tests; (8) statistical analysis; (9) miniature life-situations; (10) laboratory experiments; (11) prediction; (12) depth analysis; (13) ideal types; (14) synthetic methods.

Hall and Lindzey (1957) approach the study of personality according to the following outlines:

The Nature of Personality Theory

1. Personality theory has occupied a dissident role in the development of psychology.
2. Personality theories are functional in their orientation.
3. Personality theorists assign a crucial role to the motivational process.
4. An adequate understanding of human behavior will evolve only from the study of the whole person.
5. One of the most distinctive features of personality theory is its function as an integrative theory.

Clearly, personality theories . . . are general theories of behavior.

The Comparison of Theories of Personality

A. Formal Attributes

1. clarity and explicitness
2. how well the theory is related to empirical phenomena
3. what empirical research is generated by the theory

B. Substantive Attributes

1. purposive or teleological qualities
2. unconscious determinants of behavior
3. hedonism, reward, or effect
4. principle of association
5. learning process
6. acquisitions of personality
7. hereditary factors
8. early developmental experiences
9. continuity or discontinuity
10. holistic principles: organismic position: field emphasis

11. uniqueness
12. psychological environment
13. self-concept
14. group membership determinants
15. interdisciplinary anchoring
16. the number of motivational concepts

Hall and Lindzey build a chart for comparison of various personality theories (cf. Fig. 2).

At the end of the treatise on personality theory, Hall and Lindzey ask this important question:

Would it not be better to provide a single viewpoint which incorporated all that was good and effective from each of these theories so that we could then embrace a single theory which would be accepted by all investigators working in this area?

One of the answers, forming the final paragraph of their book, includes their view on what it is we are doing when we theorize. It is quoted here to show the very common view on theory and its role in scientific research:

It is our strong conviction, then, that this is not the appropriate time or circumstance for an attempted synthesis or integration of personality theories. In simplest terms we feel that it is unwise to attempt a synthesis of theories whose empirical utility remains largely undemonstrated. Why make a conceptual arrangement in terms of aesthetic reaction and internal consistency when the important issue is how these elements fare in the face of empirical data? Far more fruitful, we believe, than any attempt at a master theory is the careful development and specification of a single existing theory with simultaneous attention to relevant empirical data. The ultimate answer to any theoretical issue lies in well-controlled empirical data, and the nature of such data will be adequately defined only as the theories themselves are better developed. It is one thing to change a theory in the light of empirical data which force upon the theorist some essential change, and quite another to change a theory because of some conflicting rational or evaluative issue. Our faith is that almost any theory if it is systematically extended and coupled with extensive empirical research offers greater

Theory	Name	Purpose	Unconscious Determinants	Reward	Contiguity	Learning Process	Personality Structure	Heredity	Early Developmental Exp.	Continuity of Development	Organismic Emphasis	Field Emphasis	Uniqueness	Psychological Environment	Self Concept	Group Membership Determinants	(Interdisciplinary-Biology	(Emphasis-Social Science	Multiplicity of Motives	Stimulus to Research
Psychoanalytic	Freud	H	H	H	M	L	H	H	H	H	M	L	M	H	M	L	H	M	L	H
Analytic	Jung	H	H	M	L	L	H	H	M	L	L	L	M	M	L	H	L	M	M	
Individual Psychology	Adler	H	M	L	L	L	M	H	H	H	M	H	H	H	H	M	H	L	L	
Basic Anxiety	Horney	H	H	M	L	M	M	L	M	M	M	M	M	H	H	L	H	L	L	
Man's Needs	Fromm	H	M	M	L	M	M	M	M	M	M	M	M	M	H	L	H	L	L	
Inter-personal Relations	Sullivan	H	M	M	H	M	M	M	H	H	H	M	H	H	H	M	H	M	M	
Field	Lewin	H	L	M	L	M	M	L	L	L	L	H	H	H	M	H	L	M	H	
Psychology of the Individual	Allport	H	L	L	M	M	H	M	L	L	H	L	H	M	H	L	H	L	H	
Personality	Murray	H	H	M	L	L	H	M	H	H	H	M	H	M	M	H	H	H	M	
Constitutional	Sheldon	L	M	L	L	L	H	H	L	H	H	L	H	L	L	L	H	L	L	
Dimensions	Eysenck	L	L	M	L	L	H	H	L	M	L	L	L	L	L	L	M	L	L	
Traits	Catell	M	M	H	M	H	H	M	M	L	L	M	L	H	M	H	L	H	M	
Organismic	Angyal	H	M	L	L	M	H	M	L	H	H	M	L	H	H	L	M	L	L	
Organismic	Goldstein	H	L	L	L	M	L	M	L	L	H	M	L	H	H	L	H	L	L	
Self	Rogers	H	M	L	L	M	L	L	L	M	H	M	M	H	H	M	L	L	L	
Bio-Social	Murphy	H	M	H	H	H	H	H	H	H	H	M	M	M	H	H	H	H	M	
Stimulus-Response	Miller & Dollard	L	M	H	M	H	L	L	H	H	L	L	L	L	L	M	M	H	M	

key: H=high (emphasized) M=moderate L=low (de-emphasized)

DIMENSIONAL COMPARISON OF THEORIES OF PERSONALITY (Hall & Lindzey, p. 548) Figure 2.

hope for advance than an amalgamation of existing theories some of which are poorly stated and precariously related to empirical data.

One could comment that an amalgamation would be ridiculous, especially when some of the theories are lacking in internal consistency. But the inability to amalgamate should not deter us from constructing an overall of "master theory". It just happens, as Hall and Lindzey themselves point out, that one theory is not as "good" as another. Then why not work towards an overall theory, rather than select just "any one". It seems more in keeping with the nature of scientific endeavor. In fact, this is the intent of theorizing.

Klubertanz (1955) clearly outlines what we do in formulating theory, and why it is important:

Note the nature of scientific theory. It does not arise from facts distinct from those which give rise to the laws. The process is not one of generalization, even though a theory always is very general and inclusive. Nor is the theory induced from the facts or the laws. It is constructed and imposed on the laws and facts. First of all, a theory is the product of creative imagination. . . This image or model was then employed to unify the various facts and laws already known about . . . The theory had to be internally consistent. . . Without consistency a theory cannot even be conceived as a possible explanation. In addition to internal consistency, three relations are necessary.

- (1) The theory must take account of all the relevant data and laws.
- (2) Its relation to experience and/or experiment has to be able to be clearly pointed out (the "epistemic relation" of Margenau.)
- (3) It has to be fruitful, in the sense that it can suggest new observations and experiments, and predict results.

. . . We can derive a notion of the nature and function of a

scientific theory. A scientific theory is a rational explanation of observed fact, such that, if the theory be granted, the data follow by way of logically necessary implication. This explanation may be a model which is drawn from other areas (of experience or reason), an abstract symbol, an operational definition, or a real trait selected as a clue to other characteristics. These "explanatory" factors are considered by the mind to be the originating source of the observed behavior, experimental results, classifiable similarities, etc. The purpose of such a constructed factor is to provide an intelligible explanation, to unify large masses of data, and to stimulate and predict.

. . . Consequently, "theory" in science does not always have one and only one relation to reality. Most scientific theories would have to be divided into purely constructural, hypothetical, and descriptive elements for an accurate epistemological evaluation. We should therefore most correctly speak of a scientific theory as "good" or "successful" rather than "true." If we must speak of the "truth" of a theory, we must change the meaning of the term true, so that it means "helpful in understanding, related to the facts, internally coherent, inclusive of all pertinent facts and laws, coherent with related theories, fruitful of new experiments, and verified by fulfilled predictions.

The contention of this thesis, then, is that the theory chosen makes a difference. In fact, it is in the framework of the theory that the hypothesis is set up. Were it not for the theorizing that went into the construction of the MMPI and the PGR Tests, these would not be considered "personality" tests nor would they have any bearing on emotion. Were it not for a theory which would allow a hypothetical relationship between a self-inventory and a physiologically-measured response in word-association, this present thesis would not have been envisioned. Had it not been judged that some theories of emotion were no "good," and that we do have a great deal of research behind us, the hypothesis of a relationship between specific emotional measures on MMPI and PGR Tests simply would not have been formulated. Hall and Lindzey give a

relatively pessimistic view of the status of personality theory today. The application of Klubertanz's criteria would give us a much more clear cut path to follow, a more sure estimate of the "goodness" of the theory we are using as we go about our research of human personality. It makes a big difference whether Freudian views, for example, are followed, or whether one holds a hierarchical theory. It is not the purpose of this thesis to show the difference, but it could be shown. Cleckley (1960) and Arnold (1960) have handled the question, and here it might be worth while to mention that the Freudian factor of "anxiety" was one hypothetical construct which has caused some obscurity in the area of the present research problem.

Another approach to personality study and theory is that of McClelland (1956). He lists three variables:

- (1) motives mentioned by Sanford and Bellak.
- (2) schemas mentioned by Mead.
- (3) traits mentioned by Cattell and Klein.

According to McClelland, motivation is used to define the why of behavior; schema (ideas and values) is used to account for the what or content-dimension of mind; and trait is used to describe how people adapt consistently to similar situations. In reconciling the inconsistencies which he finds among the views of the various authors and in integrating the three basic variables used to describe personality, McClelland has, in the process, set forth his own views of understanding personality.

It may be worthwhile to mention something of what McClelland has said regarding traits:

Furthermore the first child may generalize his smiling behavior and become generally emotionally expressive, whereas the second child may continue to be relatively inhibited, so that in time one may speak of a trait of 'expressive versus inhibited emotional expression.'

From the imaginary example, it is evident that the learning of traits may begin quite early, sometimes even earlier than the learning of motives or schemas; but on the other hand, traits probably take longer to mature and to become the stable modes of adjustment they are in adulthood: the learning seems to continue over a longer period of time so that the traits become increasingly strong and increasingly broad as the person grows older. Probably the only justification at all for stating that traits are learned later lies in the fact that they may reach their mature or stable form somewhat later than motives or schemas although, of course, some schemas, such as those included in the philosophy of life, may also mature very late. Thus, expressive traits, such as shyness and "emotional openness", may be laid down in early childhood, whereas others, like neatness, may be acquired at school age, and still others, like participation in community affairs, may not appear till adulthood."

His definition of trait is interesting: "A trait is the learned tendency of an individual to react as he has reacted more or less successfully in the past in similar situations when similarly motivated."

Eysenck (1960), leaving behind his earlier system as related in Hall and Lindzey (1957), and discussing "levels of personality, constitutional factors, and social influences", integrates constitutional factors, learning theory and personality theory into a stratified system in which there are four main levels, all conceived as being causally related to each other in hierarchical order.

Level 1, the most fundamental, is physiologically determined;

refers to some constitutional property of the individual's nervous system.

Level 2, is that of observable experimental (laboratory) phenomena, such as eyeblink conditioning or figural after-effects.

Level 3, is that of objectively observable primary personality traits, such as sociability and activity.

Level 4, is that of observable attitudinal phenomena, such as ethnocentrism and hedonism.

This formulation of Eysenck points towards that hierarchical system indicated in the next paragraphs.

For a succinct summary of a personality theory which will be useful for the assessment of MMPI and PGR test results, and from which questions may be drawn for the examining of possible relationships, Gasson's (1954) contribution stands forth:

We have endeavored to work out a theory which is comprehensive and will apply to the behavior of ordinary human beings who are psychologically well, though it also provides some account of the behavior of persons who are psychologically not well. Our primary hypothesis has been that powers and capacities of the human being are natively designed to work in harmony and order to bring the person to that condition of development and self-realization that is proper to each single individual; second, that these powers are active in character and are not merely components of a passive reactive system; and third, that the human being is self-determined and must attain the goal of perfect self-actualization by deliberate control and direction of himself and his activities. We did not adopt these hypotheses arbitrarily. They are the result of scientific observation, personal and historical, of human beings in action.

He begins the formulation:

. . . by making explicit the concepts that comprise our basic

systematic outlook. . . Our first postulate is that of epistemological realism, a moderate and immediate realism. . . we can find it justified elsewhere and so need not establish its validity here. . . Our second . . . is that the person is an original unit; that is, a single undivided substance, distinct from other substantial units in the universe. . . Third, we maintain that the human person is different in kind from other living organisms, not merely more complicated or more highly differentiated. . . We suppose, then, that there is an essential difference between spontaneity and self-determination . . . Lastly, we assume that the lower orders of organization are present in higher organisms virtually but not actually or formally.

Summary of Major Theoretical Propositions.

1. Psychologically, personality is the patterned totality of human powers, activities, and habits, uniquely organized by the person in the active pursuit of his self-ideal, and revealed in his behavior.
2. The capacities or powers of a human being are hierarchical and active in nature; upon presentation of their specific object, they are capable of initiating action.
3. The active nature of these powers impels and urges the person (when the necessary conditions are provided) not only to be active in pursuing their specific objectives but also to do so in an ordered and coordinated way. The function and nature of impulse and urge are unconscious, though they can become known by formal reflection and reasoning.
4. Human powers have a bimodal way of natural action: toward possession of external reality, and toward actuation of the self by stabilizing possessions; hence in their integrated action they constitute a natural tendency in the person toward possession and toward self-actuation in possession.
5. The prime factor in integrated action is the will, or the capacity of self-determined action. Like the other capacities, it has a natural and unconscious way of acting. For fully integrated personality, there must be active and deliberate ordering not only of concrete actions but also of the total behavior pattern.
6. The rationale of this order is the self-ideal.
7. For proper integration, the self-ideal as it is must approximate closely the self-ideal as it ought to be for any given individual; if it does not, there will be internal disturbance which may be called conflict.
8. The externally perceptible organization of a person's activities, habits and powers, as they go toward a self-ideal, is called the personality structure.

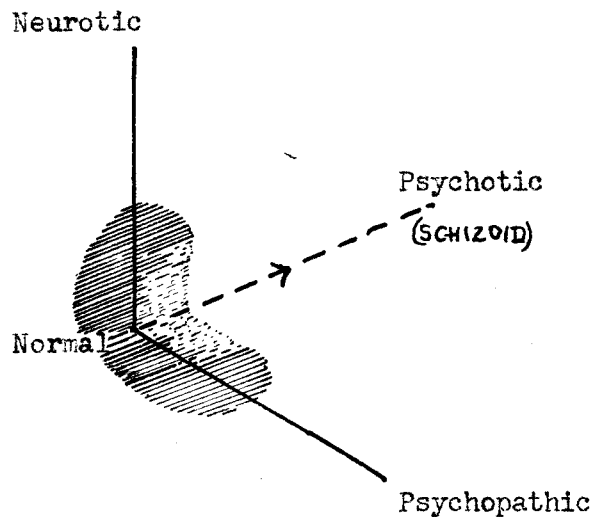
9. At the root of this structure there is unity, not conflict. Impulse, heightened to urge, makes it possible for the person to deal with a difficulty, whether internal or external.

10. Conflict arises from inconsistent choice, or from incompatibility of the chosen goal with the natural order of things. This incompatibility may not be recognized, or it may be recognized but not connected with the disturbance. Only in this sense can psychological conflict be called unconscious.

Having talked of personality and an overall definition and having outlined a theory which appears suitable, it may be well to speak of the classifications of personalities as seen in the world today. A possibility of laying out a three dimensional scheme, with the "normal" personality in the large central area, occurs to this writer through a summary of Cleckley (1960). This formulation does not differ greatly from Welsh's (1952) proposal for measuring "internalization."

In the American Handbook of Psychiatry, Cleckley has given a clear picture of the psychopath, and at the end of his article he lays down this three-fold classification:

If means became available of obtaining adequate control over psychopaths who plainly show themselves not fitted for unrestricted freedom in the social group, it would be possible to set up facilities specifically designed to deal with their problems. Our large state and federal psychiatric institutions, organized for the treatment of patients psychotic in the traditional sense, are not well adapted to handle the psychopath. The numerous private hospitals primarily designed for the needs of psychoneurotic patients lack the means of restraining him and are unable to deal adequately with the problems he creates. The establishment of institutions primarily for psychopaths would not be advisable until legal means of controlling them are available. The expense of building and operating specialized institutions of this sort would be large. There is good reason to believe, however, that it would be far less than what the psychopath is costing the public today.



Cleckley's Dimensions Fig. 3

To enumerate some of the particular factors at work in the person's emotions during the Herr-Kobler PGR test or as described in the MMPI's "true" and "false", the suggestions of Arnold (1960) under the heading of Research and Measurement Problems are most pointed. In the discussion of emotion and personality she is dealing with physiological indicators of emotion:

To correlate physiological changes with the emotion, we must either distinguish carefully between effect and reaction by repeated measurement during and after the emotion (done in the Herr-Kobler PGR Test), or we must use as many physiological indices as feasible and show the total interlocking pattern of changes as they occur during emotion. . . The most promising examples of the second type of measurement are the studies of Funkenstein, King and Drolette (1953), and of Ax (1951). . . These investigators measured a number of physiological changes during "anger out" (anger), "anger in" (self-blame), and "anxiety" (fear). These were genuine emotions aroused when the subjects found themselves unable to solve a series of difficult problems and the experimenter berated them for their poor performance. The physiological changes included changes in heart rate, ballistocardiogram, blood pressure, finger and face temperature, and the like. There was

a clearly different pattern of physiological changes in each of the three emotions. "Anger in" showed the same changes as "anxiety", only in milder form, while "anger out" showed changes in the opposite direction. Since some of the men characteristically reacted to ambiguous situations with anger while others tended to blame themselves and still others became apprehensive, these studies also demonstrate that there are habitual patterns of emotional reaction that are characteristic for a given individual. The typical reaction of neurotics was fear ("anxiety").

It is interesting to note in passing that the anxiety and anger-in showed the same changes, so that one might consider the results pointing to two extremes, anger-in and anger-out, with anxiety adding to the anger-in extreme, or running in conjunction with self-blame.

In the section on Psychological Research Related to Emotion, Arnold continues:

Since emotions influence rational appraisal and action, the judgment a person makes and the attitudes he develops will include emotional factors: personality tests of various kinds will tap emotional differences. But the individual differences in the emotions described or expressed will necessarily be less important for personality evaluation than the way in which they are integrated into action. It is not nearly so important to discover whether a man feels anger or fear or love than it is to find out what arouses his ire, what makes him afraid, and what kindles his enthusiasm; and finally, to see to what actions these emotions inspire him. Such data can be obtained through questionnaire methods, like the MMPI or the Bell adjustment tests, which are sufficiently accurate for diagnosis of maladjustment or neurosis. But to predict and, still better, to understand an individual's actions, to discover the motives behind his actions, projective tests are far more adequate.

Some of the power of the projective test, and some of the insight into how a person behaves, can come through the MMPI used in conjunction with the Herr-Kobler PGR Test. What Arnold has to say of emotion and the TAT can be applied to this two-fold battery, it is hoped:

- (1) The only possibility left is that the storyteller reviews various

actions in imagination; and that he agrees with or approves those that are rewarded in the story or have a favorable outcome, and disagrees with or disapproves those actions that are punished or lead to misfortune and difficulty.

(2) When Mussen and Naylor (1954) compared belligerent and mild-mannered boys, they found that the former told many stories of aggression and few in which aggression was punished. The well-behaved boys had few aggressive themes and many stories in which aggression was punished. Apparently, the aggressive boys told stories in which hostile and belligerent heroes neither were punished nor came to a bad end. It is not surprising that a boy who tells such stories expects to get away with his own malicious and aggressive actions. His "acting out" is the result of his expectation, betrayed in the story import, that violence will go scot-free.

Something of the "life situation" of the subject comes through in the Ratios run, IR of MMPI and R of the Herr-Kobler PGR. Arnold's sequence analysis of the TAT especially emphasizes this:

In the TAT sequence analysis, each story is summed up in the import, i. e., what the storyteller is saying about his life situation. This is a simple condensation of the moral of the story, without any interpretation. Each import, as indicated by story and outcome, may be either constructive or not constructive. It is constructive when the story import indicates that achievement is the result of effort, initiative, virtue or the outcome of a definite plan that accepts limitation and adapts to circumstances; when loss, harm or danger is overcome by positive action; when ill-intentioned action is punished, rejected or renounced; when others are met with good will, good fellowship or humor.

The emotions that occur in the story seem to have been conquered when negative (e.g. fear, anger, resentment, discouragement) and fostered when positive (e.g. love, humor, cheerfulness). It is a reasonable assumption that stories which express such constructive attitudes are told by people who really have such attitudes. It would follow that they have developed habits of self-discipline which make it possible for them to achieve. . .

The sequence analysis gives us a picture of a man's motivational pattern, his self-ideal in action. Thus it can be used to predict whether he will act constructively or not. The sequence analysis will also show areas of conflict where firm con-

victions have not yet been formed. The normal person will reveal in the sequence analysis how he is ordering his life, not merely what are the raw materials that are so ordered. In the neurotic, the sequence analysis shows the preoccupation with particular areas of conflict, and in the psychotic, the difficulty, even the impossibility, of acting effectively. It is a moot point whether a 'deeper' analysis will improve prediction. What does it profit us to know the emotions that harass a man if we are unable to tell whether he is their plaything or their master?

