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Color Preference and Personality Structure

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THE RELATIONSHIP BETWEEN

Color Preference

and

Personality Structure

A Thesis

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Master of Arts

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by

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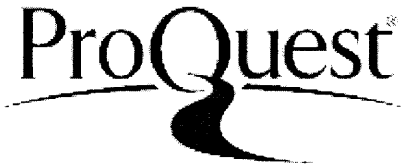

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ACKNOWLEDGEMENTS

Few contributions of this type may be considered "one-man" accomplishments. "One-man" accomplishments are about as rare as "self-made-men"----neither flourishes in great numbers. Men produce with the considerable help of----or in oppositional reaction to----other men. In either case, the producer certainly owes a debt of gratitude to the individuals who provided the stimulus that aided in the accomplishment of the task.

The author is vividly aware of the many debts of this type that he must acknowledge. He fully realizes that he can never adequately repay the tremendous debt of gratitude that he owes

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CHAPTER I

STATEMENT OF THE PROBLEM

The retina of the human eye is made up of ten layers. One of these layers, the bacillary layer, is composed of 130 million rods and 7 million cones.(1) It would appear, in view of the unusually large proportion of rods to cones, that the rods were of much greater importance to the process of seeing than the cones,---but this is not the case at all. The cones, it is true, are very thinly scattered throughout the peripheral area of the retina; so thinly scattered, in fact, as to appear almost entirely lacking. The proportion of cones increases, however, as the visual axis is approached. They become the exclusive element of the macula, that localized area directly in line with the visual axis.(2) Thus, the focal point of vision, plus a reasonable area of the retina surrounding it, is almost exclusively made up of cones. Are the cones, i.e., the agents of color vision, important to visual perception? They certainly are. They are, by far, the most influential factor in the process of seeing.

Color is a very important experience in the life of the human being. He suffers blue moods, is green with envy, sees red when angry, is characterized as yellow in retreat, or is purple with rage. He exhibits

a form of color preference every time he chooses a segment of apparel, a car, a color scheme for his home, a set of dishes, or an ill-used set of books for the family library. Since color is such a consistent part of the individual's environment, it could conceivably have a very important effect on the thinking, acting and feeling that characterizes him.

Our society is a color-conscious one. The interest and regard for color displayed by the people of this country is of the extreme variety. The advertising agency is absorbed in the search for a little knowledge regarding its effective and affective value. The interior decorator is deeply interested in ascertaining the most plausible color scheme for a multitude of specific functional buildings. The designer of dresses, automobiles, or of any other common item clashes daily with the problem of selecting the colors that will best fit and sell his creations. If color were not an important factor in all of these instances, there is no reason to assume that the time, energy, and money being spent on charting its effects would continue to mount----but mount it does. Color is a joy to behold. It is, however, a very real problem.

This research problem was established with the hope of dispelling, in one way or another, a little of the uncertainty that surrounds the use of color. If color

and personality are related in any way, it is knowledge worth the gaining.

THE PROBLEM

The problem of this investigation was to determine what, if any, personality characteristics, as measured by standardized tests, relate to affective preference reaction patterns to the colors: red, orange, yellow, yellow-green, green, blue-green, blue, and violet. Particular attention was focused on the following points:

1. Similarities and differences exhibited by the sexes in regard to personality characteristics as determined by the standardized personality inventories. The material was analyzed in terms of the individual traits, as these were presented and defined by the various personality inventories used.

2. Similarities and differences exhibited by the two sexes with respect to group color preference, as determined by a color preference test.

3. Similarities and differences exhibited by two groups of the same sex, so chosen because they represented the polar extremes of one trait, with respect to mean color preference pattern.

4. The basic color preference patterns, their similarities and differences, that might serve to differentiate between the two groups representing the polar extremes of one trait.

5. The possibility that color, as an abstract stimulus with possible affective properties, might be used to help in the determination of the basic nature of the individual's personality.

The purpose of this investigation was to discover whether or not certain colors, because of the nature of their stimulus value, were liked or disliked (accepted or rejected) on the basis of the personality of the perceiving organism.

DELIMITATIONS.

The real problem of this research was, as is many times the case, one of deciding when and where to stop. In the beginning, forty college students were given the battery of personality tests and the color preference test. The group was composed of twenty men and twenty women. When the appropriate statistical procedures had revealed the fact that the men and women would have to be treated, in all future analysis, as separate groups, a more thorough treatment of the data that represented the women was initiated. As the work progressed, it became increasingly apparent that the scope of the problem was too great to be developed completely in this paper. It required over thirty graphs to illustrate adequately the color preference patterns of the women. Such extensive measures were found to be not feasible in the analysis of the material procured from the group of men.

The data was treated with the same statistical procedures as were used in the analysis of the women, but only a sample, large enough to suggest the nature of the results achieved with the men, will be presented in this paper.

1. Maximow, Alexander A. and Bloom, William., "A Textbook of Histology," W. B. Saunders Co., Philadelphia & London; Pp. 617. (Pp. 616-622)

2. Krieg, Wendell J. S., "Functional Neuroanatomy", The Blakiston Co., Philadelphia; Pp. 163-171. (Color perception of cones--Pp. 166)

CHAPTER II

PREVIOUS, RELATED RESEARCH

Very little material has been accumulated in the field of study embraced by this research problem. Very little pertinent material has been recorded in the numerous periodicals, pamphlets, textbooks, and source books that were referred to prior to the formation of the methodology used in this problem. A number of investigators have tested the color preference patterns of various age and racial groups. The several different methods used, as well as the results that were achieved, will be mentioned later in this chapter. A few men have attempted to determine the nature of the individual's physiological responses to the stimulation of colored lights. Others have tried to ascertain the effect that color exerts on production. (The testees, in this case, were asked to perform simple tasks, tasks such as the solving of simple arithmetic problems, etc., under the influence of highly saturated colors. All of the articles that fell within the visual field of the testee were of one dominant color; the desk, the chairs, the general background against which the testee operated. The rates of production achieved under the influence of the colors used in the experiment, as well as the rate of production achieved in a neutral situation,

were compared.) The author was able to uncover only one experiment in which color preference pattern and personality structure were definitely equated and analyzed.

At the World's Fair in St. Louis, 1904, R. S. Woodworth and F. G. Bruner checked color preference by placing a large assortment of skeins of colored worsted "(those used in the Holmgren test for color blindness)" in a loose pile on a table, and by allowing the testee to pick out the color that pleased him most and least.(1) The reds and pinks and light blue were chosen most often. Orange and reddish purple were chosen least. When they were chosen, it was because of the testee's dislike for them. The greens were seldom chosen as best or least liked. The results of this experiment suggest that colors that approach the primary colors, red and blue, were best liked, that the hues that resulted from a mixture of red and blue or red and yellow (violets, purples, and oranges) were disliked, and that the greens were the least affective colors---in so far as extent of choice for either extreme was concerned.

Jastrow,(2) at the Chicago World's Fair of 1893, presented a group of testees with a series of colored papers. The most frequently preferred color was blue in the case of men, and red in the case of women.

J. P. Guilford, using the paired comparison method

of color preference testing, attempted to plot the affective value of various spectral colors.[3] He found that the curve started at average affective value for red, dropped to a low point for yellow, rose to a little above average for green, dropped somewhat for blue-green, ascended to a high point for blue, and dropped again for violet. The most affective colors were, according to his findings, red, green, and blue. The colors yellow, bluish-green, and violet were found to be least affective. Guilford went on to suggest several factors that influenced color preference. These factors were: (1) hue, (2) brightness, (3) saturation, and (4) previous associations with the colors. He found, also, that the color preference pattern of the individual, after an interval of one year, showed relatively high stability. The correlation between test and retest was .84.

