AN EXPERIMENTAL INVESTIGATION OF THE RELATION OF PALMAR SWEAT TO RORSCHACH COLOR SHOCK

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PREFACE

With the increased emphasis in recent years on mental health and the increased graduate training in psychology and psychiatry there has been a greater demand not only for more clinical tests in order to facilitate more rapid treatment but also a demand for more research and experimental work on the tests already in use. It is felt that if these tests hold up under rigid experimental conditions they can, and will, be used with greater confidence in therapeutic situations. If they do not hold up then perhaps their faults will be discovered and through these weaknesses new, stronger, and more valid tests can be developed.

The Rorschach Ink-blot test is one such clinical tool that has been under fire for some time because of the lack of experimental investigation to which it has been subjected. The following experiment was an attempt to help correct this situation.

Without the generosity of Dr. Roy Gladstone with his time and his own equipment, which I used unsparingly, this problem would have proved impossible. I wish to express my gratitude not only for the above but also for his interest in helping me formulate the problem and his guidance as the experiment progressed.

I also wish to thank Dr. S. L. Reed for making the space and equipment of the Psychology department available to me at any time, and Dr. Wm. Coffman for his assistance in the statistical treatment.

The Chemistry, Physics, and Electrical Engineering departments of Oklahoma A and M College also deserve mention for their interest in the problem and loan of equipment.

Lastly, to my colleague, Mr. Robert Curnutt, who carried much of the load of administering and scoring the tests I owe my sincere gratitude.

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CHAPTER I

REVIEW OF THE LITERATURE

A. The Rorschach Ink-blot Test.

In 1921 Herman Rorschach published his Psychodiagnostik which was the first systematic use to be made of ink blots.[1] This test is now referred to as a "projective technique", a method which faces the subject with a relatively "unstructured" situation in which his responses are not determined by the external stimulus and therefore must depend upon inner conditions. This fact the Rorschach test has in common with all other projective techniques; the subject must organize the situation; the meaning must be projected from his own mind. But in this projection "the interest is not so much in what the subject sees as in his method of handling the stimulus material."[2] It is this "method of handling" that allows the responses to be categorized and makes for whatever objectivity the test has. Inherently, it is not as objective as certain paper-and-pencil type tests but it does have "one intrinsic superiority to the word-association, interview, and questionnaire procedures; that in the purely verbal techniques conscious control and concealment are

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[1] The use of ink blots was initiated by Kermer and later referred to by Rosenzweig. See Tulchin, S. H., The Pre-Rorschach Use of Ink Tests, Rorschach Research Exchange, 8(1940), pp. 1-7, and also Rosenzweig's A Note on Rorschach Pre-History, Rorschach Research Exchange, 8(1944), pp. 41-42.

[2] Klopfer and D. M. Kelley, The Rorschach Technique, p. 4.

easier. In this case, the subject cannot discern what he ought to say; logic is of no assistance. What he produces must come from within himself, not from the world of external reality."[3]

The above is the usual description of the Rorschach technique as is the following statement by Ruch concerning a particular aspect of the test, "Subjects react to the color in the blots in a manner similar to their emotional response to their environment."[4] In reference to this response to color there are indications that even in remote times in the development of culture the relation of color to affectivity was sensed.[5] This relationship has been investigated by Howenstine who states that warm colors like red and orange are usually stimulating but may be either agreeable or disagreeable. They tend to cause greater muscular tension and thus increase blood pressure, pulse, and circulation rates while cool colors are usually restful and act in an opposite direction.[6] Indeed, one scientist claims that yellow and purple have the best effect on human metabolism.[7] Symbolically, colors also are said to take on certain meanings. Red represents blood, health, tragedy,

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[3] Stagner, R., Psychology of Personality, p. 48.

[4] Ruch, F. L., Psychology and Life, p. 557.

[5] Beck, S. J., Rorschach's Test, I, p. 113.

[6] Howenstine, M. V., unpublished Master's Report, Oklahoma A and M College, 1949.

[7] Psychology of Color, Design, Vol. 43, March 1942, p. 28.

anger, love, shame, revolution--all strong emotions. Black represents woe, gloom, dread and death.[8] In the field of mental and physical activities Pressy found that after subjecting a person to a given color for five minutes he could detect differences in the effects of the various colors upon certain activities such as tapping, memory, and mental work.[9] In this study he found that the same subject might respond differently to different colors and different subjects might respond differently to the same color.

This relationship between color and affectivity Rorschach made use of and by experimentation obtained an index of that portion of personality concerned with emotional living.[10] Naturally there are great individual differences in the reactions to the colored cards but "whether the color is exhilarating or shocking, it always seems a force which tends to get the subject away from a purely formal, impersonal matter-of-fact handling of the Rorschach situation."[11] With the above in mind most workers in the field arrive at the hypothesis "that the subject's reaction to the coloring or shading of the blot reflects closely his general emotional reaction to outer reality."[12]

But the question "Do they really react in this manner?" can still be raised. We know that an emotional response has three observable

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[8] Howenstine, op. cit., p.8.

[9] Hachiesh, Matthew, The Language of Color, Part III, p. 161.

[10] Beck, op. cit., p. 113.

[11] Klopfer, op. cit., p. 205.

[12] Ibid., p. 281.

components: internal, or organic, reaction, expressive movements, and some variety of feeling tone which must be observed introspectively.[13] The second criterion, that of expressive movements, a careful administrator of the Rorschach can observe during the normal testing procedure; the third criterion, that of feeling tone, must be gained, if at all, from the subject himself through his various responses to the individual cards and to the test as a whole; but the first criterion, that of internal, or organic, reactions is an area that has been left until recently without verification.

In the last two years at least two studies have been conducted in which attempts have been made to examine the reaction of the autonomic nervous system in relation to the Rorschach. The first, conducted at Cornell, investigated the PGR during the administration of the Rorschach in an attempt to determine if the PGR of those who showed color shock was significantly different from those who did not. In general they found that the skin resistance of those with "shock" did not lower as much as those without "shock" which they interpreted as indicating that those persons showing "shock" were not as capable of organizing their defense mechanisms as the normal group. In a different place they state that the "shock" is a manifestation of a neurotic trend and that the neurotic's defenses are continually in such a high state of defensive agitation an increase is almost impossible.[14] The second conclusion

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[13] Guilford, J. P., General Psychology, p. 297.

[14] Rockwell, Fred V., et al, "Changes in Palmar Skin Resistance during the Rorschach Test, II. The Effect of Repetition with Color Removed," Monatsschrift fur Psychiatrie and Neuologie, (1948), 115-116.

would seemingly invalidate the first.

The second study, that of Steinberg, contradicts the findings of Rockwell et al. Steinberg also used the PGR (GSR) in his investigation of Rorschach shock but his "shock" groups differed significantly from the control or non-shock group in that their GSR showed a significant decrease in resistance.[15] From an experimental point of view Steinberg's study seems to be more valid and will be treated in greater detail later.

This study will deal with one of the two categories of Rorschach interpretation that seem to have the most intense emotional elements. These two are "color shock" and "shading shock."[16] When the subject is presented with the colored cards he may present a variety of responses but usually the responses can be grouped under rather definite types. "Many subjects experience this intrusion (of colored cards among uncolored ones) very vividly. Some are shocked by it,[17] some delighted, some grow increasingly annoyed as these stimuli accumulate."[18] Color shock, the category that will concern this study, is indicative of emotional instability in dealing with the outer environment and especially social contacts. Concerning the relation between color and emotion on the test Klopfer states that "Whether the color is exhilarating or shocking the responses represent not only the general readiness of the subject to establish a relationship with the world around him, but it seems to

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15 Steinberg, Arthur, "An Experimental Investigation of the Relation of Galvanic Skin Response to Rorschach Shock," unpublished Phd. dissertation, Boston University, 1949.

16 Steinberg did not find the significant differences with "shading shock" that he did with color.

17 My underlining.

18 Klopfer, op. cit., p. 281.

involve more specifically the emotional qualities of this relationship, both the intensity and emotional qualities of his emotional relationship to people."[19] Originally Rorschach defined color shock as "an emotional and associative stupor of varying length" a reaction of "astonishment and vexation" which occurs with some subjects when presented with colored plate VIII.[20] Other writers have enlarged the definition and added cards which they felt tended to produce shock. Thus Beck says that "the color figures (he includes all of them) produce a startle," which, "momentarily misshapes the subject's reaction pattern."[21] Another Rorschach research worker, Hertz, states that "there is general agreement that color factors give a measure of the stability of the emotional life. They show the externally directed or expressed emotionality of an individual." She goes on to say that FC responses[22] represent emotional stability, CF responses, emotional lability, excitability and lack of control, and C responses, lack of restraint and impulsiveness.[23] Klopfer and Kelley who have treated color and shading shock together speak of shock as a "certain general reaction of anxious and insecure subjects to the color and shading effects," and these indicators (of shock) "have traditionally been considered as the Rorschach signs of emotional disturbance."

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19 Klopfer, op. cit., p. 205.