In dealing with research of Eriksen (1951a, 1951b, 1952, 1955), of Lazarus, Eriksen and Fonda (1951), and of Aronfreed, Messick and Dizzory (1953), concerning sensitizers (intellectualizers) and defenders, Arnold concludes:

Perceptual sensitization seems to reveal an interest in the crucial area while perceptual defense seems to imply a lack of interest, dislike or fear. . . . Granted that defense and sensitization are two different mechanisms and stem from a different origin, the real problem remains: How can fear delay recognition and interest hasten it? Ordinarily, something must be recognized before it can be either liked or disliked. Some theorists have suggested "pre-recognition" or "subception," meaning an unconscious recognition which may be either admitted to awareness immediately or detoured and delayed. But to say that the recognition is unconscious does not explain why it is either speeded into awareness or delayed.

Arnold then launches into a simpler explanation which appears to be as good a theory as can be found for sensitization and defense, or for externalization and internalization, or for the positive impulsives and the "fast negatives" of the PGR test:

On the basis of our discussion of brain function we can offer a simpler explanation. Our discussion of emotion has shown that we not only see something but appraise it as good or bad and thus like or dislike it. We also appraise it for action. This intuitive appraisal initiates an impulse to action that is mediated by the action circuit; when neural relays via this circuit reach the premotor and prefrontal areas (areas 6 & 8), we experience an impulse to action. The action circuit also relays neural impulses to the motor cortex initiating emotional expression and physio-

logical (autonomic) changes; it connects with the diffuse thalamic system and so modifies the electrical activity of the brain during emotion. Fear reduces the alpha index and produces low amplitude fast beta waves. From experience we know that fear retards mental processes. From the fact that it superimposes its fast frequency gradually upon the whole cortex we gather that such retardation seems to be the effect of its interference with normal electrical activity.

The sensory impulses from the retina are registered no matter what a man's feelings are: there is an electrical deflection in the sensory cortex on stimulation even during anesthesia. But seeing or recognizing something requires more than sheer registration; it requires a vital reaction, namely, the experience of seeing, remembering, and appraising, mediated via the circuit from sensory cortical areas to hippocampus, amygdala, association cortex, and limbic system.

We have argued that every emotion leaves us with the expectation that similar situations will affect us similarly. Thinking and daydreaming about a particular topic is bound to strengthen this expectation, while fear and aversion have the opposite effect. The latter create a disposition to turn away from any topic that may become dangerous. When pictures of scenes are shown that either arouse interest or threaten harm, they are identified by remembering similar scenes that have had a similar effect. The intuitive appraisal that this is interesting or dangerous is based on the expectation that this scene, resembling pleasurable or dangerous situations in the past, will affect us in the same way. "Precognition" seems to be the intuitive judgment that here is something that is either wanted or feared. If it is wanted, the self-initiated process of exact identification is accelerated and the picture or word is recognized. If it is feared, the emotion (or rather, its effect on brain activity) interferes with the process of recognition. Thus we assume that the memory of weal or woe serves for a first approximate recognition and appraisal, which either helps or hinders the final identification. . . . At any rate, it becomes clear that in this type of research a careful analysis of the subjective state of "sensitizers" and "defenders" (or whatever we may choose to call the two groups of people) is essential before we can come to any satisfactory explanation of these two types of reaction. If fear interferes directly with mental (and brain) activity, as seems likely from our evidence, it is unnecessary to postulate repression as a defensive mechanism. If interest and liking facilitate such activity, perceptual sensitization cannot be called a defense.

This evidence on personality theory and its measure and this theory of emotion as delineated by Arnold conclude Chapter II.

CHAPTER III

THE MMPI FACTOR OF INTERNALIZATION: REVIEW OF THE LITERATURE

The MMPI is one of the most widely accepted paper and pencil tests of personality in use today. Anastasi (1954) calls it "a major event in the recent history of personality testing."

The Minnesota Multiphasic Personality Inventory (MMPI) is designed to provide an objective assessment of some of the major personality characteristics that affect personal and social adjustment. The carefully constructed and cross-validated scales provide a means for measuring the personality status of literate adolescents and adults together with a basis for evaluating the acceptability and dependability of each test record. Nine scales were originally developed for clinical use of the test and were named for the abnormal conditions on which their construction was based. Since they have been shown to have meaning within the normal range of behavior, these scales have now come to be referred to by their abbreviations: Hs (hypochondriasis); D (depression); Hy (hysteria); Pd (psychopathic deviate); Mf (masculinity-femininity); Pa (paranoia); Pt (psychasthenia); Sc (schizophrenia); and Ma (hypomania); or by their code numbers (1-9) to avoid possibly misleading connotations. A large number of other scales have subsequently been developed from the same test items: Si (social introversion) is one that is commonly scored. There are also three validating scales: L (lie); F (validity); and K (correction).

Care must be exercised to maintain the appropriate test conditions. So long as the test is introduced as neither a threat nor a diversion, even adolescents, sophisticated military personnel, and hardened criminals can be expected to respond well to the group administration of the MMPI. The experience of Hathaway and Monachesi (1957) shows that large groups of ninth-grade children, sometimes several hundred at a time, can be given the MMPI without a single significant difficulty. They attribute a great deal of their success in testing thousands of children to careful preparatory work with responsible teachers and other school officials and to the professional and competent bearing of the examiners.

The source of most of the evidence for the validity of the MMPI has been its agreement with final clinical diagnosis of new psychiatric admissions. The agreement has been in terms of various kinds of clinic cases, which is a result more difficult to achieve than simple classification as to normal or abnormal. Even where a high score on the MMPI was not followed by a corresponding diagnosis, there was evidence that the trait was present to an abnormal degree.

The authors of the Manual of the MMPI (1951) report reliabilities, for both normal and abnormal adults which range from the fifties to the low nineties. But a study of the split half reliabilities of college students reports lower coefficients. The following are the coefficients listed: Hs, .78; D, .58; Hy, .47; Pd, .46; Mf, .73; Pa, -.05; Pt, .81; Sc, .79; Ma, .55.

This casts doubt upon the present suitability of the individual

categories of the MMPI for differential diagnosis. Wheeler, Little and Lehner (1951), summarizing the results of a factor analysis of the MMPI categories, report that the goal of using the MMPI for measuring specific clinical syndromes has not been achieved.

One distinct factor, according to these authors, was the so-called "neurotic triad" (hypochondriasis, depression and hysteria). Clinically, many workers use these three scales in combination for better diagnosis. Ruesch (1945) has used the mean of the neurotic triad as a neurotic score, in an attempt to derive a more objective measure. Welsh (1952), in a study on anxiety diagnosis, found that anxiety neurotics were high in the neurotic triad, with a peak on the D scale, and a secondary peak on the Pt scale. Therefore, in order to take this into account and better diagnose different degrees of severity of anxiety, he developed an anxiety index:

$$AI = \frac{Hs + D + Hy}{3} (D + Pt) - (Hs + Hy)$$

or

$$AI = 1.33 D + Pt - .66 Hs - .66 Hy$$

The Herr-Kobler Test must be measuring something basic in personality, just as Woodworth said PGR seemed to be tapping. The task would be to find an index for the MMPI similarly measuring something basic in personality, and this across a continuous range in various persons. The authors of The MMPI Handbook (1960) allude to the many

attempts to get at "a single, pervasive characteristic of personality" through various scales applied to the MMPI. The "Assessment of Emotional Control" forming the 10th chapter of the Handbook, under Part III, Clinical Applications, presents this introduction:

The concept of a single, pervasive characteristic of personality that furnishes strength in the face of temptation, stability under external and internal stressors, or control over conflicting impulses to action has long been used by personality theorists to account for the vast differences that are found in individual tolerance and integration. Whether it is called will power, character, general normality, ego strength, self-consistency, radix, biosphere, regnancy, or self-actualization, the view that a person's stability over time and across situations stems from a single organizing process keeps reappearing in psychological theories. Several of these constructs have been used, together with their nomological networks, in deriving MMPI indices of integration and control.

The Handbook authors discuss a series of scales which attempt to make some measure of a single organizing process. Of these, "one other scale, Barron's (1953) ego strength (Es) has been developed empirically for this general problem. Barron's criterion was response to treatment; his item analysis identified the pretreatment attributes that bore some relationship to the degree of improvement the subjects showed after individual psychotherapy. These items were assumed to be indicative of difference in strength of ego structure." Summing up the "single dimensional approaches," they say:

Since scores on the A scale (Welsh, 1956) are closely related to Es score values, perhaps the combination of A and R (Welsh, 1956) would give all the information provided by the Es scores. This remains to be tested by direct empirical study, however, based on detailed personality descriptions. At present, the best single index of control within the MMPI seems to be the Es scale.

The subject next taken up in The Handbook is that of "Configural Approaches," and first mentioned is Welsh's internalization ratio, IR (Welsh, 1952.) He wanted to evaluate:

Tendencies on the one hand to internalize difficulties and to suffer distress, somatic symptoms, and self-excoriation, and on the other hand to externalize problems by acting out, projecting and disowning. His index gives a theoretical value of 1.00 for normals, with lower values indicative of poor control and direct, overt expression of emotional difficulties. (pps. 303-304, Handbook).

The Handbook comes to this conclusion in the general section:

As the findings of future research accumulate, it will probably become apparent that different impulses are controlled by separate personality processes, rather than by any single, pervasive self-structure. The material reviewed in the next several sections has been brought together to show evidence available on such a formulation of control (judgment, control of hostility, control of sexuality, suicide, addiction, control of delinquency, and criminality.) In addition, the basis within the MMPI for judging the specific way that loss of emotional control may be shown by a particular patient will be described. Even though the controlling process may be seen as unitary and multifaceted, a breakdown in its effectiveness would not necessarily lead to poor control in all areas of emotional expression. Rather, the first break in self-maintenance may be related to the relative strength of impulse in the different emotional areas. The material in the following sections should be pertinent to either general formulation of personality. (p. 306)

The evaluation of the IR by The Handbook at this point is surprisingly nonchalant, but in other sections its use in research takes on importance. Cattell (1936) made this hypothesis: "The deflection (in PGR) is proportional to the act of suppression which the ego finds it necessary to exercise upon the impulse aroused. The psychogalvanometer can therefore be used as a measure of the strength of impulses,

of will acts, and of the conflict between them" (p. 265) The Handbook in turn says of repression:

A better approach to this problem of sensitization and repression would seem to be either through the use of Welsh's A and R factor scales, or through the Ad and Dn subscales on scales 3. Truax (1957) in a footnote to his study of Hy-Pt observed that Ad contributed 53 per cent of the Hy score for the sensitizers but only 6 per cent of the Hy score for the repressors. Van de Castle (1958) has shown that a conjoint use of A and R scales gave dependable separations consistent with the sensitization-repression formulation of perception of aggressive verbal material. For his sensitizer group he picked subjects with high A and low R scores; the repressors came from the diagonal quadrant, high R and low A values. . . . An attempt was made by Obrist (1958b) to demonstrate a relationship between sensitization-repression, as reflected in a composite scale formed by scales 3, 7, K, and Welsh's A and R, and subception, or autonomic discrimination without awareness. His research design involved excellent procedural controls and he found that he was unable to detect any subception effect. As in a previous study by Obrist (1958a), no relationship between psychogalvanic conditioning and sensitization could be demonstrated either.

Apfelbaum and Sherriffs (1954) found that subjects high on Welsh's A scale tended to rate the experiences they recalled under various experimental conditionings as significantly more unpleasant than low scorers. On the other hand, subjects who had an IR index in the externalization direction recalled appreciably more pleasant experiences, especially when instructed to describe the mood at the time of the experience rather than merely how they felt about the recalled material now. In a different experimental procedure in which the success or failure of the subject was explicitly known, Christine Miller (1954) found that some MMPI variables were related to the tendencies to recall predominantly successful or unsuccessful instances. In a group comparison, a high score on scale 9 was related to the tendency of the subjects to recall the items on which they had scored successes. The externalizers on IR also more generally recalled the successes while the internalizers gave significantly more failure recollections.

Renzaglia (1952) noticed persons with lower self-evaluations than the general self-description that was typical for college students had

more aberrant Welsh AI and IR values. This relationship to AI and IR was also found for those who had the largest discrepancies between self-description and self-denial characterization.

In other research, Warn (1958) found tuberculous and epileptic groups score higher on dependency than the paraplegics and controls; the latter groups could not be significantly separated. He also found a relationship between the development of dependency patterns and elevated anxiety values and internalized defenses. Pumroy and Kogan (1958) attempted to evaluate the accuracy of the Ps scale, as well as Welsh's AI and IR indices and Pearson's signs, in predicting the response of male V.A. cases to EST.

Finally, experimentation summarized under "Analysis of symptom formation: psychosomatic relationships" in The Handbook mentions Welsh's IR and something of PGR:

In the face of the severe limitations on the experimental approaches to these problems, many workers have resorted to correlational studies in which not all the variations are produced deliberately but some are merely noted in the group and collated with other measures. Thus Brower (1947b, 1948) has combined correlational and experimental manipulations in his study of cardiovascular changes. Factor-analytic exploration of the intercorrelations between various MMPI measures, experimentally produced indices of stress, and rating scale data was carried out by Holtzman and Bitterman (1956). Lewinsohn (1956b) used patients from several psychosomatic groups as subjects in a study of personality variables, stress conditions, and physiological changes in steadiness, psychogalvanic response (PGR), salivation, and cardiac measures. The PGR was also employed by Cofer, Judson, and Weick (1949) and by Calvin and Hanley (1957) as a measure of reactivity to the content of MMPI items. Ruesch (1945a, 1945b) studied the relationship of MMPI variables to such physiological features as ventilation rate or production of lactic acid during work. Greenberg and Gilliland (1952) correlated indices of basal metabolic

rate and the basic MMPI variables. Janda (1951) used Welsh's AI and IR indices in a battery of measures to investigate personality processes in accuracy of night vision.

One of the advantages brought by the Internalization Ratio of Welsh is its employment of the major portion of the MMPI profile. It omits scales 6 and 8, but the other six scales along with the K correction factor enter into the index. Thus, the range is that from the psychopathic personality of grave character-disorder at one end to the psychoneurotic at the other, with the more normal in the mid ranges. The third dimension of the more psychotic is left for the other indices; there are some theorists who hold these to be mental cases of organic defect, so it may be well to have left the psychotic out of the continuum of personality types.

The 68's or 86's omitted by the IR are spoken of in The Handbook (p. 198) thus:

Guthrie described the group of medical patients with this profile pattern as prepsychotic with schizoid personality patterns. They were, however, making a marginal adjustment without hospitalization; physical complaints and preoccupation with health may have served to stabilize their precarious adjustment. They presented a wide variety of complaints which shifted from visit to visit. They also had many food fads and depended upon patent treatments and medicines. Their relationships with others were unstable and characterized by resentment.

In the psychiatric population that they studied, Hathaway and Meehl (1951b) found the 68 group largely composed of psychotics, the majority being frankly schizophrenic, with a smaller portion in paranoid states. The most common feature of the behavior of these patients was the presence of paranoid delusions, but many of them also showed depression, apathy, irritability, and social withdrawal. Although they had conduct or behavior problems, their difficulties were not the classic scrapes of the amoral, asocial psychopathic group.

The studies of Black (1953), Gough (1946) and Hovey (1953) should be pointed out as having basic import in this personality analysis, for through checklists and testing of college groups, they have brought the MMPI to bear upon the problems of personality at large, rather than that it be left simply a tool for psychopathic diagnosis.

The configural analysis, or rather synthesis, which the Internalization Ratio of Welsh affords, then, appears to be of use in evaluating the MMPI; through the relationship of Welsh's Ratio to Cleckley's overall view of personality types and on the assumption that there is both configuration in the profile and a hierarchy in human powers, the MMPI through this measure should provide an insight into emotional eccentricity or balance within the personality, and should show how a person characteristically handles his emotions.

CHAPTER IV

THE HERR-KOBLER PGR TEST: REVIEW OF THE LITERATURE

The psychogalvanometer and psychogalvanic response have engaged the interest of nearly all experimental psychologists. A listing of the experiments and devised tests in the following paragraphs show how widespread and consuming this interest has been. Some authors in summarizing experimentation with the PGR speak of much time wasted, as for example, Woodworth and Schlosberg (1954) and Arnold (1960); yet their major criticism seems to point more to the confusion in the experimenters' thinking about what emotion is than to any basic flaw in the PGR itself.

Woodworth and Schlosberg (1954) treat of the apparatus, techniques, stimuli, and response in their Subject Index (p. 924): Galvanic skin response, GSR, PGR, EDR; activation; adaptation; advertisements; alertness; animal; anxiety; apparatus and technique; attention; attitude; autonomic; "bad words"; child; complex indicator; conditioned response; effort; emergency; emotion; expectancy; extinction; Féré and Tarchanoff effect; free association test; habituation; latency; lie detection; limitations; magnitude; mental work; muscular activity; palmar; pleasant-unpleasant; predicament; preparation; significance; skin conductance; startle; stimulus; stimulus words; strength; sweat; sympathetic nerves; tension.

Paging through more books and articles, these other titles and

their relationship with PGR might strike our attention: temperature effects; sleep and wake; group PGR; changes during the day; under hypnosis; drugs; drink; menstruation; sub-liminal perception; voluntary control; external reaction; dream analysis; twins; organic defectives; hysterics; neuresthenics; psychotics; the insane; personality types; criminal types; auditory threshold; preference in music; frustration; less response with repetition; instincts and sentiments; fear and surprise; speedy or difficult work; emotional involvement in problem solving; subjective effort; failure; strong attitudes; racial or national bias; hostility; embarrassment; mobilization; anxiety producing stimuli; threat; anxiety index; ego-strength; internalization; acting out; anger-in and anger-out; perseveration; estimate of response; Haggard transformation of score; Rorschach; TAT; MMPI.

Apparatus and Technique

Féré, the first to publish an article about the PGR (1888), passed a weak current through electrodes on the forearm. He had a galvanometer included in the circuit. His subjects were presented with stimuli such as the sound of a tuning fork, the sight of colored glass, or something to smell. The quick deflection of the galvanometer indicated an increased flow of electrical current resulting from a decrease in bodily resistance. Two years later Tarchanoff (1890) reported on a difference in electrical potential for any two areas of the skin which may be connected through a galvanometer. A weak current was found passing through the galvanometer in a certain direction. He neutralized

this current with a weak external current opposed to it so that the galvanometer was balanced. Then, a stimulus applied to the subject would yield a deflection of the galvanometer with a two or three second latency. Not only sensory stimuli but shifts in mental activity, he found, brought about this response.

Though the names, Féré effect and the Tarchanoff effect, would seem to indicate two distinct phenomena, it is generally agreed that the two men found slightly different ways of measurement. Woodworth (1938) says that though the effects differ physically, they are indicators of the same physiological activity. Tarchanoff's method has been carried out by Forbes and Bolles (1936), and by Hovland and Riesen (1940) and recently by Wilcott, Darrow and Seigel (1957). The Féré method has been preferred in research: (Strohl, 1921; James & Thouless, 1926; Hozawa (1928), Gildemeister, 1928.) When the bodily resistance has been temporarily reduced the Féré method yields an increased flow of impressed current: (Davis, 1934; Montague, 1958.) Polarization is alleged generally as the cause of the body's normal resistance. An ordinary theory predicts greater polarization with greater impressed voltage. The "Féré effect" would consist then, in a partial or temporary depolarization of the cell walls (especially of the sweat glands) through which the current is passing. The galvanometer picks up this temporary change as a temporary decrease in bodily resistance (Veraguth, 1909; Jeffress, 1928.)

Of the three theories proposed in explanation of the electrical phenomenon the "secretory" theory with its emphasis on the presecretory electrical activities of the sweat glands (McCleary, 1950) and phenomenon of depolarization, appears to have greater confirmation than the muscular theory or the vascular theory. Both Richter (1926) and Darrow (1937) agreed with D'Arsonval (1888), a collaborator of Féré, that the PGR in the action current of Tarchanoff and depolarization of Fere was a result of sweat gland activity. Richter, Woodruff and Eaton (1943) confirmed this as did Goadby & Goadby (1948.)

The effect has been treated through the years in experiments of Darrow (1929), Dysinger (1931), Misbach (1932), Darrow (1932), Syz and Kinder (1928), Richter & Woodruff (1942), Silverman & Powell (1944), Wenger & Gilchrist (1948), Wang (1957), and Shackel (1959.) Williams (1960) discusses the effect fully, to whose thesis the reader is referred.

"The Nature and Causation of the Galvanic Phenomena" is the title of an article by Sidio and Nelson (1910) and this subject is pursued by such authors as Uhlenbruck (1924), Richter (1929), Thouless (1929 & 1930), Langworthy & Richter (1930), McDowall (1933), Darrow (1937), and McCurdy (1950.)

The neurology of skin conductance is sketched by Woodworth and Schlosberg (1954) where, in their short treatment, they say, "In so far as this system tends to discharge as a unit, the skin conductance at any point is a measure of sympathetic activity. As we have already noted, the sympathetic system is basic to emotion, or more specifically,

to activation. Thus the skin conductance is a valuable measure of activation." Arnold (1960) mentions the sympathetic and the parasympathetic excitation of the sweat glands and gives the reasons why the PGR is not as useful as was once hoped in the differential measure of specific emotions. "The autonomic changes that occur in emotion are anything but simple."