Other samples of color preference pattern have been taken by Winch (1909), Washburn (1911), Katz and Breed (1922), Garth (1924), and Michaels (1924).[4] The results of these tests seldom agreed, and appeared to leave the whole problem in a rather jumbled state. Several important hypotheses, however, were suggested by the data collected. First, several factors other than hue affect the aesthetic impression. These factors are brightness, saturation, area, and field. Second,

the surface texture of the medium that reflects (rejects) the color is very important.[5] Colored silks, for instance, are generally more pleasing than are colored papers.

These experiments suggest the variety of methods that could conceivably be used in uncovering color preference pattern, but they do not reflect the type of problem that is the basis of this paper. Color preference was evidently considered an important dimension of human expression and feeling, but it was never actively considered in relation to personality structure.

T. Shikiba,[6] in 1928, assessed the color preference patterns of inmates of mental institutions and delinquent boys. The color preference pattern of the whole group was (1) blue, (2) red, (3) violet, (4) green, (5) yellow, and (6) orange. Shikiba gave his color preference test to groups of individuals who, according to clinical diagnosis, illustrated abnormal manifestations of the symptomatic complexes typical of various mental disorders. He then determined the mean color preference pattern of each group. Shikiba tested many groups, too many to list in this paper. Some of the more illustrative color preference patterns are as follows:

(1) Manic; R, V, G, B, O, Y;

(2) Depressive; B, G, Y, O, V, and R;

(3) Epileptic; B, R, V, O, G, and Y;

(4) Paralytic Dementia; B, V, R, Y, G, and O;

(5) Neurotic; B, R, O, Y, G, and V;

(6) Dementia Praecox; B, R, G, V, Y, and O;

(7) Senile Dementia; V, B, R, Y, G, and O;

(8) Amentia; V, B, O, R, Y, and G.

This partial list of the results of the work of Shikiba should serve to illustrate the variation that differentiated the groups. The color preference patterns of the manic and depressive groups is particularly interesting. They represent almost complete reversals in order of preference. Red and violet move from top positions in the one group to bottom (last) positions in the other. Blue and yellow operate in the same fashion. Green maintains about the same position, which is typical of most of the other reports, and orange, which is usually listed as an unpleasant color, retains a consistently low position.

E. Bullough,[7] using the serial method of color preference testing, attempted to discover the reasons why colors were liked or disliked----the conditions upon which color preference depends. He used seventy hues, shades, and tints. "The subject looked through a circular aperture at the color, which was in bright and constant light, and had to say whether he liked or disliked it, and his reason for liking or disliking."[8] The

thirty-five subjects were divided into four groups on the basis of their reasons for liking or disliking a color. These groups were as follows:

(1) Objective Type----who liked or disliked a color on the basis of its saturation, pureness, brightness, thinness, or dullness.

(2) Physiological Type----who liked or disliked a color because it was stimulating, soothing, or depressing.

(3) Associative Type----who liked or disliked a color on the basis of its association with some agreeable or disagreeable object or event in their experience.

(4) Empathy Type----who liked or disliked colors on the basis of the "character" of the color (jovial, sympathetic, stubborn, or aggressive.)

These four aspects of color appeal are considered "Aesthetic Types."

The apparent dearth of related material in this field of study should not be interpreted as an indication of a lack of value in this type of research problem. In view of the important position given color in the creation of clothing, in interior decoration, in advertising, and in a multitude of other fields of endeavor, this lack of knowledge about the possible relationships that might exist between color preference and personality serves, rather, to suggest the need for such research. Since men must live constantly within walls of color, they can certainly afford to learn to choose those colors that cause them the least discomfort--or allow them the greatest pleasure.

(1) Woodworth, Robert S., "Experimental Psychology", Henry Holt and Co., New York, 1938; Pp. 381.

(2) Ibid., Pp. 382.

(3) Guilford, J. P., "Affective Value of Color as a Function of Hue, Tint, and Chroma", Journal of Experimental Psych., 1934, 17, Pp. 342-71.

(4) Woodworth, Robert S., "Experimental Psychology", Henry Holt and Co., New York, 1938; Pp. 382

(5) Ibid., Pp. 382

(6) Shikiba, T., "Color Preference of Deranged Persons and Delinquent Boys", Psychological Abstracts, Vol. 2, 1928, 2694.

(7) Collins, Mary and Drever, James, "Experimental Psychology", E. P. Dutton and Co., New York, 1930; Pp. 202.

(8) Ibid., Pp. 202

OTHER REFERENCES:

Guilford, J. P., "Methods of Paired Comparisons as a Psychometric Method", Psychological Review, Vol. 35, 1928, Pp. 494.

Walsh, W. E. et al., "Color Preferences of 1279 University Students," American Journal of Psychology, 1933, Vol. 45, Pp. 322-28.

Burtt, Harold E., "Psychology of Advertising", Houghton Mifflin Co., (Riverside Press,) Cambridge, 1938.

Chandler, Albert R., "Recent Experiments in Visual Aesthetics", The Psychological Bulletin, 1928, Vol. 25. Pp.

CHAPTER III

CRITERIA OF RESEARCH

A criterion is a test by which anything is tried in forming a correct judgement respecting it. It is a standard by which a judgement is rendered. Prior to the equation and statistical analysis of descriptions of two or more dimensions of the human's nature, dimensions such as personality structure and color preference, standards of judgement must be established regarding them. This primary step is the formation of a conceptualism involving the nature and function of personality structure and color preference. Several important questions, questions that are determined or colored by the nature of the material of the research problem, must be asked---and answered. Worded in the terms of this particular problem, the following questions demand an answer:

1. What is the nature of personality structure?

2. What relationship does personality structure bear to those factors revealed and defined by the personality inventory? (This question demands an inspection of the claims of validity launched in behalf of the personality inventory.)

3. Are personality structures and color preference patterns resultant products of the same, or very

similar, processes? Do they develop from similar causes?

4. Is the apparent color preference pattern of the individual, as uncovered by the paired-comparison method of color preference testing, equivalent to his actual color preference?

5. Is the reliability (durability, consistency) of the color preference pattern of the individual great enought to allow this factor to be equated with personality,---with a reasonable expectation of achieving reliable results?

When these questions have been answered, when the battle lines of the opposition have been drawn and carefully studied,----then does it become possible to form the type of attack capable of resolving the problem into understandable form. It will be the purpose of this chapter to attempt answers to these questions. It is assumed that these answers will provide the criteria to which this research problem must be anchored.

WHAT IS THE NATURE OF PERSONALITY?

Professor Ross Stagner, in his recent text, "Psychology of Personality", describes a dynamic concept of personality that seems, in the main, to answer this question satisfactorily. Personality, as conceptualized by Stagner, takes on the semblance of a highly integrated, constantly moving organization;---genetic in formation, and affected to an undetermined extent, by the physio-

logical makeup of the individual. "Personality is the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment."[1] It is a learned pattern of intervening variables, built within the limits of the physiological character of the individual.[2]

Personality appears to operate at three distinguishable levels: behavioral, perceptual, and motivational. These three levels are closely integrated, and consist of relatively few dimensions. The behavioral level is characterized by two demensions: "(1) approach to or withdrawal from a stimulus object; and (2) increased or decreased organismic activity with reference to the object."[3] The perceptual level is organized in a slightly different fashion. It does display a rather definite demension that might be called approval-disapproval. Another dimension, not as easily determined, might be described in terms of the attentiveness of the perceiving individual----increased or decreased attention. The perceptual level of personality is, in addition, divided into areas of attitudinal sets, or <u>frames of reference</u>.[5,6] These "points of view" serve as guides to the formation of judgements. The individual reacts to the stimulus pattern in terms of the way in which it is perceived. This level of personality make-up is the record of past experience. It is the interpreter who serves to estab-

lish an understanding between the organism and the external environment; an understanding that provides for rather consistent, problem-solving behavior. The motivational level of the personality structure is characterized by a dimension of approval-disapproval,[7] or approach-withdrawal. It is also patterned in accordance with the order of dominance of different motives, the individual's capacity for delaying and sustaining the direct expression of these motives, and the complexity of the dynamic organization of these factors.[8]

It will be noticed that all levels share the common demension of approval-disapproval or approach-withdrawal. This fact of structure suggests the three-dimensional character of personality----the third dimension being one of depth, of vertical arrangement of planes. A probing of successively lower levels of the personality should uncover a tendency towards greater and greater stability and apparent unity. Behavior seems to be a matter of perception, mediation at the lower levels, and behavior aimed at the restoration of the equilibrium of the reacting organism.