20 Rorschach, H., Psychodiagnostics, p. 38.

21 Beck, S., Rorschach's Test II, pp. 37-41.

22 For meaning of these symbols see any standard text on the Rorschach technique.

23 Hertz, M. and Baker, E., "Personality Patterns in Adolescence as Portrayed by the Rorschach Ink-blot Method, II-The Color Factors," J. General Psychol., (1943), 28:13.

Then, in summary, these reactions to the color reflect the subject's emotional reaction to "outer reality," and are in the nature of a "startle" (Beck), an "emotional disturbance" (Klopfer and Kelley), a "catastrophic reaction" (Brosin and Fromm) and in Rorschach's own words:

> "It has been found empirically that the influence of colors in perceiving the figures may be taken to represent the extent of emotional excitability and actual excitement;[24] the basis for this deduction is, however, quite insufficient to satisfy demands of scientific logic. There is a definite correlation between the extent of motor activity, and the number of responses influenced by color perception. The causes, the etiological sources, of this correlation remain to be discovered."[25]

The above survey of opinions of Rorschach and Rorschach test experts would seem to be essentially in agreement but a closer examination reveals a rather subtle, but startling, difference. Some of these authors have treated color shock as an indicator, a measure, or a sign of emotional lability while others have considered it an actual behavioral reaction. Rorschach himself combines both ideas in the same paragraph. Is "color shock" then only an indication of an individual's emotional stability, or instability, as the case may be, in other situations apart from the test situation, or is the subject actually undergoing the stress and strain, with all the accompanying physiological reactions, of a real emotional situation when he manifests those signs interpreted as "color shock."

Steinberg who made a recent study, mentioned previously, treating with shock has given us a lead in answering the question. He found that

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[24] My underlining.

[25] Rorschach, H., op. cit., p. 97.

his Rorschach "shock group" had a significantly higher mean GSR than the "non-shock group" in response to an unexpected loud clap, in response to the general experimental situation and in response to the Rorschach test itself.[26] His conclusions are:

> "Rorschach shock may be considered a 'startle reaction' which is associated with a change from one stimulating situation to another for which the subject is unprepared, rather than a type of reaction to the formal nature of the Rorschach stimulus, i.e., color and shading, per se. One cannot assume that subjects can be differentiated in terms of whether they show shock on a colored card rather than on a non-colored card. It is necessary to ascertain what in a particular card constitutes a shock stimulus for this particular subject."[27]

With this one exception then there seems to be general agreement among Rorschach experts that certain subjects experience a "shock" when confronted with one, or all, of the colored plates and this shock is either an emotional state in itself or a sign of emotional lability which manifests itself by certain indicators. In general the most important of these indicators are:

1) The first response is retarded.
2) R (total number of responses) is notably reduced.
3) The card is rejected.
4) Form quality is impaired.
5) P (popular) responses are lacking or notably reduced.
6) Use of colors entirely lacking.
7) Sequence is upset.
8) A (animal) responses increase, usually FM (animal movement).

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[26] Steinberg, op. cit., p. 126.

[27] Ibid., (abstract), p. 7.

9) C (color) responses shift regressively; that is, from FC to CF to C.

10) Breadth of associational content narrows.

11) Anatomy responses take primacy in order of appearance or in quality.[28]

Beck states that when there is shock two or more of the above signs usually appear.[29]

A further sign of emotional instability as indicated by the Rorschach test is the relationship between color and movement responses (M/C or experience type). The experience type is considered an index of inner potential, the direction the individual is striving, with M>C representing an introversive trend and C>M representing an extroversive trend.[30] Beck interprets Rorschach's writings of this relationship as being a concept of the whole personality---"a psychologic medium or essence in which all the mental activities of the individual are suspended."[31] Beck considers this relationship so important that he begins patterning out the fundamental structure of the personality picture from M and from C, together with the form quality of the responses.[32] Concerning M and C Rorschach himself wrote, "Subjects characterized by affective lability give many color answers,"[33] and conversely, "Subjects

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[28] For a more complete treatment of these "shock" indicators see Beck, op. cit., Vol. II, p. 37. or Klopfer, op. cit., p. 248.

[29] Beck, op. cit., Vol. II, p. 38.

[30] Beck, op. cit., Vol. II, pp. 60-61.

[31] Beck, loc. cit.

[32] Ibid., pp. 61-62.

[33] Rorschach, op. cit., p. 31.

characterized by stable emotions give few or no color answers."[34] In another place he states that "the rule is, the more color in the test, the greater the emotional instability for the subject, the more kinaesthesias (movement), the more stable the affectivity."[35]

Steinberg in experimental work with this problem found a correlation significant at the 5% level between GSR and the excess of color over movement responses and states that "the more the ΣC exceeds M, the greater will be the galvanic reactivity." He feels that this finding supports the validity of M/C as an interpretive factor in the Rorschach test.[36]

In summary, some Rorschach administrators and researchers feel that "color shock" is actually a deep-seated disturbance in the subject while others see it as an indication of emotional instability in the subject's contacts with "outer reality." If the first assumption is correct than "it seems valid to expect reaction of the sympathetic nervous system concomitant with this shock."[37] Also Rorschach felt that the M/C balance was an indicator of emotional stability or lability. If this is true, then one should expect a higher level of sympathetic nervous activity with a preponderance of C over M and a lower level of activity with the increase of M over C. This study will attempt to put the above hypothesis to test.

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[34] Rorschach, op. cit., p. 31.

[35] Ibid., p. 76.

[36] Steinberg, op. cit., p. 140.

[37] Ibid., p. 61.

B. Palmar Sweat As A Measure of Emotion.

The Rorschach test is well-known. The same does not hold true for measurements of palmar sweat. Until recently little has been known about palmar sweat, its physiology and function. Certain theorizing has taken place in which palmar sweat was described as a product of evolution and its purpose was to provide a better grip, make the palm surface more pliable and thereby contribute to tactual acuity. It was said to be primarily a safety mechanism for fight or flight. In support of this teleologic approach it has been shown that this palmar secretion is one of the main bodily mechanisms for preparation for activity and that in the absence of such preparation, such as in sleep, the palms tend to be dry. Any increase in anticipatory preparation or apprehension is accompanied by an increase in the secretion of the sweat glands.[38]

Another prime purpose of perspiration is the function of cooling the skin by evaporation to eliminate heat generated internally. But the sweat glands of the palms, and of the soles, would seem poorly located for such heat elimination because of their continual contact with the ground, in the case of the feet, and contacts with objects or a cupped position not conducive to evaporation in the case of the hands.[39]

Probably the earliest experimental evidence of the relation of palmar sweat and emotion comes from the studies of the PGR. d'Arsonval pointed out in 1888 that the changes in generation of electricity in the

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[38] Darrow, C. W., "Neural Mechanisms Controlling the Palmar Galvanic Skin Reflex and Palmar Sweating," Archives of Neurology and Psychiatry, (1937), 37:641.

[39] Woodworth, R. S., Experimental Psychology, p. 277.

body were due to "cutaneous secretion modified by the sensory stimuli."[40] Later physiologists and psychologists have come to agree with these findings. Besides the work of Darrow several other recent studies have supported the relationship of emotion and palmar sweating. Yas Kuno worked with palmar sweat in relation to pain, labor, heat, and sensory stimulation.[41] Silverman and Powell studied the palmar sweat of neuropsychiatric patients during the war.[42] Gladstone, using basically a technique devised by Silverman and Powell, developed a group test for the measurement of emotion through palmar sweat.[43] Rothman summed up the function of sweat by saying, "Sweat secretion is probably the finest recorder of minimal emotions and of minimal mental effort."[44] To show that palmar sweat is a correlate of emotion Gladstone has summarized the literature and advanced the following logical development:

1. Anatomically the conduction of the impulses to the (palmar) sweat glands unquestionably involves the sympathetic chain.

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[40] Woodworth, op. cit., p. 281.

[41] Kuno, Yas, The Physiology of Human Perspiration, as cited by R. Gladstone, unpublished Phd. dissertation, Dept. of Educ., Univ. of Ill., Urbana, 1949, pp. 7-11.

[42] Silverman, J. S., and Powell, V. E., "Studies on Palmar Sweating," Psychosomatic Medicine, (1944), 6:243-249.

[43] Gladstone, R., "An Investigation of the Relationship between Palmar Sweating and Emotion as Measured by a Group Test of Palmar Sweating," unpublished Phd. dissertation, Dept. of Educ., Univ. of Ill., Urbana, 1949.

[44] Rothman, S., "The Role of the Autonomic Nervous System in Cutaneous Disorders," Psychosomatic Medicine, (1945), 7:90.

2. The sympathetic nervous system discharges diffusely; that is, it tends to innervate all the effectors it controls at the same time.

3. Sympathetic nervous system discharges either result from, or cause, emotionality. In any case, sympathetic nervous activity and emotionality are positively correlated.