The phenomenon was called the psychogalvanic reflex by Veraguth in 1906. The term R in PGR is often taken as "response" rather than "reflex", and in this meaning PGR is perhaps the most used among the other alternatives "galvanic skin response" (GSR) as used by Woodworth (1954) and "electrodermal response" (EDR) used in the Psychological Abstracts since 1959.

Unit of Measure

One of the major problems involved in the use of the PGR and the psychogalvanometer is the choice of an adequate unit of measure. This is necessary to make the results of different individuals comparable. It has been established that the magnitude of any individual PGR response is in part determined by the level of "basic resistance" of the subject at the time of the stimulation. The higher the basic resistance, the larger the momentary variations will be.

Because of this, Darrow (1937a) has shown that if resistance scores are used, disregarding the level of basic resistance, the distribution of scores will be markedly skewed. Similarly, if conductance change scores are used, as suggested by Hovland and Reisen (1940), Freeman and

Katzoff (1942) and Lacey (1947), a skewed distribution will also result, since the conductance is simply the reciprocal of resistance. But Darrow also found that a log conductance change^{gives} a much more normal distribution. Sherman and Jost (1942) stated their preference of the per cent change of resistance.

Haggard (1945, 1946, 1949,) after reviewing a number of different methods, found a logarithmic transformation most useful. He showed (1945) that unconverted resistance or conductance scores are inadequate measures. The advantages of using Haggard's transformation are these: the simplicity of transformation, equal units, and a normal distribution. The Haggard score is computed by adding an empirically-determined constant to the log resistance-change score, and dividing the sum by the level of basal resistance. Since the resulting scores are in decimals, they can be multiplied by the constant for their removal.

Therefore, the resulting formula, which is used in this study is:

$$Sc = \frac{\text{Log resistance change} + K}{\text{level of basal resistance}} \times 10^b$$

Haggard's transformation has been widely but not universally employed. Lacey and Siegel (1949) agreed that either conductance scores or log conductance scores were satisfactory units. More of this discussion of the appropriate unit may be found in Duffy & Lacey (1946), Haggard & Garner (1946), Lacey (1946), Lacey & Siegel (1947), Jones and Haggard (1948), Copelman (1951), Stevens (1951), Urano & Tago (1954), and

Bitterman, Krauskopf & Holtzman (1954).

Paintal (1951) suggested that the proper unit was the ratio of the resistance change to the maximum resistance change obtained for each subject, arguing that these ratios should be preferred to any transformation scores in which the individuality of the subject was lost. Elliott and Singer (1953) have supported Paintal's findings, but Niimi and Hashimoto (1953) have continued to use the percentage change of conductance, while Scholsberg and Stanley (1953) have preferred the square root of the conductance. Nichols and Daroge (1955) have suggested still another method of computing PGR scores, namely:

$$\text{Score} = \log \frac{100}{(\text{basic}) (100-\text{PRE})} - \frac{100}{(\text{basic}) (100-\text{Post})} + 10^{-6} \cdot 10^6$$

Grant (1956) used analysis of variance tests but found that even these did not constitute a universally applicable method of analyzing and comparing trends in his PGR data. All in all, it is Haggard's transformation that is used most frequently in published research.

To cover the many and various fields of literature reported it may be well to pick out the discussions of apparatus used in the PGR. The Herr-Osborn psychogalvanometer has been constructed in view of the many instruments built to so measure this effect. Richter (1927, 1929) discusses the Tarchanoff effect and the circuits and electrodes used for this measure. Jeffress (1928) speaks of the reflex latency

of between one to three seconds and has a method of simultaneously photographing the galvanometer deflections. Darrow (1930), Davis and Porter (1930), Seward and Seward (1934), Forbes and Landis (1935), and Forbes (1936), all discuss circuits and electrodes and this material is summarized in Woodworth (1938). Haggard and Gerbrands (1947), Lacey and Seigel (1947, 1948), discuss the circuit used in measuring PGR. Armington (1949) speaks of a machine costing \$17.00 useful in class demonstration and student employment. Silkett and Driscoll (1949), Trueblood and Grings (1950), Whelan (1950), Flanders (1953), Stewart (1954), Nichols and Daroge (1955), Stkeingart (1955), Traxel (1957), Shackel (1957), Levy, Thaler and Ruff (1958) and Lester (1958) all emphasize new techniques, new methods or new instruments for measuring PGR. Weisberger's (1951) thesis discusses the Herr psychogalvanometer in detail.

The discussion of temperature effects is rather lengthy. To mention one, Kleitman and Ramsaroop (1948) discuss the periodicity in body temperature and heart rate. Weisberger's (1951) thesis discusses the effects of temperature in measuring PGR. Sleeping and waking occupy much discussion. Farmer and Chambers (1925) say that the skin resistance is high during sleep and falls again when a person wakes. Richter (1926) makes a similar discussion and Jones (1930) showed that it is the palmar and plantar areas which really manifest the PGR effect during waking and sleeping. The leg resistance, for instance, does not show this same measure. Landis and Forbes (1933) confirmed this same fact.

Freeman and Darrow (1935) and Kleitman (1950) discuss this same subject and would indicate that the degree of attention that a person has and his physiological state would make quite a bit of difference in the PGR manifested in any kind of testing procedure. An interesting experiment might be that of running several people together in the same circuit; Hansel (1951) did just this, hooking together many people in parallel and running the PGR of the group. Hamaguchi (1948) ran a dispersion on the pooled momentary reaction potential of a group. Changes become evident during the day, and Waller (1919) showed that resistance is high in the morning, low at midday and high again late in the day. Wechsler (1925) confirmed these findings and also measured the resistance during an arithmetic test.

We have already summarized what Woodworth and Arnold have had to say on the relationship of emotion and PGR. In addition, neurological research using PGR, along with other research measures, has found the psychogalvanometer a useful bridge from organ to function. Schoonhoven (1925), found that measures of blood pressure, pupil diameter and PGR were not consistent. A dissertation in a similar vein but employing color as stimulus was presented by Smith (1958). General treatments, for example, the "perception of autonomic activity" (Mandler, Mandler and Uviller, 1958), have come from the research of Bard (1934), Liberson (1949), and Mundy-Castle and McKiever (1953) who report an alpha frequency of EEG corresponding to PGR adaptation rate; also Copelman (1957).

Leucotomy (Ashby and Bassett, 1950), EEG and chlorpromazine (Turner, Berard, Turner & Franco, 1956), EEG and conditioned reflexes (Novikova and Sokolov, 1957, who report a relationship of alpha EEG rhythm to PGR), EEG pattern and ease of eliciting PGR (Charan & Goldstein, 1957), and finally, EEG, EMG and PGR (Sokolov & Mikhalevskaja, 1959) have been a few of the investigations.

The effect of hypnosis on the PGR of the person undergoing it has been studied by Sears (1932), Davis & Kantor (1935) who say the suggestion makes the difference, Marenina (1949), West, Niell & Hardy (1952) who found PGR to diminish and under deep hypnosis to disappear, and Sears & Beatty (1956).

Along with the reports of lessened PGR after repetition of stimuli are studies on the day after day habituation, on preparation and trials, and on adaptation. Examples of these are Farmer & Chambers (1925), Porter (1938), Conklin (1951), Fraisse & Jampolsky (1952), Niimi and Hashimoto (1953), Bassett & Ashby (1954), Mundy-Castle & McKiever (1952), Novak, Moriarty, Koltuv & Welsh (1956), Grings & O'Donnell (1956), and Grings & Shmelev (1959). Cardu (1954) employed PGR clinically as a measure of emotional difficulty. He found PGR to grow best by repetition.

Drug effects and PGR have been studied rather thoroughly. The drug effect has been produced by tea (Stanley & Schlosberg, 1953), near or real beer (McDonnell & Carpenter, 1959), alcoholic beverages (Carpenter, 1957), wine, whiskey and alcohol (Greenberg & Carpenter, 1957), Atropin (Mall, 1936), chlorpromazine (Clerc, Turner & Berard, 1956),

tranquilizing drugs (Mitchell, 1958), menthylpentynol (Bartholomew, Franks & Marley, 1958), L.S.D. 25 (Vinar, 1958) and electroconvulsive shock, Heistad, 1958). Cattell (1929) says that the deflections of the galvanometer are decreased through fatigue, depression, alcohol, morphine, chloroform, ether, and during menstruation.

Studies in alertness, expectancy, suggestion, instructions, set, and attention have been done by Darrow & Heath, (1932), Switzer (1933), Bagchi & Greenwald (1937), Girdem (1952), Coppock (1955), Otani (1955), Kehres (1956) and Stukat (1958). Subliminal perception has found its indicator through PGR in the research of McCleary & Lazarus (1949), Lazarus & McCleary (1951), Lowenfeld, Rubenfeld & Guthrie (1956), and Dixon (1958).

Conditioned response and PGR make a natural combination. Some of the articles dealing with research in this field are the following: Langfeld (1931), Hovland (1937), Cook & Harris (1937), Grant & Schneider (1947), Gladstone, Yamaguchi, Hull & Felsing (1947), Hull, Felsing, Gladstone & Yamaguchi (1947), Grant & Schneider (1949), Grant, Meyer and Hake (1950), Longenecker, Krauskopf & Bitterman (1952), Moeller (1952), White & Schlosberg (1952), Wickens, Schroder & Snide (1954), Bitterman, Reed & Kubala (1953), Grant & Schiller (1953), Meritser and Doerfler (1954), Moeller (1954), Bierbaum (1955), Gordon (1955), Terekhova (1958), Alexander (1958), Chaiklin (1958), and Doerfler and Kramer (1959). Coppock & Chamber (1959) have developed an interesting

view: "GSR conditioning: an illustration of useless distinction between "types" of conditioning." These experiments in conditioning, together with the use of the PGR in lie detection, usually make up the core of discussions in the general psychology text books when they deal with PGR. Research in the above mentioned lie detection, outside of that mentioned in "The Police Gazette," has been carried on by Rao (1946), Rouke & Kubis (1948), Block, Rouke, Salpeter, Tobach, Kubis & Welsh (1952), Guertin & Wilhelm (1954), Iwahara, Miseki, Shiokawa & Yoshida (1955) and Block (1957).

The question of voluntary control over PGR is of high theoretical interest. Some bit of the research is included in the work summary of Cattell (1929). Other studies are those of Abramowski (1913), Hudgins (1933), and Noble (1950). "The hypothesis which seems to the present writer most apt to the facts is that the deflection is proportional to the act of suppression which the ego finds it necessary to exercise upon the impulse aroused. The psychogalvanometer can therefore be used as a measure of the strength of the impulses, of will acts, and of the conflict between them" (Cattell, 1936).

Muscular activity and physical effort induce changes in PGR. Measures of such changes have been made by Starch (1910), Claparede (1924), Seward & Seward (1934), Essen & Hansen (1940), Ryan & Ranseen (1944), and Heinze (1955). "Environmental factors have greater importance than the hereditary ones," says Ohira (1956) in a study of twins.

Children have come in for study by Jones (1930 & 1950) and Veinger (1950).

Redlich (1945) reported on a method of differential diagnosis of organic and hysterical anesthesia with the aid of the PGR. Other studies in organic defects and defectives have been done through the years by Vigouroux (1879), Prideaux (1921), Lacy, Steigel & Stuckey (1948), Lacey, Siegel & Siegel (1949), Panel & Barclay (1959).

Various mental states have been tested through PGR studies: the neuroses (Shirokov, 1937; Venables, 1955); the psychoses (Hoch, Kubis and Rouke, 1944; Paintal, 1951 & 1952; Stewart, Winokur, Stern, Goze, Pfeiffer & Hornung, 1959); mental deficiency and IQ level (O'Connor and Venables, 1956; Irwin, Hind & Aronson, 1957; Ellis & Sloan, 1958; Pryer and Ellis, 1959); various personality types (Marinesco, Copelman and Stanesco, 1937; Champion, 1950; Bitterman & Holtzman, 1952; Efron, 1954; Grant, 1956; Ohira, 1958; and Grant, 1957).

Animal PGR for comparison and for neurological research has undergone the scrutiny of Wang & Richter (1928), Wang, Pan & Lu (1929), Wang & Lu (1930), Knauf (1954), Haggard & Thompson (1954), Wang, Stein and Brown (1956), Wang & Brown (1956, 1957), and Shaklee (1957).

Auditory acuity and the study of deafness has found an important research tool in the PGR: Crombs (1938), Michels & Randt (1947), Dreher (1948), Doerfler (1948), Davis (1948), Knapp & Gold (1950), Littman (1949), Hovland (1949), Bordley & Hardy (1949), Doerfler and McClure (1954), Stewart (1954), Goldstein, Polito-Castro & Daniels (1955), Aronson (1957), Hind (1958), Buck (1958), Aronson, Hind and

Irwin (1958), Hanely, Tiffaney & Grungard (1958), Rosenblat, Bilger and Goldstein (1959), Grings, Lowell & Rushford (1959). Two studies concerning preferences in music were done by Henkin (1957) and Traxel and Wrede (1959). Preferences in advertising: Eckstrand, Gordon and Gilliland (1948) and Golin & Lysterly (1950).

Particular studies in emotion and PGR have been very numerous. Some of these are listed below: frustration (Freeman, 1940; Jost, 1941; Sherman & Jost, 1942; Thiesen & Meister, 1949; Thetford, 1952; Schwartz, 1957; Flanagan & Herr, 1959); instincts and sentiments (Shock & Coombs, 1937; Turner, 1954; Ader, 1959); pleasant-unpleasant (Dysinger, 1931; Reich, 1950); fear and anxiety (Bayley, 1928; Welch & Kubis, 1947; Welch, Livingston & Kubis, 1947; Coppock, 1949; Schiff, Dugan, Livingston and Welch, 1949; Ax, 1951; Berry & Martin, 1957); anger (Funkenstein, King and Drolette, 1953); speedy or difficult work (Sears, 1933; Fraisse and Bloch, 1957); mental work: abilities (insight) (Prideaux, 1920; Bartlett, 1927; Patterson, 1930; Carter, 1950; Kuypers, 1954); emotional involvement in problem solving (driving, flying) (Hussman, 1955; Hulber, 1957; Venables, 1956); subjective effort (stress) (Lanier, 1941; Holtzman and Bitterman, 1954; Baker & Taylor, 1954; Raphelson, 1957); attitude and strong attitude (racial or national bias) (Wiener, Salpeter, Tobach, Wineburg & Welch, 1952; Cooper & Singer, 1956; Cooper & Siegel, 1956); failure-success (Procter, 1953; Mizushima, 1954); vision, (Wagner, 1950); predicament (Abel, 1930); embarrassment (Dittes, 1957); mobilization - expectancy-actuation (Darrow, 1936-37; Freeman, 1940; Burdick & Burnes,

1958; Oswald, 1959; Merlin, 1958); threat (defense, avoidance) (McGinnies, 1949-50; Novak, Hayes, Goodman & Welch, 1955; Sines, 1957); startle-surprise (Patterson, 1930; Steinberg, 1949; Howes & Solomon, 1950); anxiety producing stimuli (Taylor, 1950; Silverman, 1960); pain (Dennard, 1950; Furer & Hardy, 1950; Clausen, Gjesvik & Urdal, 1953; Behr, Preber & Silverskiold, 1955; Clausen, Urdal & Gjesvik, 1955; Fujiki, Sadakata, Saito & Endo, 1958); acting out (Barratt, 1959); induced-tension (Staudt & Kubis, 1948; Landis & Hunt, 1936; Bloch, 1952a & b; Kushner, 1955).

Some excellent studies have been done in the nature of emotion through means of PGR research. Some of the most significant writers are these: (Wells, 1924; Thouless, 1925; Aveling, 1926; Syz, 1926; Landis & DeWick, 1929; Landis, 1930; Duffy, 1934; Masserman, 1941; Arnold, 1945 & 50; Leeper, 1948; Lindsley, 1951). Arnold (1960) has this to say in her summary:

In addition, we have suggested on the basis of neurophysiological evidence that the PGR accompanies any impulse to action, voluntary or involuntary, deliberate or emotional. The reaction to sensory stimulation, as well as startle and various emotions, are all accompanied by psychogalvanic deflections. These will be largest when there is a sudden impulse to action (e. g., in startle).

Since all action impulses, including emotions, are accompanied by psychogalvanic responses, the ambiguous results of studies in the PGR are easily explained. Sudden emotion is a strong impulse to action; hence the early positive results are explained. But startle is an even stronger motor impulse, which seems to account for the fact that the taboo words used by Syz produced such strong deflections. When a man's name is called unexpectedly, he is startled and gets ready for action, which explains why his own name usually brings about the strongest

PGR of all.

Peterson and Jung (1907) conceived that PGR might make a good "complex indicator", along with slow verbal reaction; and their results satisfied them that such was the case. Weisgerber (1951) using a PGR measure, found that his results did not verify the theory that perseveration depends on a general tendency of the nervous system to persist in activity in regard to either conscious perseverative phenomena or the autonomic system.

The magnitude of PGR was subjected to experiments by Darrow (1927) and Nober (1958). Latency received treatment by David (1930) and Felsing, Gladstone, Yamaguchi & Hull (1947). Stimuli, especially stimulus words, have been treated by such eminent people as Wells & Forbes (1911), Smith (1922), Darrow (1929), Jones & Wechsler (1928), Haggard & Jones (1947), Kubis (1948), Johnson (1951), Vail (1955), Jacobs (1955) and Sutton (1958). These studies have direct bearing on the present research in which sixteen emotionally toned words are used.

The projective test and PGR have been inter-related by Fisher and Abercrombie (1958) and Fisher (1958); through figure drawing, Fisher (1959); through the Rorschach: Kubis, Rockwell, Welchand & Fisichelli (1946), Levy (1948), Frost (1948), Levy (1950), Niimi, Hashimoto, Mochizuki, Ohno (1956) and Meissner (1958).

Most apropos to personality testing through the PGR, including the Herr-Kobler PGR test itself, are studies done by Carter (1947),

Cofer (1948), Hsu (1951), Albrecht (1952), Herr (1953), Herr & Kobler (1953, 1957), Kehres (1958), Cabanski (1958) and Williams (1960). The application of PGR testing to the clinical interview, personality typing and psycho-therapy is in the forefront of PGR research today. Mall (1936) mentions the possibility following Veraguth's lead, and more recently we have the works of Golla (1948), Neumann (1950), Seymour (1950), Van der Valk & Groen (1950), Rankin & Campbell (1955), Martin (1956), Dittes (1957), Gordon, Martin & Lundy (1959), Learmonth, Ackerly & Kaplan (1959), and Martin, Lundy & Lewin (1960).

Good summaries of work done with PGR occur in Landis (1935), Cattell (1936), Woodworth (1938), McCleary (1956), Woodworth and Schlosberg (1954) and in the theses at Loyola University, such as those of Weisgerber (1951), Albrecht (1952-1957), Kehres (1956), Cabanski (1958) and Williams (1960). This research will be detailed in Chapter VI.

CHAPTER V

THE PROBLEM: PURPOSE, METHOD, HYPOTHESIS

Purpose

We are here attempting a measurement of personality in the more or less restricted area of emotional control. The measures used are those of the Minnesota Multiphasic Personality Inventory, which is widely used and fairly well standardized, and the Herr-Kobler Psychogalvanometric Test, which employs sixteen emotionally-toned words and for the present purposes is to be compared with and validated by the MMPI. The specific comparison is founded on Welsh's Internalization Ratio which covers six of the nine MMPI scales, and the PGR Ratio, which is based on nine responses out of the sixteen elicited through the emotionally-toned words. Thus the MMPI in general and its use in the "Assessment of Emotional Control" in particular will be discussed, especially giving the reasons for the selection of Welsh's Internalization Ratio; so too does the PGR in general and the Herr-Kobler PGR Test in particular merit discussion, and especially the selection of the PGR Ratio in its correlation with the MMPI IR. The application of the use of such testing towards assessment of candidates for the religious life and the priesthood needs no thorough discussion at this point, but its practical import should be mentioned. The possible contribution of the Herr-Kobler PGR Test to the detailed formulation of a consistent personality theory,

however, ought to be assessed.

Method:

Apparatus

A moving coil galvanometer with photographic registration was used. Changes in current flow accompanying the various responses were computed from records on which were written the ohms resistance before the stimulus and the ohms resistance after the maximum drop. From these measures it was possible to compute change in ohms resistance, change in conductance, and to refer both of these to the basic resistance values. The verbal responses were recorded in writing, the reaction times through photographic recording.

The Loyola Psychogalvanometer (Herr-Osborn, 1953) was built with the special object of having a control over the amount of current through the subject during the measurement of his galvanic reflex. The traditional "open" type of bridge circuit always demands that different amounts of current flow through the different subjects, depending upon the amount of their basic bodily resistance. Thus the comparison of one person's reflex with another was difficult or even meaningless without some complex transformation. Moreover, the open bridge will deliver so high a current to some low-resistance subjects that they become conscious of the current and the whole purpose of the study of the reflex is lost.