THE NATURE OF THE VALIDITY OF THE PERSONALITY INVENTORY.

The fact that most personality inventories have been constructed to assess those polar aspects of the personality called traits suggests a widespread belief in the existence of the trait. The definition of the

trait, "a generalized tendency to evaluate situations in a predictable manner and to act accordingly"[9], certainly stimulates the belief that the trait reflects the organization of, at least, the behavioral and perceptual levels of personality. If a study of personality, in terms of traits, allows the understanding, prediction, and control of individual activity on the behavioral level, which seems to be the case, the assumption that the personality is an organization of traits seems to be, for all practical purposes, a defensible one. The consideration of personality in terms of the trait does not deny or displace the structure previously described. The trait is merely a more specifically defined part-dimension of those previously mentioned.

This vein of reasoning offers an answer to question number two; i.e., what relationship does personality bear to those factors revealed and defined by the personality inventory? If the inventory uncovers stable, predictable aspects of the personality, whether or not the titles given to the traits describe them accurately, its procedure and results can be considered valid. It performs this function with useful accuracy. Much of the proof for the existence of the trait is equally valuable in ascertaining the validity of the inventory----for the job done by the inventory is the proof.

THE ORIGIN OF PERSONALITY AND COLOR PREFERENCE.

Question number three, the question regarding the similarity of origin of personality structure and color preference pattern, can be answered. Both personality structure and color preference pattern are the result of the process of experiencing; of the process of learning. Colors have been designated, by some, in terms of their stimulus value. Red has been considered a stimulating color, and green a subduing one. This sort of color assessment has little bearing on this case. It neither tends to support nor to harm the line of reasoning being expressed. Whether a "stimulating" color seems irritating or pleasant to a specific organism is still a function of the "frame of mind" of the organism, and this frame of mind is a matter of learning; i.e., a function of personality. It would appear that personality structure and color preference pattern are both matters of learned preferences, and as such are liable to equation and analysis.

THE VALIDITY OF THE RESULTS OF THE COLOR PREFERENCE TEST.

Is the apparent color preference pattern of the individual, as uncovered by the paired-comparison method of color preference testing, equivalent to his actual color preference pattern? The answer to this question is influenced by the construed meaning of "actual color preference." If the testing procedure as a whole, in-

cluding the pre-test instructions, the presentations of the paired colors, and the atmosphere of the total testing situation, is a carefully structured routine, there is no reason to assume the existence of a difference between the two. It is indeed likely that each color is associated with a large number of types of experiences. Preference is, after all, a learned predisposition to select one color over another----perhaps, over all others. It is equally conceivable that two people might prefer the same color to the same extent---because of an entirely different group of associations. The same individual may logically display different color preference patterns if questioned with specific reference to clothing, to wallpaper for his home, or to any other object that calls forth a well defined group of associations. The affective value of color may function in color preference to the extent that the individual has found this color to have, in certain amounts, an irritating or soothing effect upon him. (This point of view suggests the idea that color, by affecting personality structure of a certain type in a certain way, causes personality to effect color preference.)

It has been suggested that color preference is the result of learned predispositions to select certain colors over others; that color preference may be a function of numerous types of associations, and the general psychic

make-up of the individual. The latter point is an important part-problem of the research problem. The former statement, i.e., that color preference is conceivably a part-function of numerous associations of different types, is of importance. It is of import to the extent that knowledge of this effect, if used, may allow it to be neutralized as thoroughly as is possible. The elimination of this effect is not the implication meant. Such a maneuver is neither possible nor desirable. The implication is, rather, that the possibility of a <u>one-sided loading</u> of the types of associations called forth should be reduced as much as possible. Specific preference for a color, as determined by considerations of clothing, wallpaper, or some other object with a definite use, is of little value to this study. A preference for a color, however, that expresses all of these is the real aim. "Actual color preference" becomes the color preference pattern of the individual as dictated by his total psychic and associational make-up. The color preference test must be considered as capable of predicting the actual color preference of the individual. The final test of its value rests in the relationships, if any, that are found to exist between color preference pattern and personality structure. If the results of a personality inventory of acceptable validity are equated with the results of the color preference test, and if

statistical analysis reveals very significant results in terms of relationships between the two, then the color preference test must be revealing a portion of the make-up of the individual that possesses just as much reality as the dimensions of personality uncovered by the personality test. This is a justifiably pragmatic view of the color preference test. The results of the analysis of the data of this problem may serve as a further justification.

THE RELIABILITY OF THE COLOR PREFERENCE PATTERN.

The final question to be dealt with in this chapter involves the reliability of the color preference patterns uncovered by the paired-comparison method of color preference testing. Although reliability, as such, will not be discussed in the body of this paper (for reliability is imperative only to the extent that standardization is the aim) approximately thirty percent of the individuals tested were given a re-test in color preference. The results suggested that the color preference pattern of the individual, on re-test, remains, in a majority of cases, the same. The only variations noted involved small changes. Last place colors, those colors occupying positions number seven and eight, occasionally exchanged positions. Colors that fell in second or first place also, on occasion, exchanged places. The majority of the variations, though few in number, were the result

of the movement of a middle value color, a color occupying position four or five, to the next higher or lower position. In no case was there a drastic change, as would have been the case if a last place color on the first test had, on re-test, moved to position number one, two, three, or four. It is worth remembering that only two reversals in twenty-eight judgements could cause drastic changes in the color preference pattern of the individual. Two changes could throw the first and last three colors into an absolute tie; six choices each for the first three, and one choice each for the last three. All changes perceived were slight, and were consistent with the pattern as first established. These findings are in general agreement with the findings of J. P. Guilford. In one of his studies, in which the second test was given after the interval of a year, the stability of the individual preferences was "evinced by a correlation of .84".(10)

The type of variation that is apparently typical of the revealed color preference pattern is little different than that found in the results of the personality test. The individual is expected to vary slightly in his responses to the statements that compose the personality test, from test to re-test----within certain limits. The person who scores at the center of the scale on the first test would be expected to vacillate from one side of the

center line to the other on subsequent re-tests. Minor fluctuations would be expected of the people at either extreme. But it is not expected, however, that an individual, diagnosed as very neurotic in tendency by the test results of one day---should, on the following test, achieve a score indicative of highly adjusted behavior. The color preference test appears to have approximately the same degree and type of reliability as does the personality inventory. The number of judgements required in the former is much lower, and the effect of each judgement is, thus, greater. It would be possible to find a slightly higher variation in color preference pattern, from test to re-test, than appears to be typical of the personality inventory. This is only a possibility, however, and was not suggested by the results of the data collected.

1. Stagner, Ross, "Psychology of Personality" McGraw-Hill Book Co., Inc., New York, 1948; Pp. 6 (A quotation from Gordon Allport, 1937).

2. Ibid; Pp. 5-6

3. Ibid; Pp. 71

4. Ibid; Pp. 74

5. Ibid; Pp. 74

6. Sherif, Muzafer and Cantiel, Hadley, "The Psychology of Ego-Involvements", John Wiley & Sons, Inc. New York; 1947; Pps. 30ff, 34-43, 40ff, 86, 121 129, 425.