4. It follows that when sympathetic activity occurs, palmar sweat occurs.[45]

Gladstone goes on to say that it is doubtful that all palmar sweat is a function of emotion. In the first place the glands are ever in a state of moderate activity from a "tonic" influence exerted continually by the sympathetic nervous system while at the same time keeping its capability of arousing the sweat glands to momentary spurts of activity.[46] Also the sympathetic nervous system does not always act as a unit.[47] And palmar sweat appears also in physiological conditions which are pleasant in nature, or related to the parasympathetic nervous system.[48] But as Gladstone points out these qualifications may lower the reliability of palmar sweat as an index of emotion, but they do not destroy it.[49]

One further bit of evidence previously mentioned is the relationship between palmar sweat and the PGR which d'Arsonval early pointed out. More recent studies have indicated that the GSR "seems more related to

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[45] Gladstone, op. cit., p. 15.

[46] Woodworth, op. cit., p. 283.

[47] Ibid., p. 284.

[48] Gladstone, op. cit., p. 16.

[49] Gladstone, loc. cit.

startle or tension than to anything else" and that it is also related frequently to "predicament or sense of encountering difficulty."[50] A survey of the field would seem to verify these relationships while at the same time reaching Woodworth's conclusion that although the PGR is not an infallible index of sympathetic arousal it is a pretty fair index.[51] To refer back for the moment to the experiments of Rockwell et al and Steinberg using PGR (or GSR as they term it) and Rorschach shock, the present study might get at an even deeper and more valid criterion of emotion than these experiments since GSR seems to be to a great extent a function of palmar sweat. As Steinberg himself points out, "When there is a lot of sweat present, a given increment of sweat will make little difference in resistance; when there is little sweat present in the skin the same increment in sweat will make a lot of difference in resistance."[52]

Of course, the question can be raised here as to whether the sweat on the extreme ends is itself an accurate measurement. That is, if an individual is in a state of continually producing large quantities of sweat then proportionately an increase would not appear as great for that individual as would a similar increase for an individual who normally produced a smaller quantity. Again, there is the possibility that an individual who normally sweats a great deal on the palmar surface may not have the possible range of increase that another, less productive, individual might have. Also, after the initial sweat has

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[50] Woodworth, op. cit., p. 16.

[51] Ibid., p. 284.

[52] Steinberg, op. cit., p. 95.

cleared the pores, additional sweat can only clean chemicals from adjacent areas of the skin and may not be able to carry a direct ratio of chemical into the paper concomitant with the amount of sweat.

In summary, it has been shown that the Rorschach test is a projective technique since it confronts the subject with a situation in which his responses are determined to the greatest extent by inner conditions, that is, the meaning must be projected into the blots from conditions existing within the individual. Further, there are great individual differences in reaction to the cards, more specifically to the colored cards, some being so extreme as to be termed "color shock." Therefore, the assumption is that the subject also reacts emotionally to the cards.

As for palmar sweat it has been shown through evolutionary, anatomical, PGR, and direct palmar sweat studies that perspiration is closely associated with sympathetic nervous activity and that sympathetic nervous activity is closely correlated with emotion.

CHAPTER II

THE PROBLEMS AND THE THEORY

A. The Problems.

The problems with which this thesis concerns itself are: (1) the determination of whether color shock on the Rorschach test arouses a definite emotional reaction and (2) whether subjects who give an excess of color responses over movement responses show more physiological activity than do those who do not respond with an excess of color responses. The palmar sweat technique will be the method used to measure emotional arousal.

B. The Theory.

The theory which links palmar sweat and emotional level is that palmar sweat is a correlate of emotional level, increasing with increase in emotionality.[1] The hypotheses which will be tested in this study are: (1) the shock response on the Rorschach arouses a corresponding physiological reaction which manifests itself by an increase in palmar sweat, and (2) those who give an excess of color responses can be differentiated from those who do not by means of an increase in palmar sweat.

The contribution of this experiment would be its validation or negation of a specific Rorschach interpretation which has, previous to this study and the already mentioned PGR studies, rested on observational findings alone.

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[1] Gladstone, op. cit., p. 33.

CHAPTER III

THE EXPERIMENTAL PROCEDURE

A. Instruments Used.

1. Rorschach test--the original ink-blots of Herman Rorschach in unmodified form were used.

2. The palmar sweat technique as devised by Silverman and Powell and modified by Gladstone was used.

This method consists of treating uniformly transluscent paper (Dietzgen 198M) with a 5% tannic acid solution, allowing it to dry, and cutting it to a desired size. For economy and ease of handling, a 2 3/4" by 4" size paper was used. Gladstone later recognized that the acid-treated paper darkens rather seriously with age. It was felt that this did not invalidate the results here because of the statistical technique used and all measurements were made at the same age-darkness of the paper. A salt solution of ferric chloride and acetone is prepared and stored for future use.[1] Previous to the administration the salt solution is put into individual containers in which are five blotters approximately 1 5/8" in diameter. This is slightly smaller than the container and allows the liquid to rise to the finger tips without gushing when the blotters are pressed. It allows a constant

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[1] For the exact method of preparation see Gladstone, op. cit., pp. 35-47.

amount of liquid to be applied to the finger tips each time. The solution is then allowed to stabilize in the individual container for at least one hour and not more than five to prevent excessive evaporation. In this experiment three hours was the maximum time allowed. The salt solution when applied to the fingers dries rather rapidly leaving an even coating of ferric chloride. When the fingers are placed on the treated paper the sweat carries the salt solution into the acid-treated paper resulting in a dark fingerprint. The more sweat there is, the more ferric chloride is carried into the paper and the darker is the print. Since eleven separate fingerprints were to be taken for each subject there was the possibility that intermittent exposure of the liquid to air might cause excessive evaporation resulting in less liquid being applied to the fingers on the last part of the test than on the first part. Therefore, five separate containers were filled for each subject. Four of the containers were used for two applications each; the first was used for three.

B. The Subjects.

All of the subjects used were male college students mainly classified as freshmen and sophomores who had never before taken the Rorschach test. An attempt was made to use only those who were most naive concerning the Rorschach test. Because the procedure involved from one to one and a half hours on the average of the subject's time, it was necessary to put participation on a volunteer basis which may have biased the sample to a certain extent. Since most of the subjects were from elementary psychology classes, the incentive used was to tell them that they would better understand such testing techniques through actual participation in such a situation. They were each given the understanding that there would be no attempt to interpret results.

C. The Administration.

The laboratory room of the psychology department was used for the actual testing. Some attempt was made to test in the dormitories but this met with little success because of interruptions.

The equipment was laid out so that the subject sat with his left side next to the table where he could rest his left arm easily on the table top. Just in front of his finger tips was the container filled with the blotters and the salt solution. The administrator sat slightly behind the subject and to his left where he could control the Rorschach cards, the treated paper, the stop watch, and the response sheet. After the subject was seated comfortably he was given the following instructions:

"1. Actually this is a very simple experiment. First, you will remove this lid (indicate covering of liquid container) and press these two fingers (indicate middle and index fingers) on the blotter so that the finger tips are covered with the liquid.

2. Then wave them in the air until they are dry (demonstrate) and at the same time replace the cover on the container.

3. I will hand you these cards one at a time. There are ten cards. Each time I hand you a card place the two fingers you have moistened on the piece of paper I will place here (indicate spot for paper) at the same time that you take the card.

4. You will hold your fingers firmly but not hard on the paper for 2½ minutes.

5. When you are through with the card lay it face down in front of you but do not lift your fingers from the paper until I indicate to do so. If you are not through with the card when I indicate lift your fingers regardless but you may continue to look at the card if you care to do so.

6. When you are done with the card and your fingers have been lifted from the paper reapply the liquid to your fingers, dry them just as before and wait for the next card. Then go through the same procedure as before.

7. Have you any questions?

8. All right, now try the finger part of the procedure to see how it feels."

The prints are taken on paper A for 2½ minutes to eliminate faulty understanding and to occupy the subject since it was found that some individuals tended to become restless with the long instructions. During this time the subject can be given the usual orientation into the Rorschach procedure; that is, "People see all sorts of things in these ink-blot pictures. You tell me what you see; what it might be for you; what it makes you think of." After this initial orientation the subject is given the following instructions:

"1. Now reapply your fingers to the liquid and dry them.

2. Are you ready? Here is the first card."

The above instructions were adhered to in principle but not necessarily to the letter. Whenever it was necessary to establish rapport or to clarify instructions a certain freedom of wordage was used. This held true in all except the instructions as to what was desired from the ink-blot. For that, the above formulation was held constant. Although Beck feels that a certain amount of paraphrasing is permissable[2] it was felt, for reasons outlined by Klopfer,[3] that this one complete instruction would be given to each subject.

There was some question about the length of time the subject would hold his fingers on the paper. Would three minutes, as Gladstone used, involve an interruption of the temporal gestalt of the Rorschach administration since the average total response time per card ranges from approximately 1 minute to slightly over 2 minutes[4] which leaves the

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[2] Beck, op. cit., p. 2.

[3] Klopfer, op. cit., pp. 32-33.