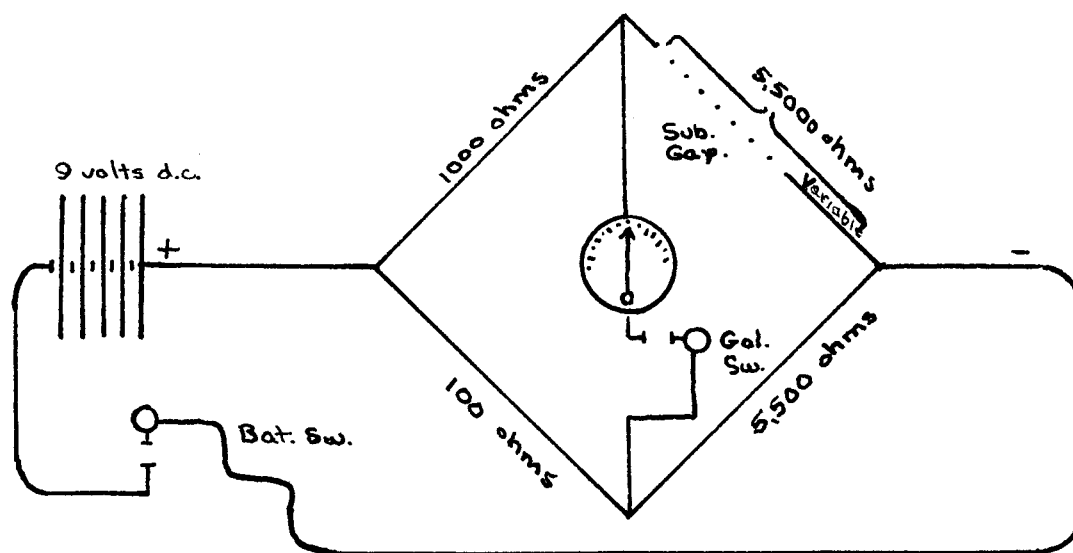
The main difficulty in the construction of this instrument comes from the fact that the "moving coil" galvanometer has to be critically damped, or else the swings of the beam will not reflect changes in current

with the proper sequences of time-relations. Woodworth (1938) makes no mention of this difficulty when he describes the "closed" type machine, but he is not really discussing the galvanometer -- rather only the resistances in the various arms of the bridge. Having achieved a "constant current" through S when balanced, we now have variations in voltages but, within the ranges described in the following setup, these do not cause any notable difficulty.

The moving coil unit is produced by the G-M Laboratories. It is of the d'Arsonval Type, very sensitive and yet very rugged, with a period of 4 sec., and sensitivity per mm. division of scale 160mm. from mirror: 0.06 microamperes. Internal resistance of the moving coil is 100 ohms. External resistance needed for critical damping is 1000 ohms.

The unit is very easy to mount, since the arms of the magnets have flanges on which the whole suspension hangs. The knob on top of the unit is adjustable for the zero point, up to 30 degrees either way. The total swing is in angular deflection 40 degrees and in reflected light, 80 degrees, this last being rarely usable with photographic paper but very useful for visual recording.

The construction of the bridge described below merely requires precision coils (load 1/2 watt) for the fixed arms, and equally graduated steps in the two variable resistors, steps of 5000 ohms for the master, and 500 for the vernier.



Loyola Psychogalvanometer Figure 4.

Since current through bridge is constant at all times, critical damping avoids all "free swings" of the coil due to its own proper period of $\frac{1}{4}$ " and hence the deflections are true pictures of changes in S. (Hence also the peculiar ratios). Copper electrodes $\frac{1}{2} \times 1\frac{1}{2}$ " were immersed in 0.1 N saline solution in cups, to be stirred at intervals of ten minutes. Total current through the bridge when balanced = 0.000160 amp. (160 microamps.) The measured change in current through "S" for a drop of 350 ohms is one (1) microampere increase. Voltages across S vary with his R. An S of 5,500 ohms has only 0.88 volts, whereas one of 50,000 ohms gets 8.0 volts. Mean R for this setup is 30,000 ohms; such a subject gets 4.80 volts, an optimum. An elaborated discussion of this type machine and its use may be found in Weisgerber's (1951) thesis.

Subjects

Twenty-two female subjects were tested, their Mean Age 26.1 years,

ranging from 17 to 43. These subjects were interviewed and given the MMPI in its booklet form. Actually there were a number of other potential subjects who went through this preliminary part of the testing but were not able to appear at the laboratory for the PGR Test. The twenty-two who were able to appear and be persuaded to take the second test themselves provided IR scores which range from top to bottom on that particular scale. This fact helped in the estimation of limits on the second test. The subjects were tested on PGR on afternoons or in early evenings in a small, quiet room with the temperature varying from 70 to 75 degrees F.

The Stimulus List

Each subject was given the same list of words and required to respond in the usual manner of free association, i.e. "what you first think of." The list was especially prepared for testing the strength of the emotional responses. After each emotionally-toned word there was inserted a neutral word. Four or five additional buffer words were used before each measured session in order to test the constancy of the basic resistance during the adaptation period. The time required for the actual testing, with the buffer, emotional and non-emotional words, was on the average thirty minutes. The emotionally-toned words in order of presentation are: sick, high, love, afraid, sin, closed, hospital, ashamed, sex, open, pain, God, sweetheart, trouble, church and breast. The buffer words were identical with those used previously in the Herr-Kobler, Cabanski and Williams experiments. Albrecht's theses (1952 and

1957) are worth consulting concerning the responses to words.

Computation

The Haggard transformation makes it possible to compare the results with the results obtained by Herr and Kobler (1953 & 1956), by Cabanski (1958) and by Williams (1960), all of whom used the Haggard scores. The transformation actually used is:

$$\text{Score} = \frac{\log \text{resistance change} - 1.74}{\text{basic resistance level}} \times 10^7$$

This is the same as the formula used by Herr-Kobler since the mean drops per basic were approximately the same. The criteria which Haggard suggests for the use of the transformation are (1) normalcy of distribution of transformed scores -- this criterion is met; and (2) independence of basics -- this also was met.

The scoring of the MMPI was carried out manually through the use of the standard IBM score sheets and correction stencils. An advantage of the Welsh Internalization Ratio derives from the fact that the ordinary "profile" provides its measure. The norm for the IR is theoretically 1.00. The PGR Ratio is derived from the transformed scores for five of the words (high, closed, open, pain and God) divided by scores for four of the words (sick, sweetheart, trouble and church). Ratios for normals run between 0.80 and 1.00 as gathered from previous studies.

Hypothesis

Herr and Kobler (1953 & 1956) devised a "test" with emotionally-toned words used as "stimuli" to gain "responses." The responses followed the instruction to "give the first word that comes to mind as quickly as possible." The psychogalvanic skin response was employed

as a measure of change and internal, emotional response. Normal groups and diagnosed neurotics were tested, and a ratio score devised, using certain high response words as criteria. The test on this basis discriminated psychoneurotics and normals. The MMPI was used as one of the measures of neuroticism.

Cabanski (1958) made a comparison of the PGR responses gained from the test of twenty college students, against the MMPI Anxiety Index (AI) from the same subjects. He did not employ the PGR Ratio for his more specific analyses. Williams (1960) ran the Taylor Manifest Anxiety Scale (derived from a part of the MMPI) against the PGR Ratio, employing seminarians as subjects. The mean responses to the sixteen emotionally-toned words showed a close correspondence with responses reported in the previous studies.

These studies show that the PGR Test affords a measure of personality factors or tendencies, and from the results of the Herr-Kobler experiments a person would wonder why the Cabanski and Williams comparisons failed to show the correspondence of Anxiety with PGR Ratio. Perhaps this could be the result of inadequate "anxiety" measures. Perhaps the PGR Ratio measures something more emotionally significant than "anxiety."

The Eco Strength measure of Barron might be a better indicator of "control of emotion" than the Anxiety Index, and better yet, the MMPI Internalization Ratio of Welsh seems to show a characteristic way that a person handles his emotions. The data (Table I) of Herr-Kobler and

Cabanski, so treated, show a positive correlation of high PGR Ratio with high IR. (Williams did not use the whole of the MMPI and thus no IR is available.)

Table 1
Comparison of MMPI internalization ratio
means and PGR ratio means of three studies

Study	Year	PGR R	MMPI IR	MMPI AI
Herr-Kobler	1956	1.28	1.17	84
Herr-Kobler	1953	1.19	1.09	93
Cabanski	1958	.95	.84	45

With this observation of a trend, PGR R with MMPI IR, further experimentation and a testing for limits seem in order. The hypothesis of the present experiment affirms a correlation between the MMPI IR of Welsh and the Herr-Kobler PGR Ratio; furthermore on the basis of the experimenter's previous use of the PGR with female subjects the correlation should be negative, contrary to the positive correlation of the data listed above. Such a hypothesis would be in accord with the different responses which men and women give to the word association tests. An added hypothesis would be that the mean response for the women should be similar to that of the men; the same should hold for the ranks of the mean responses to the words, i.e. that the rank coefficient of correlation

should be high when run against the data of Herr-Kobler, Cabanski and Williams.

CHAPTER VI

PRELIMINARY EXPERIMENTATION

The work of Herr and Kobler (1953) cleared the field for validating studies. The selection of emotionally-toned words and the amount of response to these words elicited by neurotic and normal persons was carefully made and assessed.

It is useful to do an analysis of variance separately for each of the two groups of normal and neurotic subjects. Here the comparison is not between the two groups on any one word or for a series of words, but rather between words for either group considered alone. In this way one can determine the relative stimulus value of these words for the normal and the neurotic individuals.

Herr and Kobler found the neurotic to be more erratic (a significant difference in regard to variance, but not in regard to means), and the words God, pain, church and closed appeared to have different stimulus value for the two groups. Again, analysis of combined groups yielded significant differences in PGR between normals and neurotics. The so-called sex word grouping, love, sex and sweetheart, brought greatest responses in the normals. The religious words, sin and God, were tied in with the sex words for the neurotics. Through differential selection, high, closed, open, pain and God evoked larger responses for the neurotics; sick, sweetheart, trouble and church evoked larger responses from the normals; a ratio score was devised to serve as an index of neuroticism. The hypothesis was this: "The five words evoke more anxiety response in the neurotics than they do in the normals, and the four words inhibit such response in the neurotics but heighten it

or some other kind of response in the normals." The ratio was that of the five words' response divided by the four words' response. Other measures were applied as well, such as a comparison of responses to the buffer words, a comparison of number of blocks, i.e. four seconds or more to give a response to the stimulus word, and also the number of zero PGR's to stimuli.

Cabanski (1958) and Williams (1960) tested various possibilities and appeared to have defined some of the limits that this PGR Test can reach in assessing such a vague factor as anxiety. Weisgerber's work (1954) on perseveration erased many questions that could be written on temperature effects, the physical environment and the use of the PGR. Kehres (1956) explored the possibilities of harassment of the subject (and indirectly the effect of rapport between S and E) in the taking of the Herr-Kobler PGR Test. All of this experimentation has direct bearing on the Herr-Kobler PGR Test; but from the literature cited in this thesis the work of men such as Cattell and Paintal and vast numbers of others has indirect bearing.

In an experiment prior to the present one, several factors were studied. Ten subjects were run through the Herr-Kobler PGR Test. However, to some subjects the Otis Gamma IQ Test was given orally and in part just before the sixteen emotionally-toned words, and with other subjects, just after. Some subjects were given the approving nod of the experimenter, others were subjected to his frown throughout the test. Later each subject went through the Otis Test in writing. The hypothesis

affirmed that a high IQ would be associated with fairly good emotional balance under the conditions of the tests, with, therefore, lower total PGR's. The result confirmed the hypothesis; however, it raised more questions than it answered.

A few of the questions thus raised were these: (1) Can another test be run together with the Herr-Kobler PGR Test? It would seem not, for the length of time makes a difference, and the other test changes the frame of reference for the Herr-Kobler PGR. (2) Is it true that those with higher IQ's give evidence of better emotional control under test conditions? Actually, if one were to suppose poorer emotional control under test conditions, they might possibly have been able to attain even higher IQ scores with better conditions. This question, however, cannot be answered in any practical way by any tester, but it led the present experimenter into the question of whether the Herr-Kobler PGR Test assesses emotional control, and if so, in what manner. The correlation between the Ratio developed for the Herr-Kobler PGR Test and some scale or other used in the assessment of emotional control from the MMPI became a possibility. (3) Do women give different responses than the men, i.e. are their verbal responses different and is their autonomic nervous response different? Does a neurotic woman respond differently than a neurotic man?

The experimenter had worked with the problem of bias in a large study in human genetics a few years previously; he was aware that not only sex differences introduce bias but that age and state of life,

among other factors, have profound influence. Since he had done a good deal of counseling of working girls, he saw the advantage of further validating this test through the use of a homogeneous group of female subjects. They would not be dependent upon their parents at home, nor upon some such institution as a jail or mental hospital. They would be earning their living, managing their own lives, neither married nor belonging to a religious order. This factor of independence would make the girl a more apt subject, free to express her mind and heart. Since the Herr-Kobler PGR Test had been run on men, would it not be interesting to compare the results from a group of women? These were the main questions raised by the preliminary experiment attempted in January, 1961. The present experiment was set up with the hope of answering these and other questions.

CHAPTER VII

THE MAIN EXPERIMENT: RESULTS

PGR Ratio Analysis

In the Herr-Kobler (1953) experiment, ratio scores were suggested as possible indicators of differences between the normals and the neurotics. These scores were computed by dividing the mean or median score for the words high, closed, open, pain and God by the mean or median score for the words sick, sweetheart, trouble and church. The mean ratio score for the neurotics of 1953 was 1.19 and that for the 1956 sample, 1.28. Mean ratios for normals were 0.80 and 0.82, respectively. Also, in 1953 there was significant difference between these two indices, that for the neurotics and that for the normals. It was slightly more significant in the Herr-Kobler 1956 sample: taking a ratio of 1.00 as the cutting point, 71 per cent of the neurotics were designated as neurotic, whereas 83 per cent of the normals were classed as normal. These mean ratios distinguished the groups at a fairly high level of efficiency. (For the comparison of means, see the Appendix, Fig. 5).

Welsh Internalization Ratio of the MMPI

Welsh's Internalization Ratio was rather fully described in the Basic Readings on the MMPI (1956), and evaluated as useful in the assessment of "tendencies on the one hand to internalize difficulties and suffer distress, somatic symptoms and self-excoriation, and on the other hand to externalize problems by acting out, projecting and disowning"

in the MMPI Handbook (1960). Lower values of his ratio are indicative of poor control and direct, overt expression of emotional difficulties. His index gives a theoretical value of 1.00 for normals. Scores are computed by the following formula using the T-score values of the appropriate scales:

$$IR = \frac{Hs + D + Pt}{Hy + Pd + Ma} = \frac{1 + 2 + 7}{3 + 4 + 9}$$

This IR of Welsh seems to show a characteristic way that a person handles his emotions.

The data of Herr-Kobler and Cabanski, treated to yield the MMPI IR as well as AI (Anxiety Index), shows a positive correlation of PGR Ratio with Internalization Ratio. Corresponding to these data, the present study yielded an average PGR Ratio of 1.05, and an MMPI IR of 0.90, and an MMPI AI of 60. These results are shown in Table 2.

Table 2

PGR R, MMPI IR and AI mean score of previous
studies compared with the present study

Study	Year	PGR R	MMPI IR	MMPI AI
Herr-Kobler	1956	1.28	1.17	84
Herr-Kobler	1953	1.19	1.09	93
Hoene	1961	1.05	0.90	60
Cabanski	1958	0.95	0.84	45

The overall product-moment correlation of MMPI IR and PGR R for the present study is -0.57 ($n=0.83$). This correlation is shown in Table 3. Following McNemar's (1956) illustration of analysis of variance, the correlation ratio is significant at or beyond the 0.05 level, but not at the 0.01 level. The significance of the linear correlation is at or beyond the 0.01 level. Testing for linearity of regression, the values do not approach the 0.05 level by half; the hypothesis of linearity is not disproved (the null hypothesis is not rejected.) Thus, the correlation coefficient may be suitable, the function may be linear, and the personality factors so measured and expressed may be thought of as lying on a continuum.

To test the possibility of other scales of the MMPI being more in accord with the PGR Ratio, the Anxiety Index of Welsh and the Ego Strength Scale of Barron were scored and tabulated (Table 4). The Anxiety Index had some small correspondence (-0.56) with the PGR Ratio, where the IR and PGR is -0.83 , calculated by rank correlation.

The ES scale showed little ($+0.17$) correlation with the PGR Ratio (Table 5), and not much ($+0.55$) with the Internalization Ratio. It did not appear to correspond with the experimenter's judgment of the subjects, based on his interviews. The IR appears to be best associated with the PGR Ratio, for the PGR R with the AI is -0.56 , with the Fm it is -0.55 , with Pt it is -0.51 , with Age it is -0.45 , with Si it is -0.37 , with R it is -0.34 , with A it is -0.22 , with F it is $+0.06$, with Mf it is $+0.07$, and with ES it is -0.17 .

Scattergram correlation and rank correlation of
IR and PGR R, with tests of significance

		65	70	75	80	85	90	95	100	105	110	115	120	
0														f _y
25	0								1	1			1	4
50	1													3
75	2				1	1	1	1						2
100	3				1									2
125	4			1										2
150	5						1							1
175	6													0
200	7													1
225	8													0
250	9													0
275	10			1										1
300	11													0
325	12		1											1
$\Sigma x = m_r$		1	3	1	1	5	4	2	2	2	0	0	1	22
Σy		7	19	10	1	11	8	3	1	0	0	0	0	260
Σy^2		49	169	100	1	31	28	5	1	0	0	0	0	2384
$(\Sigma y)^2 / m_r$		49	130	100	1	24	16	45	0.5	0	0	0	0	315

Source	Sum of Squares	df	Variance Estimate
h. R.	71.6	1	71.6
Dev.	55.8	8	6.97
Botw.	151.0	9	16.77
Within	69.0	12	5.75
Res.	148.8	20	7.44
Total	220.4	21	

$$1) 384 - 60^2/22 = 220.4$$

$$2) 384 - 315 = 69$$

$$\eta^2 = 151/220.4 = .687 = .69$$

$$3) 315 - 60^2/22 = 151$$

$$\eta = -.83$$

$$\text{Scattergram correlation} = -.57 \rightarrow r^2 = .3249$$

$$a) (.3249) (220.4) = 71.6$$

$$b) (1-.3249) (220.4) = 148.8$$

$$c) (.687 - .3249) (220.4) = 55.8$$

$$F_1 \text{ Significance of correlation ratio } 2.91 \quad n_1 = 9$$

$$n_2 = 12 \text{ -significant at and beyond .05 (2.80 required at .05)}$$

$$F_2 \text{ Significance of } \underline{r} \text{ (linear correlation) } 9.62$$

$$n_1 = 1 \quad n_2 = 20 \text{ - significant at and beyond .01 level (8.10 required for .01)}$$

$$F_3 \text{ Linearity of Regression: } 1.21 \quad n_1 = 8 \quad n_2 = 12; \text{ not .05 level by half; thus hypothesis of linearity not disproved.}$$

Table 4

Rank correlation of PGR R, AI and ES; with IR

IR	PGR R	AI	ES
.69	2.07	26	76
.71	1.25	32	69
.72	3.50	44	56
.73	1.11	56	48
.76	2.99	55	62
.82	.73	51	64
.85	1.38	49	--
.85	.73	33	50
.87	1.13	52	53
.88	.79	49	51
.89	.58	57	64
.91	1.58	38	58
.91	.66	58	53
.91	.65	98	43
.93	.56	48	64
.97	.71	84	32
.98	.81	94	24
1.00	.60	104	41
1.04	.28	50	64
1.07	.47	55	65
1.09	.42	85	41
1.23	.37	109	41
Rank <u>r</u>	-0.83	+0.75	+0.55

Table 5

Correlation of scores mentioned in text with the

PGR Ratio scores of 22 women

PGR R	IR	Mf	Fm	Si	F	A	R	Es	Pt	AI	Age
350	72	61	11	42	92	61	27	56	50	44	18
299	76	66	14	49	62	43	36	62	50	55	27
207	69	55	9	42	46	36	60	76	45	26	28
158	91	37	14	53	45	37	62	58	51	38	22
138	85	51	--	52	58	--	--	--	56	49	33
125	71	55	10	47	50	35	46	69	53	32	18
113	87	43	14	50	50	38	55	53	50	52	17
111	73	45	20	55	60	61	36	48	60	56	18
81	98	55	20	73	87	68	62	24	83	94	39
79	88	51	15	50	58	38	58	51	51	49	25
73	85	47	20	50	50	44	55	50	50	33	20
73	82	74	12	45	48	40	41	64	51	45	20
71	97	49	26	68	80	71	58	32	74	94	25
66	91	49	12	43	50	41	39	53	50	58	17
65	91	49	23	51	64	70	44	43	83	98	21
60	100	51	21	80	64	77	55	41	83	104	20
58	89	55	13	47	48	35	53	64	63	57	33
56	93	59	15	67	58	35	55	64	48	48	43
47	107	55	17	69	50	46	60	65	53	55	39
42	109	34	25	77	53	64	65	41	73	85	29
37	123	74	24	82	88	75	65	41	79	109	35
28	104	55	15	48	50	40	55	64	53	50	28

Rank r

-.83 +.07 -.55 -.37 +.06 -.22 -.34 +.17 -.51 -.56 -.45

The hypothesis that female subjects would have scores of IR and PGR R with high negative correlation was borne out ($r = 0.83$ by rank correlation). There was the further hypothesis that Rank Coefficient of Correlation should be high for responses to the various words, run against the data of Herr-Kobler, Cabanski and Williams. This holds true. The coefficient of Herr-Kobler with Williams was 0.90, with Cabanski 0.80 and with the present data 0.78. The correlation of Cabanski with Williams was 0.94, and of Cabanski with the present study 0.87. The correlation of the Williams group with the present study was 0.85 (Table 6).