7. Stagner, Ross, "Psychology of Personality", McGraw-Hill Book Co., Inc., New York, 1948; Pp. 76

8. Ibid; Pp. 76

9. Ibid; Pp. 143

10. Guilford, J. P., "Affective Value of Color as a Function of Hue, Tint, and Chroma", Journal of Experimental Psych., 1934, 17, Pp. 342-71.

CHAPTER IV

TESTS USED AND MATERIALS NEEDED

This particular research problem, i.e., the determination of which, if any, personality characteristics, as measured by standardized personality inventories, relate to affective preference reaction patterns to the eight major spectral colors, demands the use of the personality inventory and the color preference test. The first task involved the selection of the personality test, or tests, to be used in determining the personality characteristics of the individuals that comprised the test-group. A number of considerations were of prime importance. How many tests should be used? Which tests should be used? Should a test be chosen because it reveals the greatest number of individual traits, ----or because it uncovers a substantial number of fairly well correlated traits? It was decided, on the basis of advice rendered by my Thesis Advisor, Dr. Claude E. Thompson, that a battery of five tests of personality should be administered to each of the testees. These tests should be so chosen that they would take inventory of the greatest possible scope of the personality structure, and still exhibit enough inter-correlation to allow one to function as a check of the others. The following tests were selected.

1. "An Inventory of the Factors STDGR", by J. P. Guilford, Ph. D.

a. Introvert----Extrovert (Social)
b. Introvert----Extrovert (Thought)
c. Depressive---Optimistic
d. Cycloid------Non-Cycloid
e. Non-Rhathymic----Rhathymic

2. "The Johnson Temperament Analysis", devised by Roswell H. Johnson, University of Pittsburgh.

a. Composed-----Nervous
b. Gay-Hearted--Depressed
c. Quiet---------Active
d. Cold----------Cordial
e. Hard-Boiled--Sympathetic
f. Objective----Subjective
g. Submissive---Aggressive
h. Appreciative-Critical
i. Impulsive----Self-mastery

3. "The Personality Inventory", by Robert G. Bernreuter; published by Stanford University Press, Stanford University, California.

a. Emotionally Adjusted--Emotionally maladjusted
b. Non Self-sufficient---Self-sufficient
c. Extrovert----Introvert
d. Submissive---Dominant
e. Self-confident----Self-conscious
f. Social----Non-social

4. "Inventory of Factors GAMIN", by J. P. Guilford and H. G. Martin.

a. Low Overt Activity----High Overt Activity
b. Submissive----Ascendant
c. Feminine Interests----Masculine Interests
d. Self-conscious----Self-confident
e. Nervous----Calm

5. "Minnesota Multiphasic Personality Inventory", by Starke R. Hathaway, Ph.D., and J. Charnley McKinley, M. D.; published by the Psychological Corporation, New York.

a. Hypochondriacal
b. Depression
c. Hysteria
d. Psychopathic Deviate
e. Masculine and Feminine Interests
f. Paranoia
g. Psychasthenia
h. Schizophrenia
i. Hypomania

A close examination of the descriptive, bi-polar titles of the scales listed under the various personality inventories should serve to illustrate the scope and depth of the probing potentially possible with this battery of tests. They should yield evidence of the nature of the individual's personality at many levels of the structure.

THE COLOR PREFERENCE TEST

There are several methods of taking an inventory of the color preference of the individual: (1) the method of choice, (2) the order of merit method, (3) the rating method, and (4) the paired-comparison method.[1] Since the first three methods seem to allow a great deal of subjective meandering on the part of the testee, and since there might be some doubt as to the validity of the results of these methods, it was decided that the paired-comparison method best suited the demands of this problem. This method allows the examiner to exert greater control over the entire testing situation, since the testee has much less to do. The order of merit method requires, for instance, that the testee be allowed to array all of the colors in the order of their preference; i.e., from left to right or top to bottom, as the case may be. How many times are the colors placed in the positions that actually reflect their order of preference? How many times does some vague

factor of "aesthetic judgement" demand that the colors be arrayed in a pattern, with the possible exception of those colors liked best and least, that satisfies a desire to achieve an internally consistent or a totally pleasing effect? Would the results be an indication of color preference, or do they indicate, rather, the aesthetic judgement, influenced at times by actual color preference, of the individual? These questions can hardly be answered with certainty, but they brought to mind a number of suggestive possibilities that were unpleasant enough to encourage the use of the method of paired-comparison.

The creation of a color preference test requires the use of a number of materials, relatively rare in some cases. (The selection and procurement of standardized colored papers is of particular importance.) Due to the generosity of Dr. Miles A. Tinker, University of Minnesota, who furnished this experimenter with a set of papers from his own supply, Milton Bradley coated colored papers were used in this research problem. These colored papers, as designated by the Milton Bradley pure spectrum scale (The Milton Bradley Studio Book Of Colored Papers), were as follows: Red, Orange, Yellow, Yellow-Green, Green, Blue-Green, Blue, and Violet. After the colored papers were procured, the creation of the color preference test got under way. The whole procedure was

characterized by the following steps (stages):

1. A set of seven squares, 4 cm. by 4 cm., was cut from each of the eight colored papers.

2. A square "mat-board", 60 cm. by 60 cm., was cut from a piece of white, heavy-duty, illustration board.

3. A "frame-board", 20 cm. by 20 cm. square, pierced in the middle by two windows, 3 cm. by 3 cm. square and 8 cm. apart, was cut from a piece of the same type of illustration board used in step two. This frame was then covered with a medium-grey Milton Bradley colored paper. Care was taken so that the inside edges of the windows were also covered.

4. A square, 20 cm. by 20 cm., was lightly drawn in the center of the "mat-board" so that the "frame-board" could be placed accurately in position. An Exacto Knife was used to cut a slit along one side of this drawn square. This was the first step in the process of connecting the "frame-board" to the "mat-board" with a cloth hinge.

5. A hinge, 3 cm. wide and 18 cm. long, was cut from a piece of tough cloth. Butcher's linen was used in this instance. This piece of material was tightly glued to the bottom of the "frame-board" along one of the edges that paralleled the two windows. It was glued in a fashion that allowed one-half of its width to project beyond the edge to which it was attached. This excess material was then inserted through the slit previously cut in the "mat-board", was drawn taut from beneath, and was then glued securely to the underside of the "mat-board".

6. Finally, twenty-eight "mounting-sheets", 18 cm. by 18 cm., were cut from a twenty-four pound, bond, typing paper. The number of sheets cut represents the number of paired-comparisons needed to present eight colors in all possible combinations of two. These sheets were cut of a size that allowed them to be inserted under the "frame-board" without extending beyond its edges. The colored squares were then pasted to the "mounting-sheets" in the paired order suggested by E. B. Titchener.[2] Each pair of colored squares, as alloted to each sheet, was pasted to its "mounting-sheet" in the positions that allowed it, when the "mounting-sheet" was placed under the "frame-board" with its leading edge against the backside of the hinge, to be viewed by the testee through the two windows.

The reason behind the hinging of the "frame-board" to the "mat-board", and the pasting of the pairs of colors to the "mounting-sheets", is apparent. These preparations allow the color preference test to be given with much greater dispatch. The whole testing procedure is reduced to the following steps:

1. The testee is seated at the table with the examiner standing opposite him.

2. The testing board is placed on the table before the testee, with the hinged portion of the "frame-board" toward him.

3. After the testee is given his instructions, and after he has closed his eyes, the "frame-board" is swung upward on its hinge, the first "mounting-sheet" (with its pair of colors) is slipped into place under the "frame-board", and the "frame-board is dropped back into place.

4. After the testee has opened his eyes and has indicated his preference in regard to the two colors, he closes his eyes----and the procedure is repeated.