[4] These times were determined with "check" subjects prior to the start of the actual study.

subject sitting for a time with nothing to do except hold his fingers on the paper? With this criticism in mind the time was reduced to 2½ minutes since Kuno found that palmar sweat reaches its approximate maximum in 2½ minutes.[5] It was felt that whatever break in the sequence remained could be justified on the following grounds:

1. All of the subjects were exposed to the same conditions.

2. "Shock" is usually brought out by individual cards and although recovery from shock may be partially a function of the following cards the shock itself is not.

After the administration of the test the inquiry into the responses was made in the usual manner. No attempt was made to "test the limits" or gather interpretive reports since it was felt that neither procedure would further the purpose of this study.

Five subjects were used prior to the actual study to smooth out the administrative technique. Their protocols have not been included in the data.

D. Measurements.

1. Determination of shock.

The interpretation of shock is a difficult matter but for the purpose here it was felt that if three persons, the administrator and two others interpreting "in the blind," could agree that shock had occurred it would immediately be acceptable as data.[6] For those protocols where a diversity of opinion prevailed it was decided to place the

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[5] Kuno, op. cit., p. 10.

[6] Dr. Roy Gladstone and Mr. Robert Curnutt gave freely of their time and effort to serve this function.

record in the category of majority agreement, that is, where two of the three interpreters had placed it. In the cases where there existed complete disagreement, the protocol was discarded. To delimit the experiment all distorting protocols were placed in an unclassified file and not included. These included such protocols as those which manifested definite "shading shock" or some other maladjustment.

2. Measurement of the prints.

This posed an easier question since a modified instrument had been suggested by Gladstone and which was followed in theory.[7,8] The function of this instrument was to shine a constant light through a small opening over which the print was placed. The amount of light coming through the print was picked up by a photoelectric cell and transmitted to a microammeter for quantitative measurement. That is, "the print was laid over the light opening, centering as nearly as possible the central whorl, or corresponding finger configuration in the center of the light. This kept the area measured constant to a certain extent. Prints not large enough to cover the light opening were discarded. The light cell was pressed over the print, using some caution to get the cell in the same place each time.[9] This pressed the paper flat between the flat metal surface[10] and the flat glass surface. The resultant deflection

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[7] Gladstone, op. cit., p. 107.

[8] A diagram of the instrument included in appendix.

[9] This was taken care of by guide arms in the instrument used.

[10] Flat wooden surface in this case.

of the microammeter is an inverse measure of the darkness of the print, which in turn is a measure of the amount of palmar sweating."[11]

A 0-50 microammeter was used and only one change was made in the present study from the above instrument. In this study the circuit was reversed and set up in order to give a direct ratio measure of the light-darkness of the print, i.e., the darker the print the larger the reading.[12] This simplified both the statistical and interpretive processes.

It was found that the photoelectric cell used tended to show a positive fatigue of from 0.8 to 3.0 microamperes over a period of 20 minutes.[13] This may have been caused by a dulling of light. The cell tended to level out again after a period of 35 to 40 minutes. Neither the rise nor the fall was rapid enough to influence measurably the readings for any one subject,[14] but it is possible that attempts to compare one subject directly with another might prove quite erroneous. Therefore the light meter should be exposed to the light source for at least 25 minutes previous to actual readings. In this study the light was on 40 minutes prior to the measurements.

E. General Statistical Technique.

The statistical procedure for handling the data at first presented some difficulty because of factors that arose as the experiment progressed. First, a new batch of paper had to be prepared with the

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[11] Gladstone, op. cit., p. 39.

[12] The writer was assured by the college physics department that the readings would be just as accurate in this manner.

[13,14] See appendix for charts on characteristics of the photoelectric cell used.

resulting possibility that the chemical concentration might not be exactly the same. Then new and slightly different chemicals had to be used on the fingers. Instead of the original $FeCl_3$ a tincture of Ferric Chloride was substituted for the last ten subjects. This served the same function, but the new paper and new chemical made cross-comparisons of subjects rather unfeasible until it could be determined if the prints of the two groups, those tested with the original and those tested with the new solution, were significantly different. This was accomplished by comparing Print A of the subjects in each group. The significance of the difference between the means of these two groups was 7.68 which yielded a critical ratio of .06. As a check on this the significance of the difference between the sigmas was calculated and found to be 5.43 with a critical ratio of .09. These results pointed to the fact that there was no significant difference between the groups, and therefore they could be thrown into one distribution.

The following outlined methods were the main ones used in the statistical treatment of the data:

1. The Chi Square Test.

The subjects had been categorized into two groups--those showing shock and those not showing shock, hereafter to be referred to as the "shock group" and the "non-shock group." The statistical problem was to determine if there was a significant difference in palmar sweat between the two groups. For this purpose the "chi square" test[15] was employed and used in the following manner.

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[15] Garrett, H. F., Statistics in Psychology and Education, pp. 251-57.

The shock group was divided into two categories, those showing an average increase in sweat on the colored cards over the base sweat (Print A) and those showing an average decrease sweat on the colored cards in relation to their base sweat. A similar division was made with the non-shock group. The number of subjects in each group was then placed in a chi square table.

A similar device was employed as a check. That is, the shock group was divided as to whether the average sweat on the colored cards was an increase or a decrease over the average sweat on the non-colored cards. A like division was made with the non-shock group. The number in each group was then placed in a chi square table the same as before.

2. The Significance of the Difference between the Means.

The significance of the difference between the means was employed in two ways:[16]

a. Raw Increase.

> The average raw increase or decrease in sweat on the colored cards over the base sweat of the shock group and the non-shock group was compared.

b. Percent Increase.

> The average percent increase or decrease in sweat on the colored cards over the base sweat of the shock group and the non-shock group was compared.

The formula used for the above purpose was:

$$\sigma_{M_1 - M_2} = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2} \qquad \sigma_M = \frac{\sigma}{\sqrt{N}}$$

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[16] Garrett, op. cit., pp. 251-57.

3. Correlations.

As the experiment progressed a sub-problem emerged which involved the use of correlation. The question was, "Are first response times related to amount of sweat?" This tied in rather closely with the major hypothesis to be tested since first response time is a major determinant of shock.

A correlation was computed for each individual using the amount of sweat produced on each plate in relation to the first response time for that plate. A similar correlation was computed for the average first response time per card in relation to the average sweat per card for the total group. Since N was small, being 10 in each case, it was decided to use the rank-order method of correlation.[17]

$$P = 1 - \frac{6\Sigma D^2}{N(N^2 - 1)}$$

The rank-order method does not give an absolutely true picture of the relationship since it assumes that the differences between any two neighboring ranks at any part of the scale are equal which is obviously false.[18] Guilford gives the formula $r_e = 2 \sin\left(\frac{\pi}{6} e\right)$ for finding the equivalent Pearson product-moment correlation but notes that the correction is very slight. (In fact it is only a correction of .018 at its greatest).[19]

Since only a good indication was desired here and the correlations were not the main problem involved it was felt that the rank-order method would serve the purpose.

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[17] Garrett, op. cit., p. 344.

[18] Guilford, J. P., Psychometric Methods, p. 341.

[19] Guilford, loc. cit.

CHAPTER IV

FACTORS INFLUENCING THE RESULTS

After a study of the experimental situation it is evident that there are a great many uncontrolled variables contributing to the final results. Some of these are subjectiveness of the administration, scoring, interpreting of the Rorschach test, and the many unknown factors operating to influence palmar sweat.

Many of these variables raise questions that go beyond the scope of this thesis and will therefore necessarily remain unanswered here. The following discussion will perhaps clarify to some extent a few of those problems.

I. Evaluation of the Protocols.

If the agreement of the three judges in their classification of protocols were a chance agreement then the results would also be chance results.

A. Problem:

To what degree did the evaluations of the three independent judges agree?

B. Results:

The Rorschach test protocols were placed in one of two categories by each of the three judges--color shock, or no color shock. The results were as shown in Table 1.

TABLE 1

AGREEMENT OF THE JUDGES

Degree of Agreement	Number	Percent of Total Protocols
Total agreement (3 judges)	24	36.5
Partial agreement (2 judges)	44	63.5

Those protocols in the total and partial agreement groups were classified for the purpose of this experiment as shown in Table 2.

TABLE 2

CLASSIFICATION OF PROTOCOLS

Classification	Number
Color Shock.....	37
No Color Shock.....	29

C. Discussion:

It is possible that whatever difference in classification occurred might be accounted for in the different experiential background of the three judges and perhaps by the emphasis each placed on different shock factors.

D. Conclusion:

A chance agreement would have resulted in all three judges agreeing 25% of the time.[1] The actual agreement of 36.5% is slightly

[1] Garrett, op. cit., p. 106.

better than chance. This degree of agreement should be interpreted as meaning that whatever results are obtained will be in the correct direction but that their true significance will be masked. To test the influence this factor exerts on the final results the 24 protocols upon which all three judges agreed were later tested separately from the total group.

II. Card Sequence and Amount of Sweat.

Since three of the five colored cards are placed last in the test, any relation of palmar sweat to card sequence would influence the results of this experiment by delimiting the sweat-arousing possibilities of these last three cards.