Table 6

Rank correlations of four studies based on mean response to the 16 emotionally-toned words

	Herr-Kobler	Cabanski	Williams	Hoene
1. open		1	1	1
2. church		4	3	4
3. sick		10	8	12
4. high		6	6	5
5. hospital		5	2	7
6. pain		3	4	2
7. closed		2	5	6
8. trouble		8	7	3
9. afraid		11	10	9
10. sweetheart		12	12	8
11. God		7	9	10
12. ashamed		9	11	11
13. sex		15	15	14
14. sin		13	13	15
15. love		16	14	16
16. breast		14	16	13
HK and W	.90		C and W	.94
HK and C	.80		C and H	.87
HK and H	.78		W and H	.85

Response means in the ranks are ordered from small to large.

Since the female subjects yielded scores on the Internalization Ratio from very high to very low, an analysis of this group in the threefold separation of the low five, middle twelve and the high five subjects, yielded the following correlations: the low IR scoring group with Herr-Kobler, 0.62; the high scoring group with the same, 0.76; the middle group, 0.70; the middle scoring group with Cabanski was 0.91 (Table 7).

Table 7

Subjects grouped as top, middle and bottom,
based on mean PGR ratio scores

22 Women		PGR R	MMPI IR	MMPI AI
Top	5	2.18	0.72	43
Middle	12	0.86	0.90	58
Bottom	5	0.43	1.09	81

and correlated by groups, with Herr-Kobler and
Cabanski groups in PGR mean response to 16 words:

H-K	C	Low	Mid.	High		
1	1	1	2	3		
2	4	8	4	1		
3	10	16	13	7		
4	6	2	7	6	HK and H low	.62
5	5	4	6	10	HK and H mid.	.70
6	3	3	1	4	HK and H high	.76
7	2	5	5	11		
8	8	6	3	2	C and H mid.	.91
9	11	7	10	9	H low and H high	.49
10	12	12	11	5		
11	7	10	9	8		
12	9	11	8	13		
13	15	9	15	14		
14	13	13	12	16		
15	16	14	16	15		
16	14	15	14	12		

These correlations indicate that women as well as men find the sixteen emotionally-toned words, and the whole test, for that matter, geared to their personalities in the same way overall. This is borne out again by the similarity of mean responses where the Herr-Kobler mean was 303, the Cabanski mean, 443, the Williams mean, 342, and the present mean 340 (Table 8).

Table 8

A comparison of the mean PGR values for the sixteen stimulus words as reported in four different studies

Study	Stimulus Word Mean
Herr-Kobler	303
Cabanski	443
Williams	342
Hoene	340

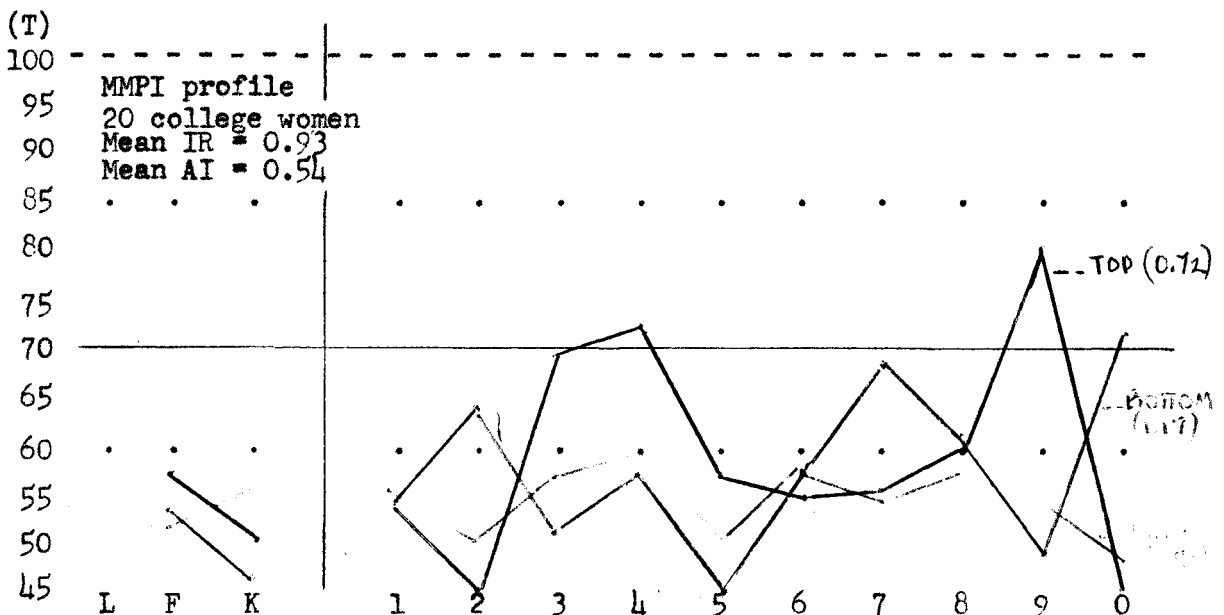
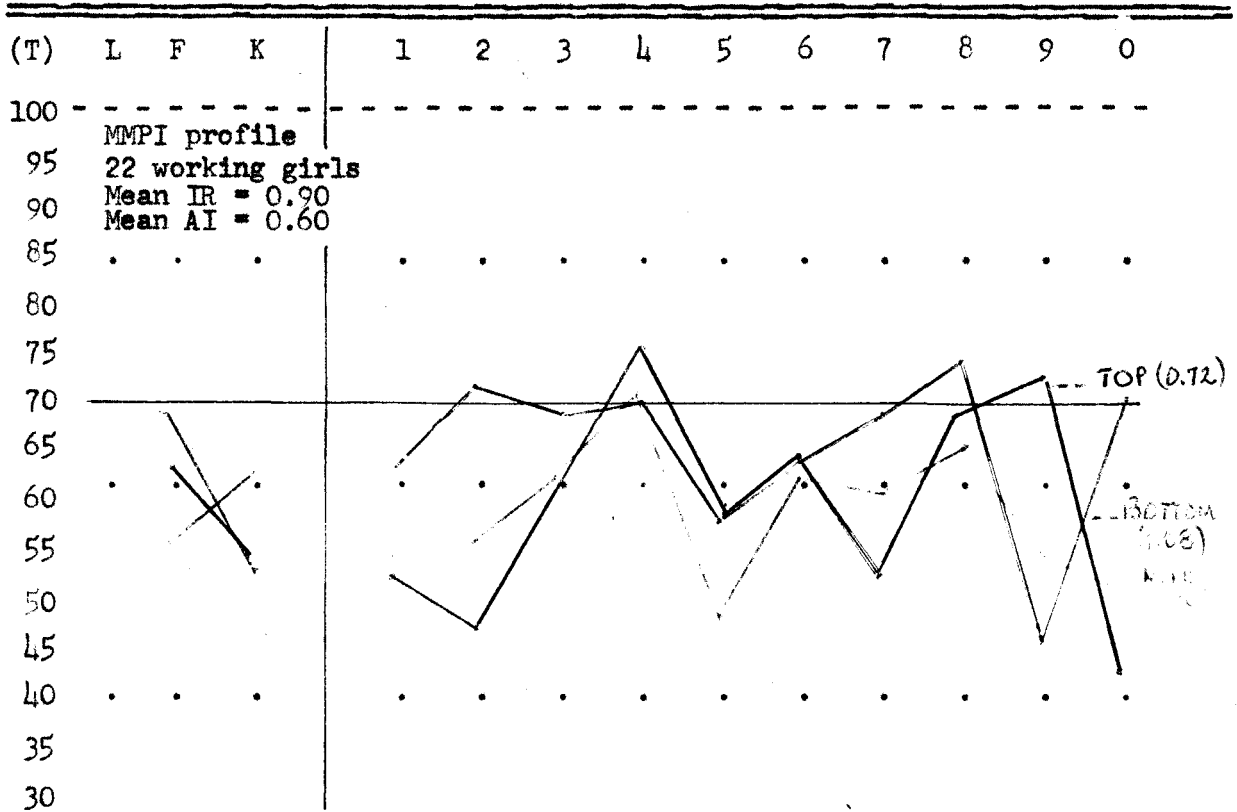
The "neurotics" of the groups for men and women have differing scores; the middle groups are homogeneous through comparison of Cabanski's group with the present and with the reported mean PGR R of 0.81 for the Herr-Kobler normal groups.

With the realization that top and bottom groups of five scored equally on the word pain, a ratio of log PGR to four (not five) words divided by four words was tried. This yielded a series of ratios for

the twenty-two subjects which correlated with the IR at a value of -0.83, the same as did the old ratio series.

A perusal of the peaks on the profiles led the investigator to try a new scale as a substitute for the IR. The study of large numbers of MMPI profiles of women, college students and working girls, showed a high Ma and a low Si score to be associated with the "acting out" IR (low value), and vice versa for the internalizing IR (high value). A selection of twenty profiles from a Loyola University set of MMPI's through matching for the top, middle and bottom scores of the twenty-two women yielded a comparable group (Table 9). When compared for the Ma and Si phenomenon a noticeable similarity appeared. Thus, using a computation of addition for all Ma scores over 50, all Si scores below 50, and subtraction of all Ma scores below 50 and Si's above, a new ratio was developed (here named the Fh Ratio). This correlates -0.83 with the IR Ratios of these subjects. It correlates +0.66 with the Herr-Kobler PGR Ratio, and +0.75 with the new PGR ratio suggested above. The Fh R has the advantage of simple calculation, based on the 9 and 10 scores only, that is, Ma and Si.

Comparison of working girls with college women,
showing similar configurations following similar IR's



CHAPTER VIII

CONCLUSIONS AND DISCUSSION

The hypothesis that the way people handle their emotions be borne out through both MMPI and PGR Tests and that the Internalization Ratio and the Herr-Kobler PGR Ratio show a high correlation was confirmed. The fact that this was high negative correlation, the group tested being women, stood in curious contrast to the re-examination of the Herr-Kobler and Cabanski data with their positive correlation. There is a certain amount of significance in any correlation at all being found; but that men and women would yield reversed Ratio scores while at the same time possessing as a group roughly the same Mean responses brings a person to make an interesting speculation. It would come to something like this: an internalizing man and an externalizing woman (and vice versa) handle their emotions in much the same way. That is, the external manifestation may be diverse, but the emotional tendency of their personality is similar.

Such a speculation may be rather wild. A more ordinary explanation could be found in the differences in emotional tone which words carry, for men and for women. But, one may ask, why do these men and women respond to the MMPI in a similar way -- e. g. the neurotic men and the women of this tendency -- and diversely to the sixteen words as measured in PGR?

A high correlation between the MMPI written test and the PGR test

of response to emotionally-toned words measured through a physical means leads an experimenter to advance more questions. One of these would look to the possibility of the PGR Test as possibly providing a measure of the degree of those tendencies manifested in an MMPI profile. Again, if the Internalization Ratio, which taps six of the scales of the MMPI, can be correlated with the rather brief and straightforward Herr-Kobler PGR Test, then the possibilities of the use of this thirty minute test in conjunction with the clinical setting and procedure bears serious consideration. The fact that experimental psychologists of all times have worked with the psychogalvanometer, at first with enthusiasm and then with dismay, showed that there was some way of gaining a measure of emotional control (or its lack) if only they could put their finger on it. Seemingly the Herr-Kobler PGR Test offers one positive step in this direction. With this in mind, an application of this test to members of religious orders has been projected, with the hope that it may eventually be of use in the screening of candidates for the religious life.

Why is it that the Barron Ego-Strength Scale does not correlate well with the Herr-Kobler PGR Ratio? The MMPI Handbook (p. 305-306) says that the ES "probably best summarizes the available information about the MMPI correlates of control." It appears to the writer that the ES scale, just as the AI, Si, or any single scale, is too narrow. The MMPI Handbook gives a hint in this direction: "As the findings of future research accumulate, it will probably become apparent that dif-

ferent impulses are controlled by separate personality processes, rather than by any single, pervasive self-structure. . . The first break in self-maintenance may be related to the relative strength of impulse in the different emotional areas." (p. 306). Tamkins (1951) found the ES to be a relatively ineffective measure. The Internalization Ratio is very broad in its scope and when supplemented with the Anxiety Index yields an important measure of the personality, specifically in the way a person handles his emotions. One would speculate that had Cabanski and Williams employed this measure of "Anxiety" rather than others, they would have found significant correlation of PGR with MMPI.

A division of this group of twenty-two female subjects into high and low classes of five each, and a middle class of twelve, based upon their scores of the Internalization Ratio (MMPI) yields a high, middle and low group on the basis of their PGR results. This observation is based upon comparisons of the Rank Coefficient of correlation where the group of twenty-two correlated with Herr-Kobler 0.78, with Williams 0.85, and with Cabanski 0.87; but on the basis of "high and low" classes the correlation of the "low" class with Herr-Kobler is 0.62 and the "high" 0.76; conversely the middle group with Cabanski correlated 0.91. This differential would be expected through the fact that the Herr-Kobler MMPI IR (mean) was 1.13, while the Cabanski IR was 0.84. The Cabanski group appears to be normal and fits with the middle group of the twenty-two women, while the Herr-Kobler group was all "neurotic".

Differences were predictable through the calculations of the

IR from the data of Herr-Kobler and Cabanski, the one group being made up of internalizing neurotics while the other must have had a good number of externalizers or persons who "acted out". A difference is evident through the Rank Correlation Coefficients, for the total group correlated highly with Herr-Kobler and Cabanski, while the correlation within the women's group of low against high was only 0.49. That is, this group of twenty-two women have a rather wide range on the continuum.

If this group of twenty-two were men, we would have a conundrum; here we find, starting with the IR scores, that the more neurotic women manifest their emotions in PGR more as the "psychopathic" men do and the "psychopathic" women more as the neurotic men. One might ask, with tongue in cheek, whether the alleged marriage of introverted man with extroverted woman is based on emotional sameness rather than difference. The observation made above, it is true, is founded on a rather small sample of women; the writer will predict, however, that the tendency will become more manifest through further testing of selected groups. The possibilities of developing some sort of masculinity-femininity test presents itself.

The fact that among the twenty-two women were found some who fell in the extremes and middle of the internalizing-externalizing led to a question concerning the normalcy of this group, its comparison with other groups tested in PGR and its association with women's groups and norms. The observation that the K score in MMPI and any six (Pa) and especially eight (Sc) peaks could be uncontrolled variables was made

before testing and could be made after.

The noticeable correlation of the two ratios of MMPI and Herr-Kobler PGR Test should lead to more experimentation and maybe clinical application. If the MMPI reveals emotional tendencies of a given person, the Herr-Kobler PGR Test may be used to measure something of the degree of this tendency. The openness of the latter makes it very easy for a person to reveal his inner self, and very difficult to tell a lie about the manner in which his emotional life operates. Some psychologist might object that the PGR Test can be influenced by the expectancy of the experimenter, but the manner of its presentation and its very real complexity makes such a bias relatively impossible.

Regarding the theories of personality which were outlined in the earlier sections, the tri-dimensional system of Cleckley for overall description and categorizing makes good sense when a person comes to assess the results of the IR PGR R correlations. Welsh's IR already deals with externalizing and internalizing across a continuum, and Cleckley's psychopath stands at an extreme away from the neurotic group at the other extreme, with the "normal" in the center. Consideration of the forces at work to achieve a balance within the normal person demands some such dynamic and consistent theory as Eysenck's latest, and better yet, that of Gasson.

Specific to the problem of the characteristic way that a person handles his emotions is the excellent delineation by Arnold of the basis for emotion. Her stress on the importance of estimation, and her

outline of how, exactly, this bears on emotion has proved a milestone in psychological theory. Following her mention of worthwhile research and the recent studies of Funkenstein and Ax, we might draw on the concept of "anger out" and "anger in" types, and speak of a progression from the more happy, "anger out" individual to the acting-out type, to the conscienceless person, to the psychopath at the extreme. In the center are the persons who have their emotions more or less in balance and who, no doubt, are willing to pay the price of revising their estimates when they find themselves reacting unrealistically. The other end of the continuum begins with the conscientious, moves on to the moody, the internalizing, the self-blaming with definite "anger in", and arrives at the extreme of the psychoneurotic.

The IR measure of Welsh describes these types and gives some calculation. The substitution of the Ma and Si scales and the ratio derived from these appears to be fairly satisfactory. Similarly, social internalization and externalization become apparent. Now the Herr-Kobler PGR Test has sufficient power to measure these same qualities and thus gets to some of the deeper strata of the personality. In addition, this test gives some measure of the degree of emotional involvement. In reading the literature on the PGR, one is struck by the vast amount of experimentation and by the speculation concerning the PGR's measurement of emotion. But one is also faced with the fact that, until the Herr-Kobler test was devised, there was no specific measure, no one test that could specify in any exact way the emotionality involved. Woodworth

ended his section on the PGR by suggesting that it would be our revision of our concept of emotion which might lead to the application of PGR in measuring emotion. No doubt it has been through a revision of concept as to the way emotion operates that has lead to the attempt of this thesis: the correlation of the MMPI in its configural analysis with the PGR ratio. This PGR ratio, based on the differential response, measured by the skin resistance and the autonomic activation, gets at the characteristic way a person responds to the emotionally-toned words and concomitantly to the way he tends to handle his emotions.

CHAPTER IX

SUMMARY

The purpose of this thesis was to seek correspondence between the MMPI and the Herr-Kobler PGR Test. A relationship was suspected between MMPI and PGR since both aim at evaluating the deeper emotional strata of the total personality. Few such correlations had been discovered up to this time. If the connection between the two could be established, the great amount of research on both, it was hoped, might be brought together.

Various theories of personality were discussed, and methods of measurement proposed by theorists were outlined. A general theory, such as that proposed by Gasson, was proposed as more satisfactory, especially in the conception suggested by these words: "The capacities or powers of a human being are hierarchical and active in nature; upon presentation of their specific object, they are capable of initiating action." It was shown that Cleckley's dimensions of personality were not too different from those of Welsh when the latter came to describe the configuration of the MMPI profile as expressed in the internalization ratio. Underlying this analysis is the viewpoint that personality can be conceived of as running along a continuum. Specific experiments as described by Arnold lead to the very modern attempts to measure "anger out" and "anger in" and in some such manner to the description of emotional control.

Research through the use of PGR had frequently pointed to such measurement, but the development of specific tests proved most elusive. The Herr-Kobler PGR Test provides a landmark in the development of a specific measure. The testing of neurotics and normals led these experimenters to the development of a ratio which could be used as an index of neuroticism. The application of this test in the present experiment and the extension of this ratio to the measure of subjects not only somewhat neurotic, but normals, and the seemingly somewhat psychopathic, too, would appear to fit the formulation of Welsh and Cleckley, and if so, the Herr-Kobler test could be used not only as a measure of neuroticism but as a means of insight into the degree and type of emotional control across the whole range of personalities. The correlation was established, through this experiment, of the Herr-Kobler PGR ratio and the Welsh internalization ratio of the MMPI, significant at the 0.01 level. A linear function appeared to be descriptive of the relationship. Through confirmation of the hypotheses of this thesis the MMPI and the PGR have been definitely associated.

BIBLIOGRAPHY

- Abel, T. M. Verbal report in problem solving. J. exp. Psychol., 1930, 13, 47-60.
- Abramowski, E. Recherches experimentales sur la volante. J. de Psychol. norm. et pathol., 1913, 10, 491-508 & 1915, 12, 14-43, 88-118.
- Ader, R. The effects of early experience on subsequent emotionality and resistance to stress. Psychol. Monogr., 1959, 73 (2, whole no. 472), 31 pp.
- Albrecht, E. An experimental investigation of the constancy of psychogalvanic responses and ratios. Master's thesis, Loyola Univer., 1952.
- Albrecht, E. PGR in a threat situation. Doctoral dissertation, Loyola Univer., 1957.
- Alexander, L. Apparatus and method for the study of conditioned reflexes in man. A.M.A. Arch. Neurol. Psychol., 1958, 80, 629-649.
- Allport, G. W. Personality: a psychological interpretation. New York: Holt, 1937.
- Anastasi, A. Psychological testing. New York: Macmillan, 1954.
- Apfelbaum, B. E., and A. C. Sherriffs. Factors influencing ratings of recalled experiences. J. Pers., 1954, 22, 557-564.
- Armington, J.C. An electronic psychogalvanometer for student use. J. Psychol., 1949, 28, 3-7.
- Arnold, M.B. An excitatory theory of emotion. In M.L. Reymert (Ed.), Feelings and Emotions: The Second International Symposium. New York: McGraw-Hill, 1950. Pp. 11-33.
- Arnold, M.B. Physiological differentiation of emotional states. Psychol. Rev., 52, 1945, 35-48.
- Arnold, M.B. Emotion and personality. Vol. 2, Neurological and physiological aspects. New York: Columbia Univer. Press, 1960.