Allowing enough time between the exposures for possible after-image to disappear, the entire test seldom takes over four minutes. This was the color preference test as it was used in this experiment.

1. Woodworth, Robert S., "Experimental Psychology", Henry Holt and Co., New York, 1938; Pp. 370-381.

2. Titchener, Edward B., "Experimental Psychology", The MacMillan Co., New York, 1901; Pp. 92-95.

CHAPTER V

METHOD AND PROCEDURE

In the previous chapter, a description was given of the various tests used in this research problem. A relatively detailed description was given of the methodology involved in the construction of the color preference test. Several important topics, topics that might conceivably have been dealt with in conjunction with those just mentioned, were reserved for discussion in this chapter on "Method and Procedure". It was felt that they could be handled with greater clarity in this fashion. These topics are as follows: (1) the method of pairing colors, (2) the testing situation, (3) the order of testing, and (4) the nature of the statistical methods that fulfilled the needs of this problem.

THE METHOD OF PAIRING COLORS.

The method of pairing colors used in this instance was, with certain modifications, that outlined by E. B. Titchener.[1] The modifications, it is hoped, increased the accuracy of the results. Titchener's method can be readily illustrated with a simple chart.

Colors:	B	BG	G	YG	Y	R	V	O
BG	1							
G	2	3						
YG	14	4	5					

Colors:	B	BG	G	YG	Y	R	V	O
Y	15	16	6	7				
R	23	17	18	8	9			
V	24	25	19	20	10	11		
O	28	26	27	21	22	12	13	

The method, as charted, is simply one of arraying the colors in two dimensions (horizontally and vertically), and then giving a number designation to the points where the color vectors would cross. The number one (1) represents the pair of colors, Blue and Blue-Green. It will be noticed that each color is involved in two pairings in a row. If, now, the color designation at the top of the chart is always recorded first, Blue would invariably find its way into the left-hand column or position. Blue-Green would accomplish this in six instances out of seven, Green in five, Yellow-Green in four, etc.. This type of pairing allowed the space error (2) to function with little obstruction. In order roughly to equate the pairs with reference to the factor of space position, Titchener's method was slightly modified. Every other pair, beginning with pair number two, was reversed. This correction allowed each color to be displayed in the right hand position about half of the time. In order to reduce the possible effect of one color appearing in two pairs in a sequence, the order of the pairs was then rearranged to the best apparent advantage.

The resultant order of presentation used in this experiment was as follows.

1.	B	BG	8.	O	Y	15.	YG	Y	22.	YG	BG
2.	V	O	9.	B	R	16.	G	O	23.	B	Y
3.	BG	G	10.	BG	V	17.	Y	R	24.	BG	R
4.	YG	B	11.	Y	G	18.	G	B	25.	YG	O
5.	O	R	12.	V	B	19.	V	Y	26.	V	YG
6.	Y	BG	13.	G	YG	20.	R	YG	27.	R	G
7.	G	V	14.	R	V	21.	O	B	28.	O	BG

This order of pairing and presentation seemed to offer the greatest opportunity for achieving the most accurate results. All colors appear at fairly regular intervals from beginning to end, and vary from the left-hand position to the right, with acceptable regularity.

THE TESTING SITUATION.

All of the testing was carried on with as much care and forethought as the situation allowed. Since a special room had not been set aside for this type of experimentation, it was necessary to select, with all due consideration for the requirements of the testing, a room that could be used with fair regularity and for relatively long periods of time. Since the testing involved the presentation of colors, the factor of lighting was of maximum importance. The general color scheme of the room was also an important factor. A room was finally chosen that fulfilled the major requirements of the administration of the color preference test. It was a fairly small room with a large window to the north. The walls of light, relatively neutral tan, the clean white ceiling, and the light woodwork, of the color of the wood, allow-

ed the greatest and most even diffusion of the light. The room contained one table, one large desk, and three chairs. This room was always used in the administration of the color preference test. On occasion, however, the long battery of personality tests had to be given elsewhere. The alternate room always had similar placement of windows, and similar general color scheme. The testee was, in every case, seated close to the window, with the source of light to his right and slightly to his rear.

THE ORDER OF TESTING.

The order of testing was, in all cases, the same. The color perception test was given first. The "Pseudo-Isochromatic Plates for Testing Color Perception", Engraved and Printed by the Beck Engraving Co., Inc., Philadelphia, New York (Copr. in 1940 by the American Optical Co.), were used for this purpose. No color-weak persons were tested further. Next, the color preference test was administered. It was felt that this practice might reduce the possible effects of visual fatigue; in-so-far as visual fatigue might modify the results of the color preference test. The administration of this test was always prefaced by the verbal presentation of the instructions. These instructions were as follows:

"I am going to take an inventory of your color

preferences. When I say, READY, I want you to close your eyes. When I say, NOW, you will open your eyes and look straight at the two colors. When you have decided which of the two colors you like the best, point silently to it. REMEMBER,----point SILENTLY to it."

These instructions contain several interesting points. First, it was the practice of this examiner to have the testee close the eyes between the presentations of the paired colors. It was believed that this precaution might have two effects: (1) the enhancement of the stimulus value of the colors being presented, and (2) the elimination, as far as was possible, of the effect of other colors in the room. Second, it was felt that the practice of having the testee point silently to the color he preferred would reduce the effect that might result from the relative ease with which the names of certain colors are pronounced and recalled. This was to be a test of color preference, not a test of the familiarity and ease of reiteration of certain names of colors.

The personality inventories were given in the order that appeared best to pace the efforts of the individual. The long Minnesota Multiphasic Personality Inventory was given first. The Bernreuter Personality Inventory, because of its relatively small number of statements, was given second. It was felt that a shorter inventory

might make the testees to realize that, at some time in the foreseeable future, they might actually finish all of the tests that comprised the battery. The next test given was the Johnson Temperament Analysis. Finally, the last two tests, An Inventory of Factors STDGR and An Inventory of Factors GAMIN, were administered.

GENERAL TREATMENT OF THE DATA.

When the testing had been completed, it was necessary to devise a method of reducing the data collected from the forty testees to understandable form. At first, an attempt was made to analyze the material on the basis of the choice rendered in relation to each separate pair of colors. Thus, the scores the individuals received on each trait of the personality inventories were grouped according to the color chosen in each pair. It quickly became apparent that this procedure was too involved to be of value. The next attempt at analysis was more productive. The people were grouped according to their scores on every trait of the personality inventories. If they scored between zero and fifty-one percentile, they were placed in one group. If they received a score of fifty-one to one hundred percentile, they were placed in the other group. The group-mean color preference pattern for each group was determined, and the two patterns were then equated and analyzed. It will be remembered that the men and women were handled as individual groups, and

were compared only in terms of their group results.

OTHER CONSIDERATIONS.

Before bringing this chapter to a close, it seems advisable to discuss the considerations that were involved in the selection of the test group. The test-group was not, in the first place, a thoroughly representative sample of the total population. This research problem was not born, however, of a desire to determine the mean color preference pattern of a group of people who were representative, in terms of personality characteristics, of the whole population. In an experiment of this type, where the number of persons tested must remain relatively small because of the scope of the tests administered to each, there is greater interest in the extreme individual than in the individual representing the mean. It might help to clarify this declaration if it were stated in a different way. If an experimenter were interested in determining what relationships existed between color preference pattern and personality characteristics, as uncovered by the B1-N trait of the Bernreuter Personality Inventory, he would have need for both neurotic and well-adjusted individuals. He would have to use those individuals most illustrative of each pole of the trait in his analysis. This type of treatment is dictated by the very nature of the construction of the personality inventory.