A. Problem:

Is there any correlation between the place of the card in the sequence presented and the amount of sweat produced?

B. Results:

The cards were presented in the normal manner (Card I through Card X). Therefore, the statistical procedure was one of finding the average amount of sweat produced per card for the entire group and correlating it with the place of the card in the sequence. The heaviest average sweat was given the value of 1 and the lightest was given the value of 10. The rank-order correlation was + .89 with the average sweat per card and their standard deviations as shown in Table 3.

C. Discussion:

The test situation in itself is probably an emotion-arousing situation. It is an actual "external reality" facing the subject at the moment and surely an intellectual task whether the content of the test arouses an emotion or not. It is at least a strange new task

TABLE 3

PALMAR SWEAT IN RELATION TO CARD SEQUENCE:
AVERAGES AND STANDARD DEVIATIONS

Card	Average Sweat Per Card	Standard Deviations
A	22.9	7.76
1	25.4	8.50
2	22.8	7.75
3	22.4	7.48
4	20.9	7.63
5	21.8	7.63
6	21.5	7.62
7	21.2	7.55
8	20.1	6.53
9	19.8	6.47
10	20.3	7.30

facing the subject. We then should expect the sweat to be high at the start and gradually decreasing as the subject becomes more familiar with the situation. If it not true and the subjects never achieve a feeling of familiarity or ease with the situation, then the place of the card in the administrative sequence should have no bearing on the amount of sweat.

D. Conclusion:

From the table above and from the correlation of +.89 it would seem that the place of the card in the sequence presented has a definite relationship to the amount of sweat produced, with the first card producing more and the last producing less. The results of this problem have a decided bearing on the experiment since the last three cards are colored and possibly capable of producing shock, especially Card IX. Therefore, if color shock is evoked by one of these last three

cards, and if color shock does tend to produce more sweat, such shock on these cards would still produce less sweat than color shock on earlier colored cards because of their place in the test.

A further interesting fact shown in the table above is the trend of the standard deviations. Not only is less sweat secreted on the average, but there also seems to be a tendency for the range to lessen as the test progresses.

III. "Shock" and "Non-shock" Groups in Relation to Total Sweat.

If the "shock group" responds to the test as a whole with more sweat than the "non-shock group", then it can be expected that they will also sweat more to the colored cards than the non-shock group, and any difference found will be influenced by this factor.

A. Problem:

Do those with color shock respond with a higher average sweat to the whole test than those without color shock?

B. Results:

The average sweat for all the cards in each group was found with the results as shown in Table 4.

TABLE 4

AVERAGE SWEAT OF THE SHOCK AND NON-SHOCK GROUPS TO THE WHOLE TEST

Group	Average Sweat	Standard Deviation
Shock	21.83	7.99
Non-shock	21.48	7.85
Difference	0.35	....

σ_D = .52 CR = 0.67 P = 50 to 60

C. Discussion:

The critical ratio of 0.67 is too small to say that the difference shown above has significance, but the difference is in the direction expected.

D. Conclusion:

Although the shock group does not react to the test as a whole with a significantly higher level of activity than does the non-shock group, the difference points to more sweat for the shock group and the final results will have to take this trend into account.

IV. Summary.

Three main factors work to influence the testing of the hypothesis concerning physiological reactions concomitant to color shock on the Rorschach test. These factors are: (1) the subjectiveness of the test interpretation led to a certain amount of disagreement which may mask the true significance of the results, (2) in general palmar sweat decreased as the test progressed, and (3) the direction of difference was for the shock group to sweat more to the total test.

Other factors that may possibly have exerted influence on the test results will be treated in the chapter on related areas of investigation.

CHAPTER V

THE RESULTS OF THE EXPERIMENT

The hypotheses that this study tests are as follows: (1) the color shock response on the Rorschach Ink-blot test arouses a corresponding physiological reaction which manifests itself by an increase in palmar sweat, and (2) an excess of summated color responses over movement arouses a corresponding physiological reaction which manifests itself by an increase in palmar sweat.

The methods of testing the first hypothesis were threefold. First, the shock and non-shock groups were compared in relation to how many in each group responded to the test with a higher average sweat on the colored cards than on their base sweat. Second, the cards for each individual in each group, shock and non-shock, were divided according to how many colored cards produced less sweat than the individual's average sweat for all ten cards, and how many non-colored cards produced less sweat than the average for all ten. This latter method did away with the base sweat and allowed direct work with the cards. The chi square test was used on both of these methods.[1] Third, the averages for the sweat of the shock group on the colored and non-colored

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[1] The shock and non-shock groups were also tested using the "Significance of the Difference Between the Means" formula in relation to raw unit increase or decrease and also percentage of increase or decrease of palmar sweat on the colored cards compared to base sweat. The results were comparable to the chi square test results presented elsewhere in this chapter.

cards were compared with the averages of the non-shock group on the colored and non-colored cards.

In the section on the evaluation of the protocols it was mentioned that the low number of total agreements between the judges would mask the significance of the results and an attempt to arrive at the true significance would be made by treating those protocols where there had been unanimous agreement. This was done in the same way as the methods mentioned above.

The second hypothesis concerning the relation of M/C to palmar sweat was tested by dividing the protocols into those with C>M and those with M>C. These groups were then divided into those who averaged more sweat on the colored cards and those who averaged more sweat on the non-colored cards, and the difference was calculated by the use of the chi square test.

I. Increase or Decrease in Sweat over the Base Sweat.

Each individual began the test by secreting a certain amount of sweat. If the hypothesis is correct there should be a larger ratio of those showing an increase of palmar sweat on the colored cards in the shock group than in the non-shock group.

A. Problem:

Do those with color shock have a significantly different increase or decrease in sweat on the colored cards over the base sweat than those without color shock?

B. Results:

The chi square test was used with the results shown in Table 5.

TABLE 5

CHI SQUARE TABLE SHOWING NUMBER OF SUBJECTS WITH INCREASE OR DECREASE IN PALMAR SWEAT ON COLORED CARDS AS COMPARED WITH BASE SWEAT

	Decrease on colored cards from base sweat	Increase on colored cards from base sweat	
Shock group	(21.1) 21	(15.9) 16	37
non-shock group	(15.9) 16	(12.1) 12	28
	37	28	65

x^2 .001 df 1 P 98

C. Discussion:

The x^2 of .001 with a P of 98 indicates no difference between the groups. In fact is indicates that some factor may be operating to make the groups more homogenous --- causing their reaction to become more alike. This factor may well be the decrease of sweat occurring with card sequence discussed in the previous chapter.

D. Conclusion:

There is no statistically significant difference in the shock and non-shock groups in their tendency to increase or decrease in sweat on the colored cards in relation to the base sweat. Therefore, on this test involving the total test group the hypothesis tested has not been proven and accordingly the null hypothesis must be retained.

II. Increase of Palmar Sweat on the Individual Cards over the Subject's Average Palmar Sweat for All Ten Cards.

It is possible that the base sweat may not be an adequate measuring device for this experiment. Therefore, if the individual cards for each subject were compared with his own average sweat for all ten cards a clearer picture of whatever differences there might be can be obtained. If a significant difference can be found in palmar sweat between the shock group and the non-shock group in regard to these deviations from the average on the individual cards, the hypothesis concerning physiological concomitance can be retained.

A. Problem:

Is there a difference between the shock group and the non-shock group in relation to how many colored cards and how many non-colored cards produced more palmar sweat than the individual's average palmar sweat for all ten cards?

B. Results:

Results were as shown in Table 6.

TABLE 6

CHI SQUARE TABLE SHOWING NUMBER OF COLORED AND NON-COLORED CARDS THAT PRODUCED MORE PALMAR SWEAT THAN THE SUBJECT'S AVERAGE SWEAT FOR ALL TEN CARDS

	No. of colored cards above average	No. of non-colored cards above average	
shock group	78 (77.1)	88 (88.9)	166
non-shock group	58 (58.9)	69 (68.1)	127
	136	157	293

$x^2 = .045$ df = 1 P = 80 to 90

C. Conclusion:

The P level of between 80 and 90 indicates that there is no statistically significant difference between the shock and non-shock groups in deviations on colored and non-colored cards from individual averages. Therefore, the null hypothesis must be retained.

III. Shock and Non-shock Groups in Relation to Average Sweat on Colored and Non-colored Cards.

According to the hypothesis the shock group should produce a higher average palmar sweat on the colored cards than the non-shock group.

A. Problem:

Do those with color shock have a different average palmar sweat on the colored cards and on the non-colored cards than the non-shock group?

B. Results:

Results are shown in Table 7.

TABLE 7

AVERAGE SWEAT OF SHOCK AND NON-SHOCK GROUPS TO COLORED AND NON-COLORED CARDS

Group	Average Sweat on Colored Cards	Average Sweat on Non-colored Cards
Shock.....	21.06	22.31
Non-shock.....	20.96	21.98
Difference.....	.....	0.33

C. Discussion:

The shock group averaged more sweat than the non-shock group

not only for the total test but also on the averages for the colored and non-colored cards separately. However, these latter differences are even smaller than those for the total test.