- Aronfreed, J.M., S.A. Messick & J.C. Diggory. Re-examining emotionality and perceptual defense. J. Pers., 1953, 21, 517-528.
- Aronson, A.E. Latency and magnitude of the GSR as related to long and short auditory stimuli. Dissert. Abstr., 1957, 17, 2069-2070.
- Aronson, A.E., J.E. Hind, & J.W. Irwin. GSR auditory threshold mechanisms: effect of tonal intensity on amplitude and latency under two tone-shock intervals. J. speech res., 1958, 1, 211-219.
- Ashby, W.R. & M. Bassett. The effect of prefrontal leucotomy on the psychogalvanic response. J. ment. Science, 1950, 96, 458-469.
- Aveling, F. A better index of conation, including effort and striving, than of feeling and emotion. Internat. Cong. Psychol., 1926, 8, 227-234.
- Ax, A.F. The physiological differentiation of fear and anger in humans. Amer. Psychologist, 1951, 6, 271.
- Bagchi, B.K. & D.A. Greenwald. Electrodermal changes during certain types of attention. J. gen. Psychol., 1937, 17, 235-248.
- Baker, L.M. & W.M. Taylor. The relationship under stress between changes in skin temperature, electrical skin resistance and pulse rate. J. exp. Psychol., 1954, 48, 361-366.
- Bard, P. The neuro-humoral basis of emotional reactions. In C. Murchison (Ed.), Worcester: Harvard Univer. Press, 1934. Pp. 264-311.
- Barron, F. Some test correlates of response to therapy. J. consult. Psychol., 1953, 17, 235-241. (Also reprinted in Welsh, G.S. & W.G. Dahlstrom, Basic Readings.)
- Barratt, E.S. Anxiety and impulsiveness related to psychomotor efficiency. Percept. mot. Skills, 1959, 9, 191-198.
- Bartholomew, A.A., C.M. Franks & E. Marley. Susceptibility to menthylpentynol: eyelid conditioning and PGR response. J. ment. Sci., 1958, 104, 1167-1173.
- Bartlett, R.J. PGR during mental activity. Brit. J. Psychol., 1927, 18, 30-50.
- Bassett, M. & W. R. Ashby. The effect of electroconvulsive therapy on the PGR. J. ment. Sci., 1954, 100, 632-642.

- Bayley, N. A study of fear by means of the psychogalvanic technique. Psychol. Monogr. 1928, 38, 176, 1-38.
- Behr, K., L. Preber & B. P. Siltverskjold. Recording of the skin resistance in thermal and rotory stimulation of the labyrinth. Octa. psychiat. Koh., 1955, 30, 741-748.
- Berry, J. L. & B. Martin. GSR reactivity as a function of anxiety, instructions and sec. J. abnorm. soc. Psych., 1957, 54, 9-12.
- Bierbaum, W.B. Temporal aspects in coditioning the GSR. Dissert. abstr., 1955, 15, 1655.
- Bitterman, M.E. & H. Holtzman. Conditioning and extinction of the galvanic skin response as a function of anxiety. J. abnorm. Psychol., 1952, 47, 615-623.
- Bitterman, M.E. & W. H. Holtzman. Conditioning and extinction of the galvanic skin response in relation to clinical evidence of anxiety. U.S.A.F. Sch. Aviat. Med., 1952, Proj. 21-37-002, rep. 3 v. 232 p.
- Bitterman, M.E., P. C. Reed & A. L. Kubala. The strength of sensory pre-conditioning. J. exp. Psychol., 1953, 46, 178-182.
- Bitterman, M.E., J. Krauskopf & W. H. Holtzman. The GSR following artificial reduction of the basal resistance. J. comp. physiol. Psychol., 1954, 47, 230-234.
- Black, J.D. The interpretation of MMPI profiles of college women. Ph.D. dissertation, University of Minnesota, 1953. (Dissert. abstr., 1953, 13, 870-871.)
- Bloch, V. New aspects of the psychogalvanic method as a criterion of effective tensions. Amer. Psychologist, 1952, 52, 329-362.
- Bloch, V. New researches on the "psychogalvanic " method and its utilization as a criterion of affective tension. Rev. Neurol., 1952, 86, 168-171.
- Block, J.D., F. L. Rouke, M. M. Salpeter, E. Tobach, J. F. Kubis, L. Welch. An attempt at resersal of the truth-lie relationship as measured by the PGR. J. Psychol., 1952, 34, 55-66.
- Block, J. A study of affective responsiveness in a lie-detection situation. J. abnorm. Psych., 1957, 55, 11-15.

- Bordley, J.E. & W. G. Hardy. A study in objective audiometry with the use of a PGR. Ann. Otol., St. Louis, 1959, 58, 751-760.
- Buck, K.W. Traditional and psychogalvanic skin response audiometry. J. speech Res., 1958, 1, 275-278.
- Burdick, H.A. & A. J. Burnes. A test of "strain toward symmetry" theories. J. abnorm. soc. Psychol., 1958, 57, 367-370.
- Cabanski, S. Anxiety index and the Herr-Kobler PGR test. Unpublished master's thesis, Loyola University, 1958.
- Calvin, A.D. & C. Hanley. An investigation of dissimulation on the MMPI by means of the "lie detector". J. appl. Psychol., 1957, 41, 312-316.
- Cardu, B. Physical and psychological factors in the galvanic reflex of the skin. Année Psychol., 1954, 54, 345-356.
- Carpenter, J. A. Effects of alcoholic beverages on skin conductance: an exploratory study. Quart. J. Stud. Alcohol, 1957, 18, 1-18.
- Carter, Homer L. J. A combined projective and PGR technique for investigating certain affective processes. J. consult. Psychol., 1947, 11, 270-275.
- Carter, Homer L. J. A combined oral reading and psychogalvanic response technique for investigating certain abilities in reading of college students. J. appl. Psychol., 1950, 34, 267-269.
- Cattell, R.B. The psychical correlate of the psychogalvanic reflex. Br. J. Psychol., 19, 1929, 357-386.
- Cattell, R.B. Physiological approaches and methods, in Ch. VI, Probes of Character. A Guide to Mental Testing. London: Univer. of London Press, 1936. Pp 258-266.
- Chaiklin, J.B. The conditioned GSR auditory speech threshold and its relationship to selected voluntary auditory speech thresholds. Dissert. abstr., 1958, 19, 883-884.
- Chaiklin, J.B. The conditioned GSR auditory speech threshold. J. speech hear. Res., 1959, 2-229-236.
- Champion, R.A. Studies of experimentally induced disturbance. Austral. J. Psychol., 1950, 2, 90-99.
- Champion, R.A. The calibration of GSR as an indicant of a psychological dimension. Austral. J. Psych., 1951, 3, 99-108.

- Charan, K. K. & R. Goldstein. Relation between EEG pattern and ease of eliciting electrodermal responses. J. speech Disorder, 1957, 22, 651-661.
- Claparede, E. Pourquoi baille-t-on? Intermed. des éducateurs, 1924.
- Clark, J.A. The interpretation of the MMPI profiles of college students' scores. J. Soc. Psychol., 1954, 40, 319-321.
- Clausen, J., Arnljot Gjesvik & Asjorn Urdal. Changes in GSR as indication of pain threshold. J. gen. Psychol., 1953, 49, 261-271.
- Clausen, J., A. Urdal, A. Gjesvik. Relation between GSR and repetition effect in pain stimulation. J. gen. Psychol., 1955, 53, 29-36.
- Cleckley, H. Psychopathic states. In S. Arieti (Ed.), American Handbook of Psychiatry. New York: Basic Books, 1960.
- Clerc, N.A., M. Turner & E. Berard. Electrodermographic, sweat and skin temperature changes provoked by chlorpromazine in man. E.E.G. clin. Neurophysiol., 1956, 8, 35-39.
- Cofer, C. N. The psychogalvanic response as an indicator of emotional reaction to personality test items. Amer. Psychologist, 1948, 3, 303.
- Cofer, C. N., A. J. Judson & D. V. Weick. On the significance of PGR as an indication of reaction to personality test items. J. Psychol., 1949, 27, 347-354.
- Conklin, J. E. Three factors affecting the general level of electrical skin-resistance. Amer. J. Psychol., 1951, 64, 78-86.
- Cook, S.W. & R. E. Harris. The verbal conditioning of the galvanic skin reflex. J. exp. Psychol., 1937, 21, 202-210.
- Coombs, C. N. Adaptation of the galvanic response to auditory stimuli. J. exp. Psychol., 1938, 22, 244-268.
- Cooper, J. B. & H. E. Siegel. The GSR as a measure of emotion in prejudice. J. Psychol., 1956, 42, 149-155.
- Cooper, J.B. & D. N. Singer. The role of emotion in prejudice. J. soc. Psychol., 1956, 44, 241-247.
- Copelman, L. S. The use of psychogalvanic phenomena. Année Psychol., 1951, 51, 53-60.

- Copelman, I.S. New research on the importance of PGR in neuropsychiatry. Ann. med-psych., 1957, 2, 226-230.
- Coppock, H. A test for an assumed property of the hypothetical construct of fear. Proc. Ind. Acad. Sci., 1949, 58, 292.
- Coppock, H. W. Responses of subjects to their own GSR's. J. abnorm. soc. Psychol., 1955, 50, 25-28.
- Coppock, H. W. & R. M. Chambers. GSR conditioning: an illustration of useless distinction between "types" of conditioning. Psychol. Rep., 1959, 5, 171-177.
- Dahlstrom, W. G. & G. S. Welsh. An MMPI Handbook. Minneapolis: Univer. Minnesota Press, 1960.
- Darrow, C. W. Sensory, secretory and electrical changes in the skin following bodily excitation. J. exp. Psychol., 1927, 10, 197-226.
- Darrow, C.W. Differences in the physiological reactions to sensory and ideational stimuli. Psychol. Bull., 1929, 26, 185-201.
- Darrow, C. W. Electrical and circulatory responses to brief sensory and ideational stimuli. J. exp. Psychol., 1929, 12, 267-300.
- Darrow, C. W. Reference to the above. Int. Cong. Psychol., 1929, 9, 136-137.
- Darrow, C. W. PGR: circuits and electrodes. J. gen. Psychol., 1930, 4, 418-420.
- Darrow, C. W. & L. L. Heath. Reaction tendencies relating to personality. In K. S. Lashley (Ed.), Studies in the Dynamics of Behavior. Chicago: Univer. Chicago Press, 1932, 59-261.
- Darrow, C. W. The sweat glands in PGR. J. gen. Psychol., 1932, 7, 261-273.
- Darrow, C. W. The galvanic skin reflex (sweating) and blood pressure as preparatory and facilitative functions. Psychol. Bull., 33, 73-94.
- Darrow, C.W. Neural mechanisms controlling the palmar galvanic skin reflex and palmar sweating: a consideration of the available literature. Arch. Neurol. Psychiat., Chicago, 1937, 37, 641-663.
- Darrow, C.W. The equation of the galvanic skin reflex curve. J. gen. Psychol., 16, 285-309.

- d'Arsonval, A. Remarques a propos de la production d'electricite chez l'homme. C. R. Soc. Biol. Mem., 1888, 40, 142-144.
- Davis, R. C. Factors affecting the galvanic reflex. Arch. Psychol. N.Y., 1930 #115.
- Davis, R.C. Modification of the galvanic reflex by daily repetition of the stimulus. J. exp. Psychol., 1934, 17, 504-535.
- Davis, R. C. Responses to meaningful and meaningless sounds. J. exp. Psychol., 1948, 38, 744-756.
- Davis, R.C. Motor effects of strong auditory stimuli. J. exp. Psychol., 1948, 38, 257-275.
- Davis, R.C. & J. M. Porter. Measuring the GSR. J. gen. Psychol., 1931, 5, 115-120.
- Davis, R.C. & J. E. Kantor. Skin resistance during hypnotic states. J. gen. Psychol., 1935, 13, 62-81.
- Dittes, J.E. Extinction during psychotherapy of GSR accompanying embarrassing statements. J. abnorm. soc. Psychol., 1957, 54, 181-191.
- Dittes, J. E. GSR as a measure of patients' reaction to therapist's permissiveness. J. abnorm. soc. Psychol., 1957, 55, 295-303.
- Dixon, N.F. The effect of subliminal stimulation upon autonomic and verbal behavior. J. abnorm. soc. Psychol., 1958, 57, 29-36.
- Doerfler, L.G. Neurophysiological clues to auditory activity. J. Hearing Disorders, 1948, 13, 227-232.
- Doerfler, L.G. & C. T. McClure. The measurement of hearing loss in adults by GSR. J. speech Hearing Disorders, 1954, 19, 184-189.
- Doerfler, L.G. & J. C. Kramer. Unconditioned stimulus strength and the GSR. J. speech hear. Res., 1959, 2, 184-192.
- Dreher, R. E. The relationship between verbal reports and galvanic skin responses to music. Amer. Psychologist, 1948, 3, 275-276.
- Duffy, E. Emotion: An example of the need for reorientation in psychology. Psychol. Rev., 41, 1934, 184-198.
- Duffy, E. & O. L. Lacey. Adaptation in energy mobilization: changes in general level of palmar skin conductance. J. exp. Psychol., 1946, 36, 437-452.

- Dysinger, D.W. A comparative study of affective responses by means of the impressive and expressive methods. Psychol. Monogr., 1931, 41, 187, 14-31.
- Eckstrand, G. & A. R. Gilliland. The psychogalvanic method for measuring the effectiveness of advertising. J. appl. Psychol., 1948, 32, 415-425.
- Efron, H. Y. Some personality correlates of the learning of the GSR. Dissert. abstr., 1954, 14, 404-405.
- Elliott, D. N. & E. G. Singer. The Paintal index as an indicator of skin resistance changes to emotional stimuli. J. exp. Psychol., 1953, 45, 429-430.
- Ellis, N. R. & W. Sloan. The relationship between intelligence and skin conductance. Amer. J. ment. Defic., 1958, 63, 304-306.
- Eriksen, C.W. Some implications for TAT interpretation arising from need and perception experiments. J. Pers., 1951, 19, 282-288.
- Eriksen, C.W. Perceptual defense as a function of unacceptable needs. J. abnorm. soc. Psychol., 1951, 46, 557-564.
- Eriksen, C.W. Defense against ego-threat in memory and perception. J. abnorm. soc. Psychol., 1952, 47, 230-235.
- Eschenbach, A. E. & L. Dupree. The influence of stress on MMPI scale scores. J. clin. Psychol., 1959, 15, 42-45.
- Essen, K.W. & M. Hansen. Does the GSR remain constant in normal persons and how does it change with physical work? Z. ges. exp. Med., 1940, 107, 590-602.
- Eysenck, H. J. Levels of personality, constitutional factors and social influences: an experimental approach. Int. J. soc. Psychiat., 1960, 6, 12-24.
- Farmer, E. & E. G. Chambers. Concerning the use of PGR in psychological experiments. Br. J. Psychol., 1925, 15, 237-254.
- Felsing, J. M., A. I. Gladstone, H. G. Yamaguchi & C. L. Hull. Reaction latency as a function of the number of reinforcements. J. exp. Psychol., 1947, 37, 214-228.
- Féré, C. Note sur les modifications de la resistance électrique sous

- l'influence des excitations sensorielles et des emotions. C.R. Soc. Biol. Mem., 1888, 40, 217-219.
- Fisher, S. Body image and assymetry of body reactivity. J. abnorm. soc. Psychol., 1958, 57, 292-298.
- Fisher, S. Body reactivity gradients and figure drawing variables. J. consult. Psychol., 1959, 23, 54-59.
- Fisher, S. & J. Abercrombie. The relationship of body image distortions to body reactivity gradients. J. Pers., 1958, 26, 320-329.
- Flanagan, Jr., J. & W. V. Herr. Ascendence-submission and the PGR to mild stress. Psychol. Rep., 1959, 5, 289-292.
- Flanders, N. A. A circuit for the continuous measurement of palmar resistance. Amer. J. Psychol., 1953, 66, 295-299.
- Forbes, T.W. Measuring PGR. Amer. J. Physiol., 1936, 117, 189-199.
- Forbes, T.W. & M. M. Bolles. The Tarchanoff wave. J. Psychol., 1936, 2, 273-285.
- Forbes, T. W. & C. Landis. The limiting A. C. frequency for the exhibition of the PGR. J. gen. Psychol., 1935, 13, 188-193.
- Foulda, G. A. & T. M. Caine. The assessment of some symptoms and signs of depression in women. J. ment. Sci., 1959, 105, 182-189.
- Fraisse, P. & Madeleine Jampolsky. First investigations of the rhythmic induction of PGR and the estimation of duration. Année Psychol., 1952, 52, 363-381.
- Fraisse, P. & V. Bloch. Psychogalvanic activity and speed in a complex sensory-motor test. Acta Psychol., 1957, 13, 127-139.
- Frost, C.F. The relationship between the verbal and galvanic skin responses to the Rorschach Test for Schizophrenic and normal subjects. Dissert. abstr., 1948
- Freeman, G. L. Relationship between performance level and bodily activity level. J. exp. Psychol., 1940, 26, 602-608.
- Freeman, G. L. A method of inducing frustration in human subjects and its influence upon palmar skin resistance. Amer. J. Psychol., 1940, 53, 117-120 a.

- Freeman, G. L. & C. W. Darrow. Insensible perspiration and the GSR. Amer. J. Physiol., 1935, 111, 55-63.
- Freeman, G. L. & E. T. Katzoff. Methodological evaluation of the GSR, with special reference to the formula for deriving the recovery quotient. J. exp. Psychol., 1942, 31, 239-248.
- Frost, C. F. & E. H. Rodnick. The relationship between Rorschach determinants and the concomitant GSR for schizophrenic and normal subjects. Amer. Psychologist, 1948, 3, 277.
- Fujiki, R., S. Sadakata, H. Saito, and K. Endo. Pain and GSR. Folia psych. neur. Jap., 1958, Suppl. 5, 68.
- Funkenstein, D. H., S. H. King and M. Drolette. The experimental evocation of stress. In Symposium on Stress. Div. of Med. Sciences Nat. Res. Council and Army Med. Serv. Grad. School, W. Reed Army Med. Center. Washington, D. C., GPO, 1953.
- Funkenstein, D. H., S. H. King & M. Drolette. The Mastery of Stress, Cambridge: Harvard Univer. Press, 1957.
- Furer, M. & J. D. Hardy. The reaction to pain as determined by the galvanic skin response. Res. Publ. Ass. nerv. ment. Dis., 1950, 29, 72-89.
- Gasson, J.A. Personality theory: a formulation of general principles. In M. B. Arnold & J. A. Gasson (Eds.) The Human Person. New York: Ronald Press, 1954.
- Gildemeister, M. PGR Handbook. Norm. & Path. Physiol., 1928, 8, 657-702; 766-784.
- Girden, E. The GSR "set" and accoustical threshold. Amer. J. Psychol., 1952, 65, 233-243.
- Gladstone, A. I., H. G. Yamaguchi, C. L. Hull & J. M. Felsing. Some functional relationships of reaction potential and related phenomena. J. exp. Psychol., 1947, 37, 510-526.
- Goadby, K. W. & H. E. Goadby. The nervous pathway of the PGR. J. Physiol., 1948, 108, 177-184.
- Goldstein, R., S. B. Polito-Castro, J. T. Daniels. Difficulty in conditioning electrodermal responses to tone in normally hearing children. J. speech hearing Disorders, 1955, 20, 26-34.

- Golin, E. & S. B. Iyerly. The GSR as a test of advertising impact. J. appl. Psychol., 1950, 34, 440-443.
- Golla, F. Electrophysiology in psychiatry. In N. G. Harris (Ed.), Modern Trends in Psychological Medicine. 1948.
- Goodenough, F. L. The use of free association in the objective measurement of personality. In Q. McNemar & M. A. Merrill (Eds.), Studies in Personality, New York: McGraw-Hill, 1942.
- Gordon, J. E., B. Martin & R. M. Lundy. GSR's during repression, suppression and verbalization in psychotherapeutic interview. J. consult. Psychol., 1959, 23, 243-251.
- Gordon, J. J. Some stimulus conditions for the learning of the GSR under different rates of recovery of the GSR. Dissert. abstr., 1955, 15, 1263.
- Gough, H. G. Diagnostic patterns on the MMPI. J. clin. Psychol., 1946, 2, 23-37.
- Grant, D. A. Analysis-of-variance tests in the analysis and comparison of curves. Psychol. Bull., 1956, 53, 141-154.
- Grant, D. A., D. R. Meyer & H. W. Hake. Proportional reinforcement and extinction of the conditioned GSR. J. exp. Psychol., 1950, 43.
- Grant, D. A. & A. S. Patel. Effect of electric shock stimulus upon the conceptual behavior of "anxious" and "non-anxious" subjects. J. gen. Psychol., 1957, 57, 247-256.
- Grant, D. A. & J. J. Schiller. Generalization of the conditioned GSR to visual stimuli. J. exp. Psychol., 1953, 46, 309-313.
- Grant, D. A. & D. E. Schneider. Intensity of the conditioned stimulus and strength of conditioning of the GSR. Amer. Psychologist, 1947, 2, 348.
- Grant, D. A. & D. E. Schneider. Intensity of the conditioned stimulus and strength of conditioning. J. exp. Psychol., 1949, 39, 35-40.
- Greenberg, L. A. & J. A. Carpenter. The effect of alcoholic beverages on skin conductance and emotional tension: wine, whiskey and alcohol. Quart. J. stud. Alcohol, 1957, 18, 190-204.
- Grings, W. W., E. L. Lowell & G. Rushford. Role of conditioning in GSR audiometry with children. J. speech hear. Disorders, 1959, 24, 380-390.