The sample was stratified to some extent. The proportion of fraternity and sorority members in the sample was the same as in the University population as a whole; about one-third. The average age of the group of men was slightly higher than that of the group of women. The men averaged 20.23 years per individual. The women averaged 19.64 years per person. This difference is indicative of the actual age difference that exists between the two groups in the total population of the University of Omaha. The difference is due to the presence of numerous veterans. Only white students were tested. The experimenter wished to avoid the introduction of racial differences, particularly with reference to color preference pattern, is such differences existed. The process of racial stratification increases the complexity of the analysis, without adding much to the validity or value of the results. The experiment, as defined, requires the testing of men and women of similar age, men and women who attend the University of Omaha. This requirement was fulfilled.

1. Titchener, E. B., "Experimental Psychology", Vol. I, The MacMillan Co., New York; Pp. 92-94.

2. Woodworth, R. S., "Experimental Psychology", Henry Holt and Co., New York; Pp. 378 and 379.

CHAPTER VI

ANALYSIS OF THE DATA AND THE RESULTS

The methods used in the analysis of the data of this research problem were relatively simple. The entire procedure that was involved in the preliminary organization of the data, the procedure preceding statistical treatment, can be roughly reduced to three basic steps or stages: (1) The group of men and the group of women were divided into sub-groups on the basis of the trait-scores of the individuals that comprised them (which resulted in the emergence of a group representing each of the two polar aspects of every trait), (2) the mean color preference pattern of each of these sub-groups was determined (this pattern being a group of ratios representing the number of times a color was actually chosen in relation to the number of times a color could have been chosen), and (3) the color preference patterns of the two sub-groups that represented the polar aspects of each personality trait were compared,---so that the similarities and differences, exhibited by these groups in regard to frequency of choice of each color, could be determined. Each comparison, of the type described above, revealed several large differences in the color preference patterns of of the groups involved. It was necessary, therefore,

to find a means of ascertaining the degree of significance of these differences; a means of ascertaining whether or not the differences were large enough to warrant the belief that the sub-groups, on the basis of their mean color preference patterns, were not homogeneous.

This is a very general outline of the entire procedure utilized in the treatment of the data of this problem. It will be the purpose of this chapter to give a full description of this process of analysis, as well as a graphic illustration of the results.

ANALYSIS OF THE DATA.

The first step in the classification of the data was one of comparing the mean scores that the group of men and the group of women achieved on the various traits of the battery of personality inventories. The mean difference that separated the groups on each trait was ascertained, and a "t" value was computed for each mean difference. The formula used to determine these "t" values was as follows:

$$t = \bar{x} \sqrt{\frac{n(n-1)}{Sx^2}}$$, where Sx^2 is the sum of the squares of the deviations from the mean, $\bar{x}$ is the difference between the means, and n is the number of people who comprise one of the two groups (which were of equal size).(1)

But----what is a "t" value? A "t" value, in very simple

language, is a number, indicative of a ratio (with reference to any number of degrees of freedom,) that indicates the probability of frequency of appearence of an observed difference between the means of two, randomly selected groups. If the "t" value of a difference between two means indicated that a difference this large was to be expected, on the basis of chance, in only one trial out of twenty (or less), the difference between the two means would be considered significant. A significant difference between two means suggests the possibility that chance isn't the only factor operating, that the groups are not of the same population.

In the calculations under consideration here, a "t" value (at 18 degrees of freedom) of 2.101,(2) or larger, suggests a lack of homogeneity between the groups. The determination of the "t" values of the group mean trait scores of the men and women pointed out the fact that the men and women, on the group basis, did not differ significantly in terms of personality structure. The difference at trait "C" (Factors STDCR) was the largest trait difference, and the "t" value of this difference was only 1.35. Thus, in so far as personality structure was concerned, the men and women were very similar.

Next, the two groups were compared in terms of their group proportionate color preference patterns.

The women displayed a preference pattern of Blue, Blue-Green, Green, Yellow-Green, Yellow, Red, Violet, and Orange (in that order). The men preferred Blue, Blue-Green, Orange, Red, Green, Violet, Yellow, and Green, in the order given. This is not, however, the whole story. The two groups, as illustrated by Graph I, displayed about the same frequency of preference for Blue, and possibly yellow, but their group responses to the other colors were significantly different in almost every case. Thus, on the basis of color preference pattern, the men and women appear as two very different groups. From this point on, they were treated as such. The group of women was dealt with first.

The procedure that was used from this point on was the one described on the first page of this chapter. The group of women was divided into sub-groups on the basis of the individual's scores on the many traits. Two methods of making the divisions were necessary, for the Minnesota Multiphasic Personality Inventory rates the individual's responses to the test statements in terms of a "T" score, not a percentile. The first method was used with those tests, made up of bi-polar traits, that rendered a percentile score. All of the women whose score, on a particular trait, was between zero and fifty-

Differences (%)

2.51	10.90	11.80	24.34	8.68	13.24	17.15	27.66

"t" values of differences.

.5143	1.8320	1.9634	4.0432	1.4443	2.5102	2.9930	4.7099

one percentile were placed in one group. Those women who achieved a score of fifty-one percentile or more were put in the other group. Thus, in the trait B1-N (neurotic to well-adjusted) of Bernreuter's "Personality Inventory", seven of the women were selected, on the basis of their percentile scores on this trait, to comprise the group that represented neurotic behavior. Their scores ranged from 64% to 99% on this scale, and their mean score was 78.71%. Thirteen women, whose scores ranged from 1% to 36%, and whose mean score was 16.46%, were found to represent, to a greater or lesser degree, well-adjusted behavior. They were placed in the other sub-group. This was the first method of division that was used.

The Minnesota Multiphasic Personality Inventory is composed in a slightly different fashion. The personality characteristics that are subjected to investigation by this inventory are hardly of a bi-polar nature. Each of its nine scales inventories a symptomatic complex of behavioral tendencies. These tendencies are present in all people, but the extent to which they dominate the thinking, feeling, and the behavior of these people varies from individual to individual. If, on the scale that inventories Paranoic tendencies, a person achieved a T score of fifty-two, it would indicate that this type of reaction pattern characterized a normal portion of his total behavior.

If this T score reached seventy, it would offer the warning that the paranoic response was dominating an abnormal amount of his total behavior. The very low score is of relatively little value. It may, in fact, indicate a lack of full cooperation on the part of the testee.

The second method used in dividing the group of women into sub-groups, this time on the basis of their T scores received on the scales of the Minnesota Multiphasic Personality Inventory, was as follows: (1) those women who received a T score of fifty-eight or below were put in the sub-group that represented a normal expression of the personality characteristic being inventoried; (2) those women who had a T score of fifty-nine or above were placed in a second sub-group that represented a more extensive expression of the symptomatic complex being inventoried. It is apparent that these sub-groups do not represent polar extremes of the same trait, but represent the degree of expression of the same type of behavior.

TABULATION OF THE MEAN SUB-GROUP COLOR PREFERENCE PATTERN.

As soon as the pairs of sub-groups had been determined, they were prepared for the final comparison; the comparison of their color preference patterns. Several traits had to be dropped from further analysis at this point, for too few people were found to represent one of the two sub-groups that echoed its polar aspects. If less

than five persons comprised one of the sub-groups of a trait, further study of that trait was considered impractical.

The mean color preference pattern of each sub-group was tabulated in the following manner: (1) The color preference patterns of the individuals who comprised a sub-group were arrayed in the form of the twenty-eight choices that had been made on the color preference test; (2) The number of times each color was chosen by all of the individuals in the sub-group was tabulated; (3) In order to achieve an index of frequency of choice, these totals were divided by the number of choices that each color could have received.

Thus, each color is involved in seven comparisons in each test. If seven individuals comprised the sub-group being considered, the total number of choices that each color could have received would have been 7 x 7 choices, or 49. If, in addition, the color Red was chosen twenty-four times, it would have had a preference frequency of about fifty percent. This procedure was carried out on each sub-group and for each color. These frequencies were then graphed for each pair of sub-groups, so that the similarities and differences that characterized the comparison of pair could be more readily perceived.