D. Conclusion:

The shock and non-shock groups cannot be statistically differentiated by their average reaction to the total colored cards or to the total non-colored cards. What can be noted from the data above is the direction of difference. On both the colored and non-colored cards the shock group averages slightly higher than the non-shock group.

A further interesting fact to be seen in the table above is that the difference is even greater on the non-colored cards. This suggests that color shock on Cards II or III might start a reaction that does not reach its climax until the later non-colored cards are presented.

It was suggested previously that the degree of agreement of the judges might strongly influence the results. Therefore, the following two tests are repetitions of the first two tests above using only those protocols upon which all the judges agreed.

IV. Increase or Decrease of Sweat in Relation to Base Sweat Using Those Protocols upon Which There Was Complete Agreement.

A. Problem:

Do more subjects in the color-shock group have an increase in palmar sweat over base sweat on the colored cards than do those without color shock? If they do, the hypothesis concerning physiological concomitance can be retained.

B. Results:

Results of this test are as shown in Table 8.

TABLE 8

CHI SQUARE TABLE SHOWING NUMBER OF SUBJECTS WITH INCREASE OR DECREASE IN PALMAR SWEAT ON COLORED CARDS AS COMPARED WITH BASE SWEAT (TOTAL AGREEMENT GROUP)

	Increase	Decrease	
Shock	(6.09) 6	(7.91) 8	14
Non-shock	(3.91) 4	(5.09) 5	9
	10	13	23

$x^2 = .0027$ df = 1 P = 95 to 98

C. Conclusion:

The results of this test are comparable to the test using the entire group and the same conclusions hold; that is, this test on this group shows no statistically significant differences between those giving evidence of color shock and those who do not give evidence of color shock.

V. Increase of Palmar Sweat on the Individual Cards over the Subject's Average Palmar Sweat for All Ten Cards Using Only Those Protocols upon Which There Was Complete Agreement by the Judges.

A. Problem:

The problem involves comparing the sweat produced on each card for each subject with that subject's average sweat to all ten cards. If the ratio of colored cards producing more sweat to non-colored cards producing more sweat is greater in the shock group than in the non-shock group, there is evidence of a physiological reaction accompanying color shock and the hypothesis can be retained.

B. Results:

The results of this test are shown in Table 9.

TABLE 9

CHI SQUARE TABLE SHOWING NUMBER OF COLORED AND NON-COLORED CARDS THAT PRODUCED MORE PALMAR SWEAT THAN THE SUBJECT'S AVERAGE SWEAT FOR ALL TEN CARDS USING ONLY THOSE PROTOCOLS UPON WHICH THERE HAD BEEN COMPLETE AGREEMENT BY THE JUDGES

	No. of colored cards above average	No. of non-colored cards above average	
Shock group	(26.9) 28	(36.1) 35	63
Non-shock group	(14.1) 13	(18.9) 20	33
	41	55	96

$x^2 = .232$ df = 1 P = 50 to 70

C. Results:

For this test also the results are comparable to the same test using the entire group, and therefore the same conclusions hold; that is, the null hypothesis is retained--there is no statistically significant difference between the shock and non-shock groups.

VI. The Relation of Color and Movement to Palmar Sweat.

The hypothesis to be tested is that an excess of summated color responses over movement responses arouses a corresponding physiological reaction which is evidenced by an increase in palmar sweat.

A. Problem:

Do those subjects with sum C greater than M tend to sweat

more on the colored cards than those with M greater than sum C?

B. Results:

The protocols were divided into two groups: one composed of those with M greater than sum C, and the other composed of those with C greater than M. To classify as greater it was arbitrarily established that the larger would have to be at least one full unit above the other, i.e., 1.5/2.0 was not considered enough difference to classify one as greater than the other. Each of these groups was then divided into those who averaged more sweat on the colored cards and those who averaged more sweat on the non-colored cards. The difference between these groups was then tested with the chi square and results were as shown in Table 10.

TABLE 10

CHI SQUARE TABLE SHOWING NUMBER IN M > SUM C GROUP AND SUM C > M GROUP WHO AVERAGED MORE SWEAT ON COLORED THAN ON NON-COLORED CARDS

	Averaged more on colored cards	Averaged more on non-colored cards	
M > Sum C	5 (8.0)	13 (10.0)	18
Sum C > M	15 (12.0)	12 (15.0)	27
	20	25	45

$x^2 = 3.375$ df = 1 P = .05 to .10

C. Discussion:

The P level of between .05 and .10 gives an indication of a trend but is not statistically significant.

D. Conclusions:

The results above indicate that those subjects who show an excess of color responses over movement responses may sweat more on the colored cards.

This finding tends to substantiate Steinberg's results on the same problem and would tend to verify his contention that "the more the sum C exceeds M, the greater will be the gavanic reactivity."[2] The results of Steinberg's study, and also of this study, support the validity of M/C as an interpretative factor in the Rorschach test.

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[2] Steinberg, op. cit., p. 140.

CHAPTER VI

AREAS RELATED TO THE EXPERIMENT

During the process of analyzing the data many interesting facts were brought out that were not part of the experiment proper nor did they directly influence the results of the experiment. There may be some argument concerning the last point, whether the following facts influenced experimental results or not, but after careful consideration it was decided that these factors were not <u>directly</u> influential in the study of palmar sweat and color shock or palmar sweat and the M/C ratio. Three of them have to do with shock factors but not necessarily color shock. That is, they may just as well be components of "shading shock" or "sex shock." The other two factors are concerned with palmar sweat and are not closely connected with the hypotheses involved in this study.

I. <u>First Response Time and Amount of Sweat</u>.

First response time is considered one of the main indicators of shock or non-shock whether the shock be color, shading, or sex. Therefore, the relation of palmar sweat to first response time is related to this study but not directly influential.

A. Problem:

Is there any relation between the first response time per card and the amount of sweat produced on that card?

B. Results:

A rank-order correlation between the amount of the first response time and the amount of sweat produced for each card was calculated for each individual. The median correlation with probable error for the entire test group and each of the sub-groups is shown in Table 11.

TABLE 11

MEDIAN CORRELATIONS: FIRST RESPONSE TIME AND AMOUNT OF SWEAT

	Entire group	Shock group	Non-shock group
Correlation	-.10	-.22	+.06
Probable Error	.22	.11	.23

The table above shows the medians for individual correlations. The rank-order correlation for the average sweat produced per card for the total cards and the average reaction time per card for the total cards was -.78 with a probable error of .13.

C. Discussion:

In working with correlations in the above manner, extreme caution should be exercised in interpretation and only a bare indication can result. The only correlation that has any significance is the one for the average sweat in relation to the average first response time. This correlation of -.78 is 6 times its own probable error which is 2 more than required for significance. This correlation can be accounted for by the canceling out of high and low deviations when the units are averaged. That is, if all the first response times and all the sweat units were plotted on a graph the "line of best fit" would show a

general trend for the group but might be completely off as far as any one individual was concerned. In other words, this is a group prediction correlation and of little use for individual prediction.

Although the other correlations do not have the significance that the correlation for the averages has when viewed for just what they are, median correlations, they do take on a certain significance with the median correlation for the shock group being -.22 and the median for the non-shock group +.06.

D. Conclusions:

There does seem to be a tendency for the first response time to be negatively related to amount of sweat. In other words, the longer it takes to make the first response, the less sweat will be secreted. But in the light of the median correlations above we can only say that it is a general trend useful, perhaps, for group prediction but which may not hold for any specific individual.

II. Sweat in Relation to Prolonged Reaction Time.

If shock is indicated by prolonged reaction time, and if shock has its physiological concomitance, then those cards showing an extreme first response time should also be the ones to show evidence of the physiological reaction. Shock in this context is not necessarily confined to color shock.

A. Problem:

Is there any significant trend of sweat produced on those cards where an extreme first response time was recorded?

B. Results:

Any first response time longer than 100 seconds was considered a prolonged response time unless the other response times

approximated 100 or more. The amount of sweat produced on each such card was compared with the individual's average sweat for all ten cards. The deviation was found to be 0.33 units[1] more sweat produced on the prolonged time cards than for the average.

C. Conclusion:

In view of the wide variability in range of sweat for each individual (some ranges as large as 20.0 and above) the average increase above of 0.33 units on the prolonged first response time cards would evidence no significant difference. Again only a trend can be noted as far as physiological reaction is concerned and that trend is in the direction of more sweat.

III. Rank of Rorschach Ink-blots in Relation to Their Potential to Delay First Response Time and to Produce Palmar Sweat.

Delayed first response time is one of the main indicators of shock, color or otherwise. It has been assumed that certain cards have a greater potential for producing shock, and therefore delaying first response time. The cards usually considered to be most potent in this respect are II, IV, VI, and IX although not necessarily in that order.

A. Problem:

Which cards cause the longest average first response time and which ones cause the most sweat?