- Grings, W. W. & D. E. O'Donnell. Magnitude of response to compounds of discriminated stimuli. J. exp. Psychol., 1956, 52, 354-359.
- Grings, W. W. & Vsevolod N. Shmelev. Changes in GSR to a single stimulus as a result of training on a compound stimulus. J. exp. Psychol., 1959, 58, 129-133.
- Guertin, W. H. & P. L. Wilhelm. A statistical analysis of the electrodermal response employed in lie detection. J. gen. Psychol., 1954, 51, 153-160.
- Haggard, E. A. Experimental studies of affective processes II on the quantification and evaluation of "measured" changes in skin resistance. J. exp. Psychol., 1945, 35, 46-56.
- Haggard, E. A. On the application of analysis of variance to GSR data: I The Selection of an appropriate measure. J. exp. Psychol., 1949, 39, 378-392; 861-867.
- Haggard, E. A. & W. R. Garner. An empirical test of a derived measure of changes in skin resistance. J. exp. Psychol., 1946, 36, 59-70.
- Haggard, E. A. & R. Gerbrands. An apparatus for the measurement of continuous changes in palmar skin resistance. J. exp. Psychol., 1947, 37, 92-98.
- Haggard, E. A. & H. E. Jones. The comparative discriminatory value of various measures of GSR for words of differing affective value. Amer. Psychol., 1947, 2, 349.
- Haggard, E. A. & W. R. Thompson. Electrodes for measuring the GSR in small animals. Amer. J. Psychol., 1954, 67, 357-358.
- Hall, C. S. & G. Lindzey. Theories of Personality, New York: Wiley and Sons, 1957.
- Hanely, C. N., W. R. Tiffaney & J. Brungard. Skin resistance changes accompanying the sidetone test for auditory malingering. J. speech Res., 1958, 1, 286-293.
- Hansel, C. E. M. Measurement of "group responses". Quart. Bull. Brit. Psychol. Soc., 1951, 2, 6-7.
- Hathaway, S. R. & J. C. McKinley. The Minnesota Multiphasic Personality Inventory Manual. Revised. New York: The Psychological Corporation, 1951.

- Hathaway, S. R. & P. E. Meehl. The MMPI. In Military Clinical Psychology. Department of the Army, Technical Manual, TM 8-242; Department of the Air Force Manual, AFM 160-45, 1951.
- Hathaway, S. R. & E. D. Monachesi. The personalities of pre-delinquent boys. J. crim. Law Criminol. police sci., 1957, 48, 149-163.
- Heinze, H. Adaptability of PGR reflex for the objective measurement of fatigue. Psychol. Beitr., 1955, 2, 98-127.
- Heistad, G. T. Effects of chlorpromazine and electro-convulsive shock on a conditioned emotional response. J. comp. physiol. Psychol., 1958, 51, 209-212.
- Henkin, R. I. The prediction of behavior response patterns to music. J. Psychol., 1957, 44, 111-127.
- Herr, V.V. & F. J. Kobler. A psychogalvanometric test for neuroticism. J. abnorm. soc. Psychol., 1953, 48, 410-416.
- Herr, V. V. & F. J. Kobler. Further study of psychogalvanometric test for neuroticism. J. clin. Psychol., 1957, 13, 387-390.
- Herr, V. V. & F. J. Kobler. Instructions and personality type as related to GSR changes. J. gen. Psychol., 1957, 57, 297-305.
- Hind, J. E., A. E. Aronson & J. W. Irwin. GSR auditory threshold mechanisms: instrumentation, spontaneous response and threshold definition. J. speech Res., 1958, 1, 220-226.
- Hoch, P., J. F. Kubis & F. L. Rouke. Psychogalvanometric investigations in psychoses and other abnormal mental states. Psychosom. Med., 1944, 6, 237-243.
- Holtzman, W. H. & M. E. Bitterman. Adjustment to stress; a factorial study of selected measures. Amer. Psychologist, 1954, 9, 395.
- Hovey, H. B. MMPI profiles and personality characteristics. J. consult. Psychol., 1953, 17, 142-146.
- Hovland, C. I. The generalization of conditioned responses. J. exp. Psychol., 1937, 21, 261-286.
- Hovland, C. I. & A. H. Rieser. Magnitude of galvanic and vasomotor response as a function of stimulus intensity. J. gen. Psychol., 1940, 23, 103-121.

- Howes, D. H. & R. L. Solomon. A note on McGinnis' "emotionality and perceptual defense." Psychol. Rev., 1950, 57, 229-234.
- Hozawa, A. First effects of impressed current. Ar. ges. Physiol., 1928, 219, 111-158.
- Hsu, E. H. A method for isolating presumptive personality profiles from changes in skin conductivity during word association tests. Psychosom. Med., 1951, 13, 260-261.
- Hudgins, C. V. Conditioning and voluntary control of the pupillary light reflex. J. gen. Psychol., 1933, 8, 3-51.
- Hulbert, S. F. Drivers' GSR's in traffic. Percept. mot. Skills, 1957, 7, 305-315.
- Hull, C. L. & J. M. Felsing, A. I. Gladstone, H. G. Yamaguchi. A proposed quantification of habit strength. Psychol. Rev., 1957, 54, 237-254.
- Hussman, Jr., T. A. The relationship between psychogalvanic activity and pilot performance under simulated instrument flying conditions. Dissert. abstr., 1955, 15, 2310.
- Irwin, J.V., J. E. Hind and A. E. Aronson. Experience with conditioned GSR audiometry in a group of mentally deficient individuals. Train. Sch. Bull., 1957, 54, 26-31.
- Iwahara, S., K. Miseki, N. Shiokawa & R. Yoshida. GSR to forced lying and personality traits. Tohoku J. exp. Psychol., 1955, 1 (3), 82-85.
- Jacobs, A. Formation of new associations to words selected on the basis of reaction-time-GSR combination. J. abnorm. soc. Psychol., 1955, 51, 371-377.
- James, H. E. & R. H. Thouless. Study in PGR. Br. J. Psychol., 1926, 17, 49-53.
- Janda, E. J. On the relationship between anxiety and night vision. Ph. D. Diss., Univer. of Michigan, 1951.
- Jeffress, L. A. Galvanic phenomena of the skin. J. exp. Psychol., 1928, 11, 130-144.
- Johnson, W. R. Psychogalvanic and word association studies of athletes. Res. Quart. Am. Assoc. Hlth., 1951, 22, 427-433.

- Jones, H. E. The GSR in infants. Child Devel., 1930, 1, 106-110.
- Jones, H. E. The retention of conditioned emotional reactions in infancy. J. genet. Psychol., 1930, 37, 485-498.
- Jones, H. E. The study of patterns of emotional expression. In M. L. Reymert (ed.), Feelings and Emotions. New York: McGraw-Hill, 1950. Pp. 161-168.
- Jones, H. E. & E. A. Haggard. On the application of analysis of variance to galvanic skin response data. Amer. Psychologist, 1948, 3, 255-256.
- Jones, H. E. & D. Wechsler. Galvanometric technique in studies of association. Amer. J. Psychol., 1928, 40, 607-612.
- Jorgensen, C. A short form of the MMPI. Austral. J. Psychol., 1958, 10, 341-350.
- Jost, H. Some physiological changes during frustration. Child Develop., 1941, 12, 9-15.
- Kehres, P.S. The effect of instructions on the magnitude of the psychogalvanic skin reflex. MA thesis, Loyola Univer., 1956.
- Kennard, M. A. Pain threshold and the galvanic skin response in patients with chronic severe pain. EEG clin. Neurophysiol., 1950, 2, 361.
- Kleitman, N. & A. Ramsaroop. Periodicity in body temperature and heart rate. Endocrinology, 1948, 43, 1-20.
- Kleitman, N. The sleep-wakefulness cycle. Problems of Consciousness, In H. A. Abramson (Ed.), New York: Macy, Jr. Foundation.
- Klubertanz, G. P. The nature of science and the teaching of high school chemistry. J. chem. Educ., 1955, 248-252.
- Knapp, P. H. & B. H. Gold. The galvanic skin response and diagnosis of hearing disorders. Psychosom. Med., 1950, 12, 6-22.
- Knauf, V. H. The effects of cortical ablations in monkeys on the GSR to pure-tone stimulation. Speech Monogr., 1954, 21, 212-213.
- Kubis, J., F. Rockwell, L. Welch & V. Fisichelli. Changes in palmar skin resistance during Rorschach experiments. Amer. Psychologist, 1946, 1, 287.

- Kubis, J. F. Adaption of the psychogalvanic response (PGR) to a visual, auditory and ideational stimulus. Amer. Psychologist, 1948, 3, 256.
- Kuppers, W. Higher mental processes and GSR. Z. exp. ange. Psychol., 1954, 2, 291-320.
- Kushner, M. The effects of experimentally induced stress upon critical flicker frequency palmar skin resistance, and reversible figure fluctuation. Dissert. abstr., 1955, 15, 2583-2584.
- Lacey, O. L. An appropriate unit for the measurement of the level of galvanic skin characteristics. Amer. Psychologist, 1946, 1, 441.
- Lacey, O. L. An analysis of the appropriate unit for use in the measurement of level of galvanic skin resistance. J. exp. Psychol., 1947, 37, 449-457.
- Lacey, O. L. & P. S. Siegel. An appropriate unit for the measurement of the galvanic skin response. Amer. Psychologist, 1947, 2, 349.
- Lacey, O. L. & P. S. Siegel. A simple circuit for the measurement of galvanic skin response and of the level of galvanic skin resistance. Amer. Psychologist, 1947, 2, 398.
- Lacey, O. L. & P. S. Siegel. An improved potentiometric circuit for measuring the galvanic skin response. Amer. J. Psychol., 1948, 61, 272-274.
- Lacey, O. L. & P. S. Siegel. An analysis of the unit of measurement of the GSR. J. exp. Psychol., 1949, 39, 122-127.
- Lacey, O. L., P. S. Siegel & H. Stuckey. The relation of body morphology to galvanic skin conductance and response. Amer. Psychologist, 1948, 3, 329.
- Lacey, O. L., P. S. Siegel & H. S. Siegel. The relation of body morphology to galvanic skin conductance and response. Amer. J. Psychol., 1949, 62, 430-432.
- Landis, C. Review of recent work in PGR. Psychol. Rev., 1930, 37, 381-398.
- Landis, C. Electrical phenomena of the skin. Psychol. Bull., 1932, 29, 693-752.
- Landis, C. & W. A. Hunt. The conscious correlates of the GSR. J. exp. Psychol., 1935, 18, 505-529.

- Landis, C. & T. W. Forbes. PGR in sleep and waking states. Psychiat. Quart., 1933, 7, 107-114.
- Landis, C. & H. N. DeWick. The electrical phenomena of the skin (psychogalvanic reflex). Psychol. Bull., 1929, 26, 64-119.
- Langfeld, H. S. A response interpretation of consciousness. Psychol. Rev., 1931, 38, 87-108.
- Langworthy, O. & C. P. Richter. The influence of efferent cerebral pathways upon the sympathetic nervous system. Brain, 1930, 53, 178-193.
- Lanier, L. H. An experimental study of "affective conflict". J. Psychol., 1941, 11, 199-217.
- Lazarus, R. S. & R. R. McCleary. Autonomic discrimination without awareness: a study of subception. Psychol. Rev., 1951, 58, 113-122.
- Lazarus, R. S., C. W. Eriksen & C. P. Fonda. Personality dynamics and auditory perceptual recognition. J. Pers., 1951, 19, 472-482.
- Learmonth, G. J., W. Ackerly & M. Kaplan. Relationships between palmar skin potential during stress and personality variables. Psychosom. Med., 1959, 21, 150-157.
- Leeper, R. W. A motivational theory of emotion to replace "emotion as disorganized response." Psychol. Rev., 1948, 55, 5-21.
- Lester, D. An automatic range-selector for the continuous registration of skin resistance. Amer. J. Psychol., 1958, 71, 437-441.
- Levy, E. Z., V. H. Thaler & G. E. Ruff. New technique for recording skin resistance changes. Science, 1958, 128, 33-34.
- Levy, J. R. Changes in the GSR accompanying the Rorschach test. Amer. Psychologist, 1948, 3, 335.
- Levy, J. R. Changes in the GSR accompanying the Rorschach test. J. consult. Psychol., 1950, 14, 128-133.
- Lewinsohn, P. M. Personality correlates of duodenal ulcer and other psychosomatic reactions. J. clin. Psychol., 1956, 12, 296-298.
- Liberson, W. T. Research on the skin galvanic response in mental patients. EEG clin. Neurophysiol., 1949, 1, 251.

- Lindsley, D. B. Emotion. In S. S. Stevens (Ed.), Handbook of Experimental Psychology. New York: Wiley, 1957. Pp. 473-516.
- Littman, R. A. Conditioned generalization of the galvanic skin reaction to tones. J. exp. Psychol., 1949, 39, 868-882.
- Longenecker, E. D., J. Krauskopf & M. E. Bitterman. Extinction following alternating and random partial reinforcement. Amer. J. Psychol., 1952, 65, 580-587.
- Lowenfeld, J., S. Rubenfeld & G. M. Guthrie. Verbal inhibition in subception. J. gen. Psychol., 1956, 54, 171-176.
- Mall, G. D. The psychogalvanic reflex. Z. ps. Erganz. bd., 1936, 25, 13.
- Mandler, G., J. M. Mandler & E. T. Uviller. The perception of autonomic activity. J. abnorm. Psychol., 1958, 56, 367-373.
- Marenina, A. I. Electrometric method of dynamic measurement of the resistance of the surface of the skin. Fiziol. Zh. SSSR., 1949, 35, 722-727.
- Marinesco, G., L. Copelman & I. Stanescu. An introductory note to criminal psychology. Anal. Psychol., 1937, 4, 315-317.
- Martin, B. Galvanic skin conductance as a function of successive interviews. J. clin. Psychol., 1956, 12, 91-94.
- Martin, B., R. M. Lundy & M. H. Lewin. Verbal and GSR response in experimental interviews as a function of three degrees of therapist communication. J. abnorm. soc. Psychol., 1960, 60, 234-240.
- Masserman, J. H. Is the hypothalamus a center of emotion. Psychosom. Med., 1941, 3, 3-25.
- McCleary, R. A. & R. S. Lazarus. Autonomic discrimination without awareness: an interim report. J. Pers., 1949, 18, 171-179.
- McCleary, R. A. The nature of the galvanic skin response. Psychol. Bull., 1950, 47, 97-117.
- McClelland, D. C. Personality: an integrative approach. In J. L. McCary (Ed.), Psychology of Personality. New York: Logos Press, 1956.
- McCurdy, H. G. Consciousness and the galvanometer. Psychol. Rev., 1950, 57, 322-327.

- McDowall, R. J. The physiology of the psychogalvanic reflex. Quart. J. exp. Physiol., 1933, 23, 277-285.
- McGinnies, E. Emotionality and perceptual defense. Psychol. Rev., 1949, 56, 244-251.
- McGinnies, E. Discussion of Howes' and Solomon's note on "emotionality and perceptual defense." Psychol. Rev., 1950, 57, 235-240.
- Meehl, P. E. & W. G. Sahlstrom. Discriminating psychotic from neurotic MMPI profiles. J. consult. Psychol., 1960, 24, 5, 375-387.
- Meissner, W. W. Affective response to psychoanalytic death symbols. J. abnorm. Psychol., 1958, 56, 295-299.
- Meritser, C. & L. Doerfler. The conditioned GSR under two modes of reinforcement. J. speech hearing Disorders, 1954, 19, 350-359.
- Merlin, V.S. Experimental method for studying the properties of general types of higher nervous activity in man utilizing skin-galvanic index. Vop. Psikhol., 1958, 4, 159-192.
- Michels, M. W. & C. T. Randt. Galvanic skin response in the differential diagnosis of deafness. Arch. Otolaryng, Chi., 1947, 45, 302-311.
- Miller, C. Consistency of cognitive behavior as a function of personality characteristics. J. Pers., 1954, 23, 233-249.
- Misbach, L. E. Effect of pitch of tone-stimuli upon resistance and cardiovascular phenomena. J. Exp. Ps., 1932, 15, 167-183.
- Mitchell, L. E. The effect of tranquilizing drugs on conditioning rate of GSR in a group of psychiatric patients. Dissert. abstr., 1958, 19, 573.
- Mizushima, K. Changes in galvanic skin conductance and respiration resulting from failure experience. Jap. J. Psych., 1954, 25, 165-173.
- Moeller, G. O., Jr. The role of the CS-UCS interval in conditioning the GSR. Dissert. abstr., 1952, 12, 595-596.
- Moeller, G. O., Jr. The CS-UCS interval in GSR conditioning. J. exp. Psychol., 1954, 48, 162-166.

- Montagu, J. D. The PGR: A comparison of A. C. skin resistance and skin potential changes. J. Neurol. Neurosurg. Psychiat., 1958, 21, 119-128.
- Mundy-Castle, A. C. & B. L. Mc Kiever. The psycho-physiological significance of the GSR. Proc. soc. African Psychol. Assn., 1952, 3, 23.
- Mundy-Castle, A.C. & B. L. Mc Kiever. The psychophysiological significance of the GSR. J. exp. Psychol., 1953, 46, 15-24.
- Munn, N. L. Physiological aspects of feeling and emotion. Psychology, Boston: Houghton-Mifflin Co., 1961. P. 321.
- Mussen, P. H. & H. K. Naylor. The relationship between overt and fantasy aggression. J. abnorm. soc. Psychol., 1954, 49, 235-240.
- Neumann, E. A study of palmar skin resistance. Ph.D. Dissertation, Brown Univer.
- Nichols, R. C. & T. Daroge. An electronic circuit for the measurement of the GSR. Amer. J. Psychol., 1955, 68, 455-461.
- Niimi, Y. & H. Hashimoto. Experimental studies of GSR centered on the unit of measurement and the diminution effect. Jap. J. Psychol., 1953, 24, 29-39.
- Niimi, Y., H. Hashimoto, K. Mochizuki & I. Ohmo. Galvanic skin responses during Rorschach test adm. Jap. J. Psych., 1956, 37, 175-184.
- Nober, E. H. An investigation of the magnitudes of GSR responses that occur with different intensity levels of shock conditioned tone and extinction tone. USN Sch. Aviat. Med. res. Rep., 1958, Jet. Proj. #N.M. 180299, Sub. 1 #75 ii 34 p.
- Noble, C. E. Conditioned generalization of the galvanic skin response to a subvocal stimulus. J. exp. Psychol., 1950, 40, 15-25.
- Notterman, J. M., W. N. Schoefeld, & P. J. Bergh. A comparison of three extinction procedures following heart rate conditioning. J. abnorm. soc. Psych., 1952, 47, 674-677.
- Novak, S., R. Hayes, J. Goodman & L. Welch. The effect of an avoidance situation on the PGR. J. Psychol., 1955, 40, 307-311.

- Novak, S., D. Moriarty, M. Koltuv, & L. Welch. The effect of increased trials on the stability of the PGR in an avoidance situation. J. Psychol., 1956, 41, 243-246.
- Novikova, L. A. & E. N. Sokolov. Investigation of the EEG and the motor and skin galvanic responses in the orienting and conditioned reflexes in man. Zh. vyssh. nervn. Deiatel', 1957, 7, 363-373.
- Obrist, P.A. GSR conditioning and anxiety as measured by basal conductance. Amer. Psychologist, 1958 (a), 13, 524.
- Obrist, P.A. An investigation of the claim of autonomic discrimination without awareness and the relationship of GSR conditioning to measures of skin conductance. Ph.D. Dissertation, Univer. Rochester, 1958 (b).
- O'Connor, W. & P. H. Venables. A note on the basal level of skin conductance and Binet I.Q. Br. J. Psychol., 1956, 47, 148-149.
- Ohira, K. Similarity of the GSR in twins. Jap. J. Psychol., 1956, 27, 15-21.
- Ohira, K. A study on the basic factor of character through the GSR. Jap. J. educ. Psychol., 1958, 5, 110-115.
- Oswald, I. Experimental studies in rhythm, anxiety, and cerebral vigilance. J. ment. Sci., 1959, 105, 269-294.
- Otani, S. Relations of mental set and change of skin resistance to ESP score. J. Parapsych., 1955, 19, 164-170.
- Paintal, A.S. A comparison of the galvanic skin responses of normals and psychotics. J. exp. Psychol., 1951, 41, 425-428.
- Panel, D. M. & B. Martin. The relationship between GSR and speech disturbances in psychotherapy. J. abnorm. Psychol., 1959, 58, 402-405.
- Patterson, E. A qualitative and quantitative study of the emotion of surprise. Psychol Monogr., 1930, 40, #181, 85-108.
- Peterson, F. & C. Jung. Psychophysical investigation with the galvanometer and pneumograph in normal and insane individuals. Brain, 1907, 30, 153-218.