COLOR PREFERENCE of the WOMEN

No.	BBG	VO	BGG	YGB	OR	YBG	GV	OY	BR	BGV	YG	VB	GYG	RV	YGY	GO	YR	GB	VY	RYG	OB	YGBG	BY	BGR	YGO	VYG	RG	OBG
1.	Bbg	Vo	bgG	ygB	oR	Ybg	Gv	oY	Br	bgV	yG	vB	Gyg	rV	YGy	Go	Yr	Gb	vY	rYG	oB	YGbg	By	BGr	YGo	vYG	rG	oBG
2.	Bbg	Vo	BGg	ygB	oR	yBG	Gv	oY	Br	BGv	yG	vB	Gyg	Rv	YGy	Go	yR	gB	vY	Ryg	oB	ygBG	By	bgR	YGo	vYG	Rg	oBG
3.	bBG	Vo	BGg	YGb	oR	yBG	gV	oY	bR	BGv	Yg	Vb	Gyg	rV	YGy	Go	yR	Gb	Vy	rYG	oB	ygBG	bY	BGr	YGo	vYG	Rg	oBG
4.	Bbg	vO	BGg	ygB	oR	yBG	Gv	oY	Br	BGv	Yg	vB	Gyg	Rv	ygY	Go	Yr	gB	Vy	Ryg	oB	ygBG	By	BGr	YGo	vYG	rG	oBG
5.	Bbg	vO	bgG	ygB	Or	Ybg	Gv	Oy	Br	BGv	Yg	vB	Gyg	Rv	YGy	gO	yR	gB	vY	Ryg	oB	ygBG	By	bgR	ygO	Vyg	Rg	Obg
6.	bBG	vO	BGg	YGb	oR	yBG	Gv	oY	Br	BGv	yG	vB	Gyg	Rv	YGy	Go	Yr	Gb	vY	rYG	oB	ygBG	bY	BGr	YGo	vYG	rG	oBG
7.	Bbg	Vo	BGg	ygB	Or	Ybg	gV	oY	Br	bgV	yG	vB	Gyg	rV	YGy	Go	Yr	gB	Vy	Ryg	oB	YGbg	By	bgR	YGo	Vyg	rG	oBG
8.	Bbg	vO	BGg	ygB	oR	yBG	Gv	oY	Br	BGv	yG	vB	gYG	Rv	YGy	Go	Yr	gB	vY	rYG	oB	ygBG	By	BGr	YGo	vYG	rG	oBG
9.	Bbg	Vo	BGg	ygB	oR	yBG	Gv	oY	Br	BGv	Yg	vB	Gyg	Rv	ygY	Go	yR	gB	vY	Ryg	oB	ygBG	By	BGr	ygO	vYG	Rg	oBG
10.	bBG	Vo	BGg	ygB	oR	yBG	gV	oY	Br	BGv	Yg	vB	gYG	rV	ygY	Go	Yr	gB	Vy	rYG	oB	ygBG	By	BGr	YGo	Vyg	rG	oBG
11.	Bbg	Vo	BGg	ygB	oR	yBG	Gv	oY	Br	BGv	Yg	vB	gYG	Rv	YGy	Go	Yr	gB	Vy	rYG	oB	YGbg	By	bgR	YGo	vYG	Rg	oBG
12.	bBG	Vo	BGg	YGb	oR	yBG	gV	oY	bR	BGv	yG	Vb	gYG	rV	YGy	Go	yR	Gb	Vy	rYG	oB	ygBG	bY	BGr	YGo	vYG	rG	oBG
13.	Bbg	vO	bgG	YGb	Or	Ybg	Gv	oY	Br	BGv	yG	vB	Gyg	Rv	YGy	Go	Yr	Gb	vY	rYG	Ob	YGbg	bY	BGr	YGo	vYG	rG	Obg
14.	Bbg	vO	BGg	ygB	oR	yBG	Gv	Oy	Br	BGv	yG	vB	Gyg	Rv	YGy	gO	yR	gB	Vy	Ryg	oB	ygBG	By	BGr	YGo	vYG	rG	oBG
15.	Bbg	vO	bgG	ygB	oR	Ybg	Gv	Oy	Br	BGv	yG	vB	Gyg	Rv	YGy	Go	Yr	gB	vY	Ryg	oB	YGbg	By	bgR	YGo	vYG	rG	Obg
16.	Bbg	vO	bgG	YGb	Or	Ybg	Gv	oY	Br	BGv	yG	vB	gYG	Rv	YGy	Go	Yr	Gb	vY	rYG	Ob	YGbg	bY	BGr	YGo	vYG	rG	Obg
17.	Bbg	vO	BGg	ygB	oR	yBG	gV	oY	Br	BGv	Yg	vB	Gyg	rV	ygY	Go	Yr	gB	vY	rYG	oB	ygBG	By	BGr	ygO	vYG	Rg	Obg
18.	Bbg	vO	bgG	ygB	Or	Ybg	Gv	oY	Br	BGv	Yg	vB	Gyg	rV	ygY	gO	Yr	Gb	vY	rYG	oB	ygBG	bY	BGr	ygO	Vyg	rG	Obg
19.	Bbg	vO	bgG	ygB	Or	yBG	Gv	Oy	Br	BGv	yG	vB	Gyg	rV	YGy	Go	Yr	gB	vY	rYG	oB	YGbg	By	BGr	YGo	vYG	rG	oBG
20.	Bbg	Vo	bgG	ygB	oR	yBG	Gv	oY	Br	BGv	yG	vB	gYG	Rv	YGy	Go	Yr	gB	vY	rYG	oB	ygBG	By	BGr	YGo	vYG	rG	oBG

Proportionate color preference was determined by dividing the number of times a color was chosen by the number of times a color could be chosen. In this instance, the greatest possible number of choices was 7 x 20, or the number of comparisons in which a color was involved in each test times the number of tests given.

	BG	G	YG	Y	R	V	O	f
B	18	18	16	14	15	14	18	113
BG	12	15	18	13	15	13	4	90
G	8	14	14	15	17	6	12	86
YG	15	16	6	7	6	17	13	80
Y	5	14	7	16	14	5	8	69
R	14	6	5	12	6	7	2	52
V	2	4	2	8	5	6	9	36
O	6	5	2	4	3	3	11	34

n = 7 x 20 = 140

B = f/n = 113/140 = .8071

BG = = 90/140 = .6428

G = = 86/140 = .6142

YG = = 80/140 = .5742

Y = = 69/140 = .4928

R = = 52/140 = .3714

V = = 36/140 = .2571

O = = 34/140 = .2428

STATISTICAL ANALYSIS OF THE MEAN PREFERENCE FREQUENCY DIFFERENCES.

The next step in the analytical procedure was one of determining the "t" value for each of the "differences between the two proportionate color preferences." A table of all of these "t" values can be found on page . When a comparison is made between the proportionate color preferences of the paired sub-groups, it is really a comparison between ratios. It was necessary to find a formula of "t" that would accomplish this job. Dr. Leslie N. Garlough, Head of the Department of Science, and Statistical Advisor for this thesis, suggested a formula of "t" that suited the requirements of the data beautifully. The following formula was used to compute the "t" values of the proportionate color preference differences:

$$t = \frac{P_1 - P_2}{p \times q \left(\frac{1}{n_1} \; \frac{1}{n_2}\right)} = \frac{\text{difference between proportions}}{\left(\frac{f_1}{n_1} \; \frac{f_2}{n_2}\right)(1-p)\left(\frac{1}{n_1} \; \frac{1}{n_2}\right)}$$

where f is the number of choices given the colors, n is the number of choices the colors could have received, and $P_1 - P_2$ is the difference between the proportionate color preferences.