B. Results:

Table 12 gives the ranking of the cards in the two categories with a rank of 1 indicating the greatest amount of sweat and the most time and a rank of 10 indicating the least time and sweat.

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[1] The figures given for sweat represent the readings on the microammeter, i.e., 0.33 would represent 0.33 of a microampere deflection.

TABLE 12

RANK OF CARDS: SWEAT PRODUCTION AND FIRST RESPONSE TIME

Card	Rank of Card in Sweat Production	Rank of Card in First Response Time
1	1	9
2	2	6
3	3	10
4	7	4
5	4	8
6	5	7
7	6	2
8	9	3
9	10	1
10	8	5

C. Discussion:

The rank of the cards in sweat producing potential with I, II, III, and V producing the most in reducing order was discussed previously.

The rank-order of cards in their potential to cause long response times are cards IX, VI, X, and IV in reducing order, with II, III, I, and V trailing near the end.

The contention that Card IX is a difficult intellectual problem (besides being a colored card) would seem to be verified to some extent.

The Cards VI and IV are not quite the intellectual problems that Cards IX and X are,[2] but there are two other factors operating with these cards that might explain the longer response time. First, both

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[2] Beck, Vol. II, op. cit., p. 10.

are considered rather oppressive shaded cards. Second, each has another shock aspect. Card IV is noted for "authority shock" because of the heavy boots, and both cards tend to show what is called "sex shock."

D. Conclusion:

There is the possibility that intellectual factors and other "shock" factors besides color may be operating more strongly than color to lengthen first response time.

IV. Base Sweat in Relation to Range of Sweat.

Individuals began the test with great differences in amount of base sweat. The question that presented itself was one of individual potential; that is, did each individual have the same capabiiity for increasing or decreasing in palmar sweat?

A. Problem:

Do those who start with a low base sweat have the same increase-decrease range as those who start with a high base sweat?

B. Results:

The base sweats of the subjects were classified into the following three groups:

High------those more than one standard deviation above the mean of all the base sweats.
Medium----those included in one standard deviation above and below the mean.
Low-------those more than one standard deviation below the mean.

The range for each subject was then found and the average range of palmar sweat with the standard deviation of the range for each of the groups above was calculated with the results as shown in Table 13.

TABLE 13

AVERAGE RANGE AND STANDARD DEVIATION OF RANGE OF PALMAR SWEAT FOR THE HIGH, MEDIUM, AND LOW BASE SWEAT GROUPS

Group	Average Range of Palmar Sweat	Standard Deviation of Range
High	16.07	3.29
Medium.....	13.10	5.83
Low	8.00	5.02

The averages were then tested for the significance of the difference with the following results:

TABLE 14

SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE AVERAGE PALMAR SWEAT RANGES OF THE THREE BASE SWEAT GROUPS

Groups Compared	Significance of Difference	P Level
Low-Medium	1.56	.01
High-Medium	1.29	.02
High-Low	5.17	.001

The difference found between the low and medium and low and high are accurate at a level of almost certainty while the difference between the medium and high is accurate at the .02 level.

C. Conclusions:

Apparently everybody did not have the same capability for increasing or decreasing in palmar sweat. From an examination of the individual records it would seem that those who start out high

have every possibility of decreasing to a negligible amount while those who start low do not have the same ability to increase to such proportionate heights, nor can they decrease to such an extent. An individual who starts with a base sweat of 40 sweat units might easily drop to 20, but it would be impossible for an individual who starts with a base of 10 units to make such a drop.

V. Shock in Relation to the Lower, Middle, and Upper Portions of the Base Sweat Range.

This problem may seem closely related to the main hypothesis, but here the study is not concerned with a physiological reaction accompanying color shock. The question which is involved here is whether or not those who later show color shock begin the test with a higher level of sweat than do those who do not later show color shock.

A. Problem:

Is there more shock present in the subjects who are in the lower, middle, or upper portions of the base sweat range? Do those with color shock have a higher base sweat?

B. Results:

The divisions were again made by standard deviations with the middle group being those included in one standard deviation above and below the mean with the mean being calculated for the total shock-non-shock group. The resulting distribution is shown in Table 15.

TABLE 15

NUMBER OF SHOCK AND NON-SHOCK GROUP IN HIGH, MEDIUM, AND LOW BASE SWEAT CATEGORIES

Group	Base Sweat Category			Total
	Low	Medium	High	
Shock	8	22	7	37
Non-shock	5	17	6	28

C. Conclusion:

The distribution of the base sweat of those showing color shock is almost normal as is the distribution of the non-shock group. Therefore, it cannot be said that those who later give evidence of color shock begin the test with any higher degree of nervous activity, at least as far as is shown by the palmar sweat test, than do those who do not later show color shock.

CHAPTER VII

SUMMARY AND CONCLUSIONS

This study began with a consideration of the Rorschach Ink-blot test and specifically one particular interpretation of the test--"color shock." Through a review of the literature it was shown that some of the experts in the use of the Rorschach technique consider "color shock" to be an actual present emotional factor disturbing the individual as he gives evidence of such shock during testing, while other experts consider "color shock" to be only an indication of emotional instability in meeting "outer reality"--life situations other than the test. Two studies that have inquired into the actual reaction taking place concomitant with "color shock" were mentioned. These studies arrived at different conclusions. One stated that its shock group did not react as much as their normal and indicated that this group was incapable of reaction fluctuations comparable to that of the normal group because of their continuous state of high agitation. The other study found that its "shock group" demonstrated greater reaction not only to the test but to other "startle" situations as well. This latter study pointed out that the difference in reaction to the test itself was not large, but the "color shock" group did give evidence of less stability in experimental situations than did the non-shock group. The study cautioned against differentiating subjects in terms of whether they show shock on a colored card rather than on a non-colored card and went on to say "it is necessary

to ascertain what on a particular card constitutes a shock stimulus for this particular subject."[1]

The relation of color and movement responses was also considered. An excess of color responses over movement responses has been interpreted as giving evidence of greater emotionality. The Steinberg study gave experimental evidence to support the fact that emotionality was present during the actual testing situation.

Evidence for the relation of palmar sweat to emotion was given showing how, through theory and experimentation, the knowledge of this relationship was arrived at.

This thesis tested the following two hypotheses:

1. If "color shock" is a force actually disturbing the subject during testing then there should be physiological concomitances the same as those which accompany other emotional reactions.

2. If an excess of color responses over movement responses indicates emotionality during the test then those subjects showing such an excess should evidence physiological concomitances to emotion.

The testing of these theories was done through administering individual Rorschach tests to a group of male college students following normal administrative procedure and at the same time taking their palmar sweat with each individual card. The darkness of the print was measured by shining a light through it and picking up the transmitted light on a photoelectric cell hooked up to a microammeter. This allowed the darkness of the print to be recorded quantitatively.

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[1] Steinberg, op. cit., p. 126.

The Rorschach protocols were judged by three persons each of whom put each protocol either into the "color shock" or "no color shock" category.

The palmar sweat records of these two groups were submitted to statistical analysis to determine if any significant difference existed between the two that could be picked up by the palmar sweat technique. The sweat records of those who gave an excess of sum C over M and those who gave an excess of M over sum C were also analyzed in an attempt to find any possible differences.

The relationship offactors influencing the results of the experiment were also investigated as were certain other areas that were related to the study but not necessarily influential.

The findings of this thesis were as follows:

I. Difference between Shock and Non-shock Group.

A. There was no statistically significant difference in palmar sweat on the colored cards between the shock and non-shock groups.

B. There was no statistically significant difference between the two groups on individual deviations on the colored and non-colored cards from each subject's test average.

C. There was no statistically significant difference between the two groups in relation to average sweat on the colored and non-colored cards.

II. Difference between M sum C and sum C M Groups.

Those subjects who gave an excess of summated color responses over movement responses also produced more palmar sweat. This difference was between the .05 and .10 level and therefore not statistically significant.

III. Areas Influencing the Results.

A. A P level of from 10 to 20 was found in checking the degree of agreement of the judgements against chance. It was interpreted as indicating either weakness of judgement and/or lack of objectivity of definition of color shock. Until lack of objectivity is proven it must be assumed that the judges were at fault, and had there been greater agreement more significant results might have been found.

B. There was a correlation of +.89 between test sequence and amount of sweat with less palmar sweat being produced as the test progressed.

IV. Investigation of Related Areas.

A. A rank-order correlation of -.78 was found between the average first response times for the total cards and the average sweat per cards for the total cards.

B. There was not a significant increase of sweat on those cards which produce a prolonged first response time although there is a trend in that direction.

C. Cards IX, VI, and X were the most potent in delaying first response time while Cards I, II, and III produced the most palmar sweat.

D. The subjects with the higher base sweat also had the largest increase-decrease range of palmar sweat.

E. The shock and non-shock group cannot be differentiated in terms of whether they start out with a high or a low base sweat.