- Porter, J. M., Jr. Adaptation of the galvanic skin response. J. exp. Psychol., 23, 553-557.
- Prideaux, E. The psychogalvanic reflex, a review. Brain, 1920, 43, 50-73.
- Prideaux, E. Circuits and electrodes. Br. J. Psych. Med. Sec., 1921, 2, 23-46.
- Proctor, P.W. The GSR as a function of difference between individual reading achievement and class reading achievement: a comparative study of the amplitude and frequency of the GSR of children in a reading situation who have reading ability below, equal to, and above the average for their class. Dissert. abstr., 1953, 13, 354-355.
- Pryer, R.S. & N. P. Ellis. Skin conductance and autonomic ability as a function of intelligence in mental defectives. Amer. J. ment. Defic., 1959, 63, 835-838.
- Pumroy, D.K., & W. S. Kogan. A validation of measures that predict the efficacy of shock therapy. J. clin. Psychol., 1958, 14, 46-47.
- Rankin, R.E. & D. T. Campbell. Galvanic skin resistance to negro and white experimenters. J. abnorm. soc. Psych., 1955, 51, 30-33.
- Rao, S. Psychogalvanic reflex and its application to crime detection. Indian J. Psych., 1946, 21, 46-55.
- Raphelson, A.C. The relationships among the imaginative direct verbal and physiological measures of anxiety in an achievement situation. J. abnorm. soc. Psych., 1957, 54, 13-18.
- Redlich, F.C. Organic and hysterical anesthesia: a method of differential diagnosis with the aid of GSR. Amer. J. Psychiat., 1945, 102, 318-324.
- Renzaglia, G.A. Some correlates of the self-structures as measured by an index of adjustments and values. Ph.D. Dissertation, Univer. Kentucky, 1952. Dissert. abstr., 1952, 12, 784-785.
- Richter, C.P. The significance of changes in the electrical resistance of the body during sleep. Proc. Natl. Acad. Sci., 1926, 12, 214-222.

- Richter, C.P. Physiological factors involved in the electrical resistance of the skin. Amer. J. Physiol., 88, 596-615 (a).
- Richter, C.P. The sympathetic exerts a tonic influence on sweat gland of the palm, and it can also arouse them to momentary spurts of greater activity. John Hopkins Hosp. Bull., 1929, 45, 56-74 (b).
- Richter, C.P. & B. G. Woodruff. Facial patterns of electrical skin resistance; their relation to sleep, external temperature, hair distribution, sensory dermatones, and skin disease. John Hopkins Hosp. Bull., 1942, 70, 442-459.
- Richter, C. P., B. G. Woodruff & B. C. Eaton. Hand and foot patterns of low electrical skin resistance: their anatomical and neurological significance. J. Neurophys., 1943, 6, 417-424.
- Rigby, M. K., E. D. Ossorio & J. W. Lingner. Attitude characteristics of women serving in the Navy and Marine Corps. Dept. Psychol. Tech. Rep. #10, St. Louis Univer., 1958, 50 pp.
- Rockwell, F.V., L. Welch, J. Kubis & V. Fisichelli. Changes in palmar skin resistance during the Rorschach test. II. The effect of repetition with color removed. Psychiat. Neurol., 1948, 116, 321-345.
- Rosenblat, B., R. S. Bilger & R. Goldstein. Electrophysiologic responses to sound as a function of intensity, EEG pattern and sex. J. speech hear. Res., 1959, 2, 28-39.
- Rouke, F. L. & J. F. Kubis. Studies of the detection of deception: determination of guilt or innocence from psychogalvanic records of delinquent and non-delinquents. Amer. Psychologist, 1948, 3, 255.
- Ryan, A. H. & E. L. Ranseen. Skin resistance during a standard period of controlled muscular activity as a measure of physical fitness and fatigue. Amer. J. Physiol., 1944, 142, 68-79.
- Schiff, E., C. Dugan & L. Welch. The conditioned PGR and the EEG as indicators of anxiety. J. abnorm. soc. Psychol., 1949, 44, 549-552.
- Schlosberg, H. & W. C. Stanley. A simple test of the normality of 24 distributions of electrical skin conductance. Science, 1953, 117, 35-37.
- Schlosberg, H. Three dimensions of emotion. Psychol. Rev., 1954, 61, 81-88.

- Schoonhoven, G. O. PGR, blood pressure and pupil diameter. Ma. thesis, Columbia Univer., 1925.
- Schwartz, M. M. GSR accompanying the Picture-Frustration study. J. clin. Psychol., 1957, 13, 382-387.
- Sears, A. B. & J. M. Beatty. A comparison of the GSR in the hypnotic and waking state. J. clin. exp. Hypnosis, 1956, 4, 49-60.
- Sears, R. R. An experimental study of hypnotic anesthesia. J. exp. Psychol., 1932, 15, 1-22.
- Sears, R. R. Psychogalvanic response in arithmetical work. Arch. Psychol. 1933, 155, 292.
- Seward, J. P. & G. H. Seward. The effect of repetition on reaction to electric shock. Arch. Psychol., 1934, #168.
- Seymour, R.B. Personality correlates of electrodermal resistance and response. Ph.D. Thesis, Univer. California, 1950.
- Shackel, B. Diminishing the zero drift in recording D.C. from the human body surface. Quart. J. exp. Psychol., 1957, 9, 109-110.
- Shackel, B. Skin-drilling: a method of diminishing galvanic skin potentials. Amer. J. Psychol., 1957, 72, 144.
- Shaklee, A.B. Measurement of cutaneous electrical thresholds in animal research. Amer. J. Psychol., 1957, 70, 624-627.
- Sherman, M. & H. Jost. Frustration reactions in normals and neurotic persons. J. Psychol., 1942, 13, 3-19.
- Shirokov, A. A. The galvanic skin reflex in neurosis. Sovetsk. Psikhonevrol., 1937, 4, 62-72.
- Shock, N.W. & C. H. Coombs. Changes in skin resistance and affective tone. Amer. J. Psychol., 1937, 49, 611-620.
- Shteingart, K. M. Method of studying the skin galvanic reflexes by means of a new registration device. Zh. vyssh. neron. Deiatel'., 1955, 5 (5), 756-758.
- Sidio, B. & L. Nelson. The nature and causation of the galvanic phenomena. Psychol Rev., 1910, 17, 98-146.

- Silkett, A. F. & M. A. Driscoll. Simple circuit for measuring variations in electrical resistance of a human being under emotional stress. Trans. Ill. Acad. Sci., 1949, 42, 128-129.
- Silverman, J. J. & V. E. Powell. Studies on palmar sweating. I. A technique for the study of palmar sweating. Amer. J. med Sci., 1944, 208, 297-305.
- Silverman, R. E. Eliminating a conditioned GSR by the reduction of experimental anxiety. J. exp. Psychol., 1960, 59, 122-125.
- Sines, J. O. Conflict-related stimuli as elicitors of selected physiological responses. J. proj. Tech., 1957, 21, 194-198.
- Smith, R.A. An investigation of the relationship between physiological and cognitive measures to the affective response to color. Dissert. abstr., 1958, 19, 873.
- Smith, W. The Measurement of Emotion. London: Paul, 1922.
- Sokolov, E. N. & M. B. Mikhalevskaja. Study of the indications of thresholds reactions produced by signaling photic stimuli. Vop. Psckhol., 1959, 5 (3), 78-90.
- Stanley, W. C. & H. Schlosberg. The psychophysiological effects of tea. Dissert. Psychol., 1953, 36, 435-448.
- Starch, D. Mental processes and concomitant galvanometric changes. Psychol. Rev., 1910, 17, 19-36.
- Staudt, V. & J. Kubis. The psychogalvanic response and its relation to changes in tension and relaxation. J. Psychol., 1948, 25, 443-453.
- Steinberg, A. An experimental investigation of the relation of GSR to Rorschach shock. Ph.D. Thesis, Boston Univ., 1949.
- Stevens, S. S. Mathematics, measurement, and psychophysics. In S. S. Stevens, (Ed.), Handbook of Experimental Psychology, New York: Wiley, 1951 (b). Pp. 1-49.
- Stewart, K. C. A new instrument for detecting the GSR. J. speech hear. Disorders, 1954, 19, 169-173.
- Stewart, K. C. Some basic considerations in applying the GSR technique to the measurement of auditory sensitivity. J. speech hear. Disorders, 1954, 19, 174-183.

- Stewart, M.A., G. Winokur, J. A. Stern, S. B. Goze, E. Pfeiffer, and F. Hornung. Adaptation and conditioning of GSR in psychiatric patients. J. ment. Sci., 1959, 105, 1102-1111.
- Stukat, K. B. Suggestability: a factorial and experimental analysis. Almqvist and Wiksell, 1958, 248 pps., Sw. ki. 25, Stockholm.
- Sutton, J. T. Verbal learning, palmar skin conductance and response latency as a function of interlist stimulus similarity and warming-up. Dissert. abstr., 1958, 18, 2232.
- Switzer, S.A. Disinhibition of the conditioned galvanic skin response. J. genl. Psychol., 1933, 9, 77-100.
- Syz, H.C. Observations on the unreliability of subjective reports of emotional reactions. Br. J. Psychol., 1926, 17, 119-126 (b).
- Syz, H. C. & E. F. Kinder. Electrical skin resistance in normal and psychotic subjects. Arch. neu. Psychiat., 1928, 19, 1026-1035.
- Tamkin, A. S. An evaluation of the construct validity of Barron's Ego-Strength Scale. J. clin. Psychol., 1957, 13, 156-158.
- Tarchanoff, J. Ueber die galvanischen Erscheinungen in der Haut des Menschen bei Reizungen der Sinnesorgane und bei verschiedennnen Formen der psychischen Thatigkeit. Pflug Arch. ges.Phys., 1890, 46, 46-55.
- Taylor, J. A. A personality scale of manifest anxiety. J. abnorm. soc. Psychol., 1953, 48, 285-290.
- Taylor, W. M. Comparison of galvanic after-changes with skin temperature changes following emotion provoking stimuli. Ms. Thesis, Purdue Univer., 1950.
- Terekhova, O. P. The orienting reflex in a conditioned motor reaction to a complex stimulus. Vop. Psikhol., 1958, 4, (1), 87-96.
- Thetford, W. N. The measurement of physiological responses to frustration before and after non-directive psychotherapy. Unpublished doctor's dissertation, Univer. Chicago, 1949.
- Thetford, W. N. An objective measurement of frustration tolerance in evaluating psychotherapy. In W. Wolff and J. A. Precker (Eds.). Success in Psychotherapy, Pers. Monogr., 1952, 3, 26-62.
- Thiesen, J. W. & R. K. Meister. A laboratory investigation of measures of frustration tolerance of pre-adolescent children. J. genet.

Psychol., 1949, 75, 277-291.

Thouless, R. H. The PGR as preparedness to react. Br. J. Psychol., 1925, 16, 5-15.

Thouless, R. H. The PGR and the polarization theory. Internatl. Cong. Psychol., 1929, 9, 432-433.

Thouless, R. H. The techniques of experimentation of the psychogalvanic reflex phenomenon. Br. J. Psychol., 20, 219-240 & 309-321.

Traxel, W. About the time measure of the PGR. Z. Psychol., 1957, 161, 282-291.

Traxel, W. & G. Wrede. Changes in GSR while listening to music. Z. exp. angew. Psychol., 1959, 6, 293-309.

Truax, C. B. The repression response to implied failure as a function of the hysteria-psychasthenia index. J. abnorm. soc. Psychol., 1957, 55, 188-194.

Trueblood, H. & W. Grings. A DC amplifier for GSR and low-frequency potential measurement. J. Psychol., 1950, 30, 401-403.

Turner, M. The electrodermogram as a technique of study of the emotional periferic answer, the PGR. Rev. Neuro-Psiquiat, Lima, 1954, 17,

Turner, M., E. Berard, N. Turner, N. Franco. Electroencephalographic, electrographic and electromyographic changes provoked by chlorpromazine in man. EEG clin. Neuropsych., 1956, 8, 25-34.

Uhlenkruth, P. Measurement of PGR and vasoconstriction. Z. Biol., 1924, 81, 51-56.

Urano, F. & A. Tago. A study on the measurement of the psychogalvanic reflex. Jap. J. Psychol., 1954, 25, 118-124.

Vail, C. M. Some verbal behavior correlates of the learning of the GSR: a study in the psychology of language with special emphasis on time pattern in spontaneous verbal expression. Dissert. abstr., 1955, 15, 539.

Van de Castle, R. L. The relationship of anxiety and repression to perceptual predominance of threatening stimuli. Ph.D. dissert., Univer. North Carolina, 1958.

- Van der Valk, J. M. & J. Groen. Electrical resistance of the skin during induced emotional stress. Psych. Med., 1950, 12, 303-311.
- Van der Valk, J. M. & J. Groen. An investigation of the electrical resistance of the skin during induced emotional stress in normal individual and in patients with internal diseases. Res. Publ. Ass. nerv. ment. Dis., 1950, 29, 279-296.
- Veinger, R.A. On the arousal of the skin-galvanic reflex with visual and auditory stimulations in children in postnatal ontogenesis. Fiziol. Zh. SSSR, 1950, 36, 653-657.
- Venables, P. H. The relationships between PGR scores and temperature and humidity. Quart. J. exp. Psychol., 1955, 7, 12-18.
- Venables, P. H. Some findings on the relationship between GSR and motor task performance. J. gen. Psychol., 1956, 55, 199-202.
- Veraguth, O. Das psychogalvanische Reflexphanomen. Kong. exp. Psychol., Ber., 1906, 2, 219-224.
- Vigouroux, R. PGR in hyperthyroidism. Soc. Biol. C. R., 1879, 31, 336-339.
- Vinar, O. Analogies between schizophrenic illnesses and the L.S.D. 25 psychosis. Psychiat. neurol. med. Psychol., Leipzig, 1958, 10, 162-166.
- Wagner, H. N., Jr. Objective testing of vision with use of the GSR. Arch. Ophthal., Chi., 1950, 43, 529-536.
- Waller, A. D. Concerning emotive phenomena. I. Periodic variations of conductance of the palm of the human hand. II. The influence of drugs upon the electrical conductivity of the palm of the hand. R. soc. Lond. Proc. B., 1919, 91, 17-31.
- Walter, W. G. The Living Brain. New York: W. W. Norton, 1953.
- Wang, G. H. & T. W. Lu. PGR and motor area stimulation of cats. Chinese J. Physiol., 1930, 4, 174-182; 303-326.
- Wang, G. H., P. Stein & V. W. Brown. Effects of transections of central neuraxis of GSR in anesthetized cats. J. Neurophysiol., 1956, 19, 340-349.

- Wang, G. H., P. Stein & V. W. Brown. Brainstem reticular systems and GSR in acute decerebrate cats. J. Neurophysiol., 1956, 19, 350-355.
- Wang, G. H. & C. P. Richter. Action currents from cats foot produced by stimulation of tuber cinerium. Chinese J. Physiol., 1928, 2, 279-284.
- Wang, G. H., J. G. Pan & T. W. Lu. The GSR in normal thalamic decerebrated and spinal cats under anaesthesia. Chinese J. Physiol., 1929, 3, 109-122.
- Wang, G. H. Changes in GSR after acute spinal transection in normal and decerebrate cats. J. Neurophysiol., 1956, 19, 446-451.
- Wang, G. H. The GSR: A review of old and recent works from a physiologic point of view. Amer. J. physiol. Med., 1957, 36, 295-320.
- Wang, G. H. & V. W. Brown. Terminal rebound of GSR in anesthetized cats. J. Neurophysiol., 1957, 20, 340-346.
- Warn, L. J. A comparative investigation of dependency in epilepsy, paraplegia and tuberculosis. Ph.D. dissert., Univer. California, 1958.
- Wechsler, D. The measurement of emotional reaction. Arch. Psychol., 1925, #76.
- Weisgerber, C. A. Conscious perseveration and the persistence of autonomic activity as measured by recovery from the psychogalvanic response. J. gen. Psychol., 1951, 45, 83-93.
- Weisgerber, C.A. The relationship of perseveration to a number of personality traits and to adjustment. J. gen. Psychol., 1954, 50, 3-13.
- Welch, L. & J. Kubis. Conditioned PGR in states of pathological anxiety. J. nerv. ment. Dis., 1947, 105, 372-381.
- Welsh, G.S. An anxiety index and an internalization ratio for the MMPI. J. consult. Psychol., 1952, 16, 65-72.
- Welsh, G.S. Factor dimensions A and R. In G. S. Welsh and W. G. Dahlstrom (Eds.), Basic Readings on the MMPI in Psychology and Medicine. Minneapolis: Univer. Minn. Press, 1956.
- Wells, F. L. & A. Forbes. On certain electrical processes in the human body and their relations to emotional reactions. Arch. Psychol., 1911, #16.

- Wells, H. M. A note on the psychological significance of the psychogalvanic reaction. Br. J. Psychol., 1924, 14, 300-308.
- Wenger, M. A. & J. C. Gilchrist. A comparison of two indices of palmar sweating. J. exp. Psychol., 1948, 38, 757-761.
- West, L. J., K. C. Niell & J. D. Hardy. Effects of hypnotic suggestion on pain perception and GSR. AMA Arch. neurol. Psychol., 1952, 68, 549-560.
- Wheeler, W. M., K. B. Little & G. F. J. Lehner. The internal structure of the MMPI. J. consult. Psychol., 1951, 15, 134-141.
- Whelan, F. G. An instrument for use in measuring electrical resistance of the skin. Science, 1950, 3, 496-497.
- White, C. T. & H. Schlosberg. Degree of conditioning of the GSR as a function of the period of delay. J. exp. Psychol., 1952, 43, 357-362.
- Wickens, D. D., H. M. Schroder & J. D. Snide. Primary stimulus generalization of the GSR under two conditions. J. exp. Psychol., 1954, 47, 52-56.
- Wiener, G., M. M. Salpeter, E. Tobach, E. Wineburg & L. Welch. The effect of the experimental situation on the amplitude of the psychogalvanic response in humans. J. gen. Psychol., 1952, 47, 213-225.
- Wilcott, R. C., C. W. Darrow & A. Siegel. Uniphasic wave forms of skin potential response. J. compar. Physiol., 1957, 50, 217-219.
- Williams, G. Manifest anxiety scale and the Herr-Kobler PGR Test. Ma. Thesis, Loyola Univer., Chicago, 1960.'
- Woodworth, R. S. Experimental Psychology. New York: Holt, 1938.
- Woodworth, R. S. & H. Schlosberg. Experimental Psychology. (rev. edit.) New York: Holt, 1954.
- Yamaguchi, H. G., C. L. Hull, J. M. Felsing & A. E. Gladstone. Characteristics of dispersions based on the pooled momentary reaction potentials of a group. Psychol. Rev., 1948, 55, 216-238.

A comparison of the significant differences in the means and the Standard Deviations for PGR responsiveness in two groups of normal and neurotic subjects to a selected list of emotionally-toned words. (Herr-Kobler, 1953).

Word	Normal N=20		Neurotics N=20		Mean Diff.	t*	SD Diff.	t**
	Mean	SD	Mean	SD				
Sick	338	151	297	201	-4	0.71	+50	1.23
High	258	137	301	218	+43	0.74	+81	1.94
Love	468	178	457	240	-11	0.16	+62	1.28
Afraid	348	133	318	212	-30	0.52	+79	1.98
Sin	386	158	391	248	+5	0.07	+80	1.65
Closed	214	124	298	264	+84	1.26	+140	3.02
Hospital	240	132	231	178	-9	0.18	+46	1.28
Ashamed	317	193	284	185	-33	0.54	-8	0.18
Sex	403	173	386	236	-17	0.25	+63	1.33
Open	126	94	154	171	+28	0.63	+77	2.43
Pain	218	137	290	238	+72	1.14	+101	2.27
God	258	178	369	212	+111	1.75	+34	0.76
Sweetheart	360	209	306	209	-54	0.80	0	0.00
Trouble	308	202	254	285	-54	0.67	+83	1.46
Church	231	155	163	170	-68	1.29	+15	0.41
Breast	394	198	368	300	-26	0.32	+102	1.75
Mean	303		305		02			

t* of 2.71 significant at 1 per cent level.

t** of 2.02 significant at 5 per cent level.

APPROVAL SHEET

The thesis submitted by Robert E. Hoene, S.J. has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the dissertation is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

Jan 22 1967
Date -

Vincent J. Hen
Signature of Adviser