In closing this study two major conclusions should be brought forth:

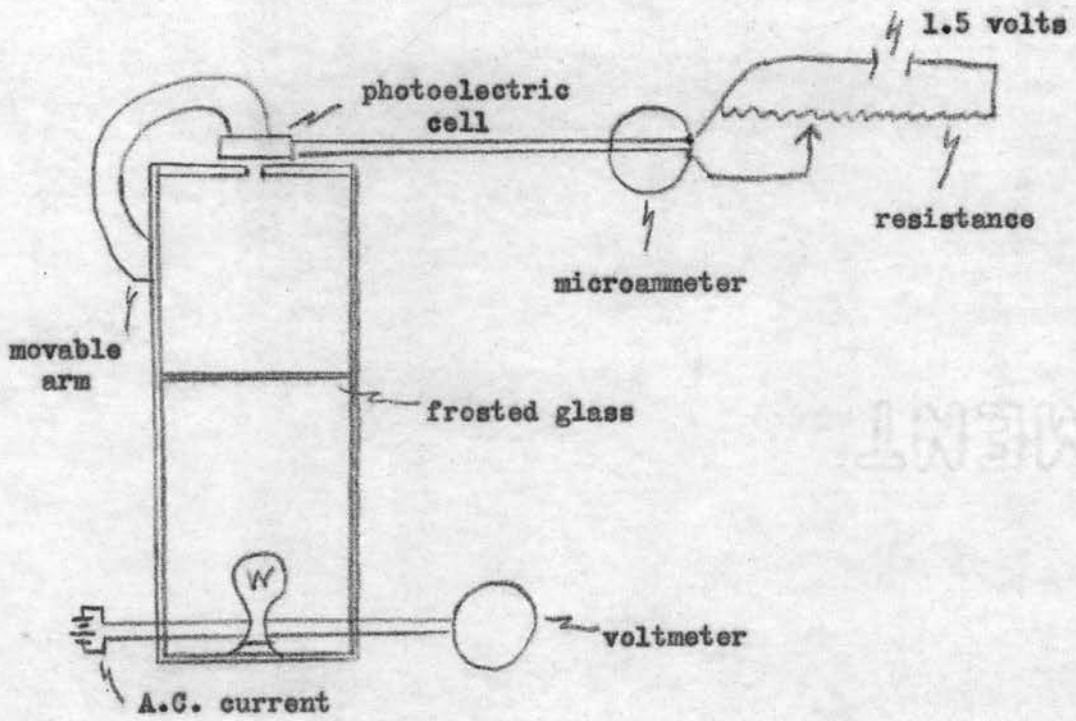
1. The relation of color responses to movement responses

appears to be superior to "color shock" as an indicator of emotional response to the test.

2. In view of the fact that two previous studies have arrived at divergent results concerning the problem of emotion accompanying "color shock" on the Rorschach test and this study has found no significant difference between "shock" and "non-shock" groups, it is felt that the empirically designated "color shock" does not have any consistent physiological concomitances and, therefore, unless further experimentation should prove definitely otherwise, may not be considered to indicate emotional reaction to the test--at least among the college population.

-end-

APPENDIX I



THE MEASURING INSTRUMENT

Two 9000 ohm resisters.

A 50 microampere range microammeter.

A Weston, model 594. Photronic Cell RR.

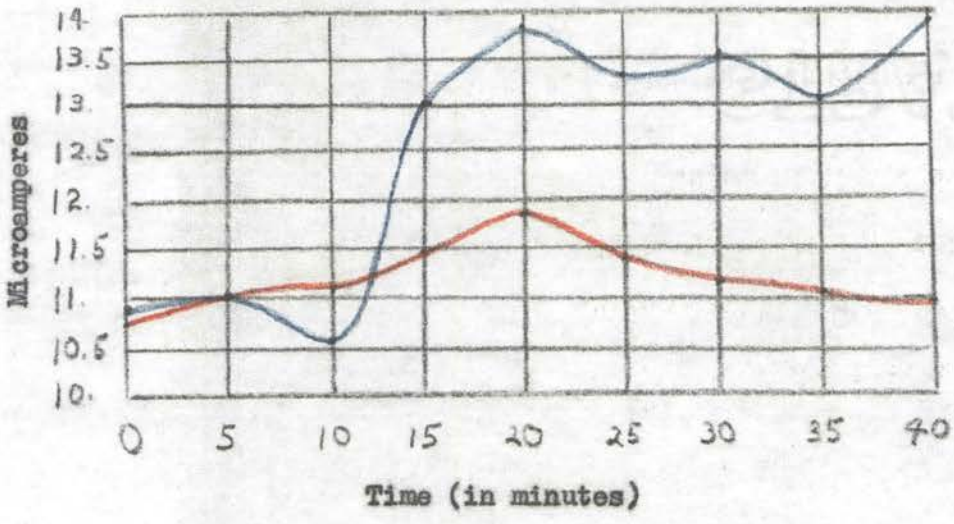
A 300 watt frosted light bulb.

Light bulb cooled by an electric fan.

A reflecting type instrument proved impractical because of the difficulty of controlling the use of only a small portion of the print. An instrument using indirect light on the cell also proved impractical because of the difficulty obtaining sufficient light on the cell surface.

APPENDIX 2

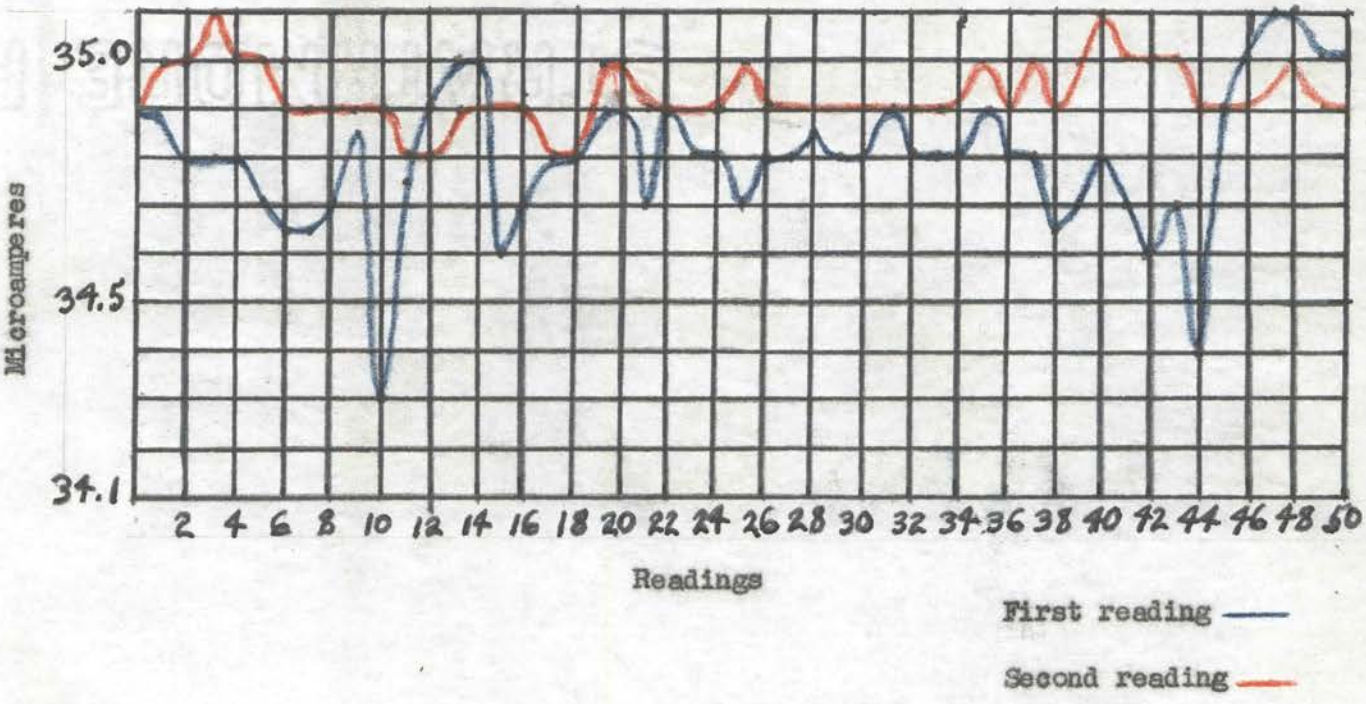
CONTINUOUS EXPOSURE OF PHOTO-ELECTRIC CELL TO LIGHT SOURCE OVER A PERIOD OF FORTY MINUTES SHOWING CELL CHARACTERISTICS.



The first reading was taken during the day; the second reading was taken late at night. The smaller increase on the second reading may be due to a difference in the use of electrical equipment or a cooler atmosphere.

APPENDIX 3

INTERMITTANT READINGS OF THE SAME PRINT SIMULATING ACTUAL MEASUREMENT PROCEDURE



The photoelectric cell was placed over the print and held until the microammeter arm came to rest. The reading was recorded and the cell was removed and the indicator allowed to fall back to a reading of 50 after which the cell was placed again over the same print held in the same place. Each cycle took approximately 14 seconds.

The first reading (black line) was taken during the daytime. The second reading (red line) was taken late at night just previous to the actual measurements when there was less use of electrical equipment.

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