A graph has been prepared for each trait comparison. It illustrates the proportionate color preference that the two sub-groups being compared display for each of the eight colors, the differences between the proportion-

TABLE OF "t" VALUES OF MEAN PROPORTIONATE COLOR PREFERENCE DIFFERENCES

Bernreuter Personality Inventory.

	B	BG	G	YG	Y	R	V	O
B1-N	.248	2.410	2.997	.233	.657	2.280	.163	.868
B2-S	2.976	1.610	1.224	.707	.561	2.247	2.563	1.981
B3-I	.248	2.410	2.997	.233	.657	2.280	.163	.868
B4-D	.372	.561	2.207	.000	.294	1.523	.894	.227
F1-C	.248	2.410	2.997	.233	.657	2.280	.163	.868
F2-S	.349	1.804	.919	.000	.481	.072	2.134	2.177

Johnson Temperement Analysis.

	B	BG	G	YG	Y	R	V	O
B	2.765	.000	1.977	1.495	.998	.613	.930	.512
D	.372	1.020	2.208	1.581	1.661	1.618	1.788	.227
E	3.141	.000	2.333	2.785	1.238	2.065	.552	1.366
F	1.359	1.004	2.150	.229	.473	2.068	2.068	1.040
G	.253	1.159	1.217	.747	.111	.996	2.877	.370
H	.367	2.305	2.339	1.375	.357	1.616	1.864	1.302
I	.959	1.437	1.555	.000	.482	.072	2.204	1.845

Inventory of Factors GAMIN.

	B	BG	G	YG	Y	R	R	O
G	2.946	1.666	.766	1.077	1.828	2.130	.974	.785
A	2.213	1.241	.104	.344	1.037	1.195	.466	.911
I	.926	1.241	2.548	.344	.697	1.899	.855	1.067
N	2.645	1.596	1.850	.687	.357	1.547	.855	1.067

Inventory of Factors STDCR.

	B	BG	G	YG	Y	R	V	O
S	.372	.611	2.208	.000	.293	1.618	.894	.227
T	.365	.886	1.501	.687	.357	2.250	.310	1.467
D	.797	3.014	3.594	1.718	1.002	2.953	.855	1.067
C	.215	2.457	3.455	2.041	.846	3.132	1.538	.786
R	.372	.611	1.806	.395	2.833	3.640	.447	.227

Minnesota Multiphasic Personality Inventory.

	B	BG	G	YG	Y	R	V	O
Hy.	3.801	1.296	.766	2.512	1.827	1.028	.974	1.696
Pd.	2.088	1.241	.453	2.749	.322	1.195	.699	2.890
Ma.	1.221	2.872	.213	1.742	2.546	1.709	1.209	3.770

These values were determined with the use of the formula;

$$t = \frac{P_1 - P_2}{\sqrt{\frac{f_1 + f_2}{n_1 + n_2}(1-p)}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where f = frequency of choice, n = possibility of choice, and $p = \frac{f_1 + f_2}{n_1 + n_2}$.

With this table use "t" as 1.96 (at .05 level) and 2.58 (at .01 level).

ate color preferences, and the "t" values for each difference. The most acceptable (socially) of the two polar extremes being treated is usually indicated with a Green line. Red is used to indicate the color preference pattern of the less acceptable of the two. The results of the analysis will be presented in the following manner: (1) each graph will be discussed in terms of the results it reveals; (2) as more and more graphs are discussed, correlations between the graphs will be indicated. At the end of this chapter, in the form of a summary, mention will be made of any outstanding similarities or differences that exist between the various patterns that have been discussed.

PRESENTATION OF RESULTS.

Bernreuter's "PERSONALITY INVENTORY"---traits B1-N, B3-I, and F1-C.

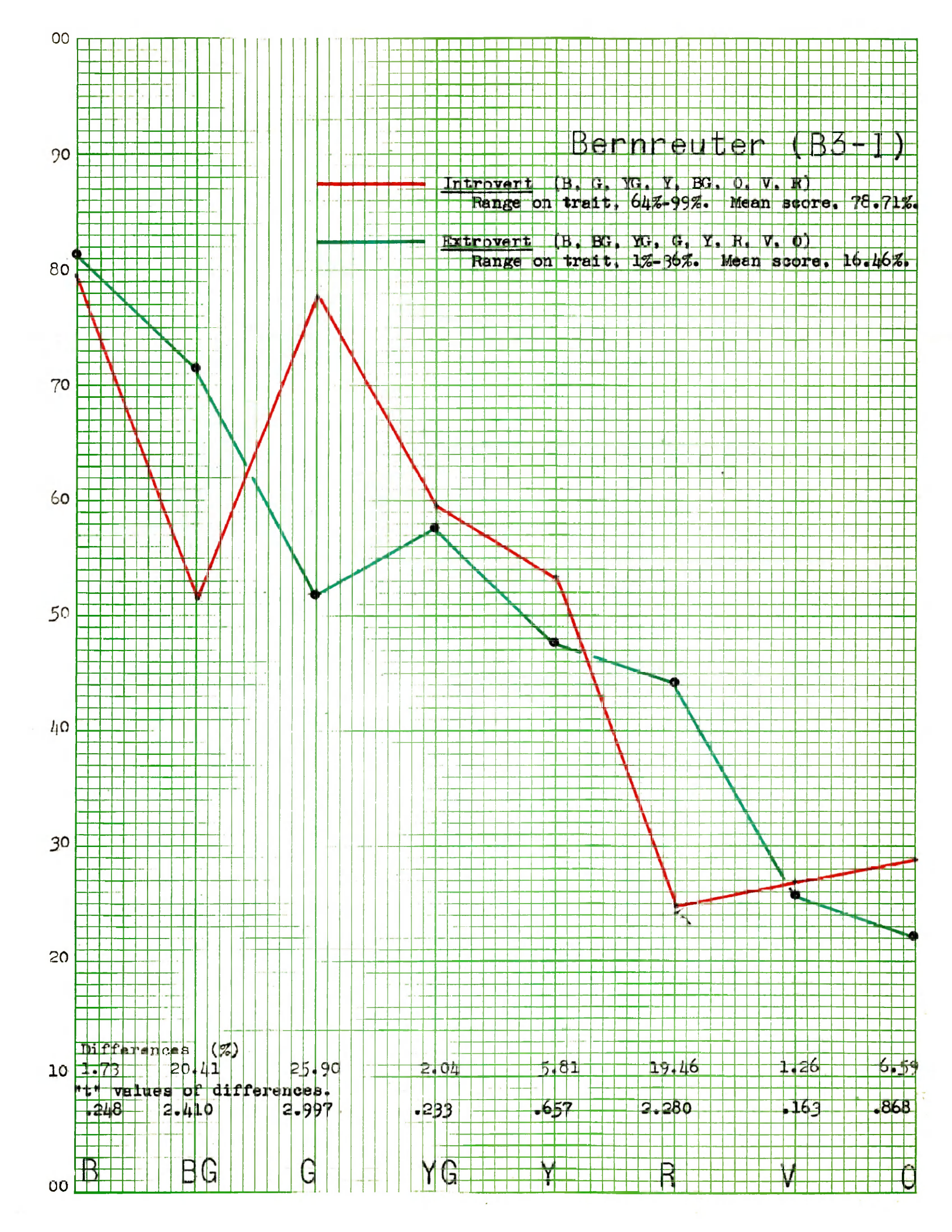
The three graphs that illustrate the color preference patterns of the personality sub-groups of the traits listed above, Neurotic--Well-adjusted, Introvert---Extrovert, Self-conscious--Self-confident, are the same. The high correlation among these three traits is demonstrated by the fact that the seven women who composed the sub-group, Neurotic, also composed the sub-groups, Introvert and Self-conscious. The remaining thirteen women make-up, in turn, the Well-adjusted, the Extrovert,

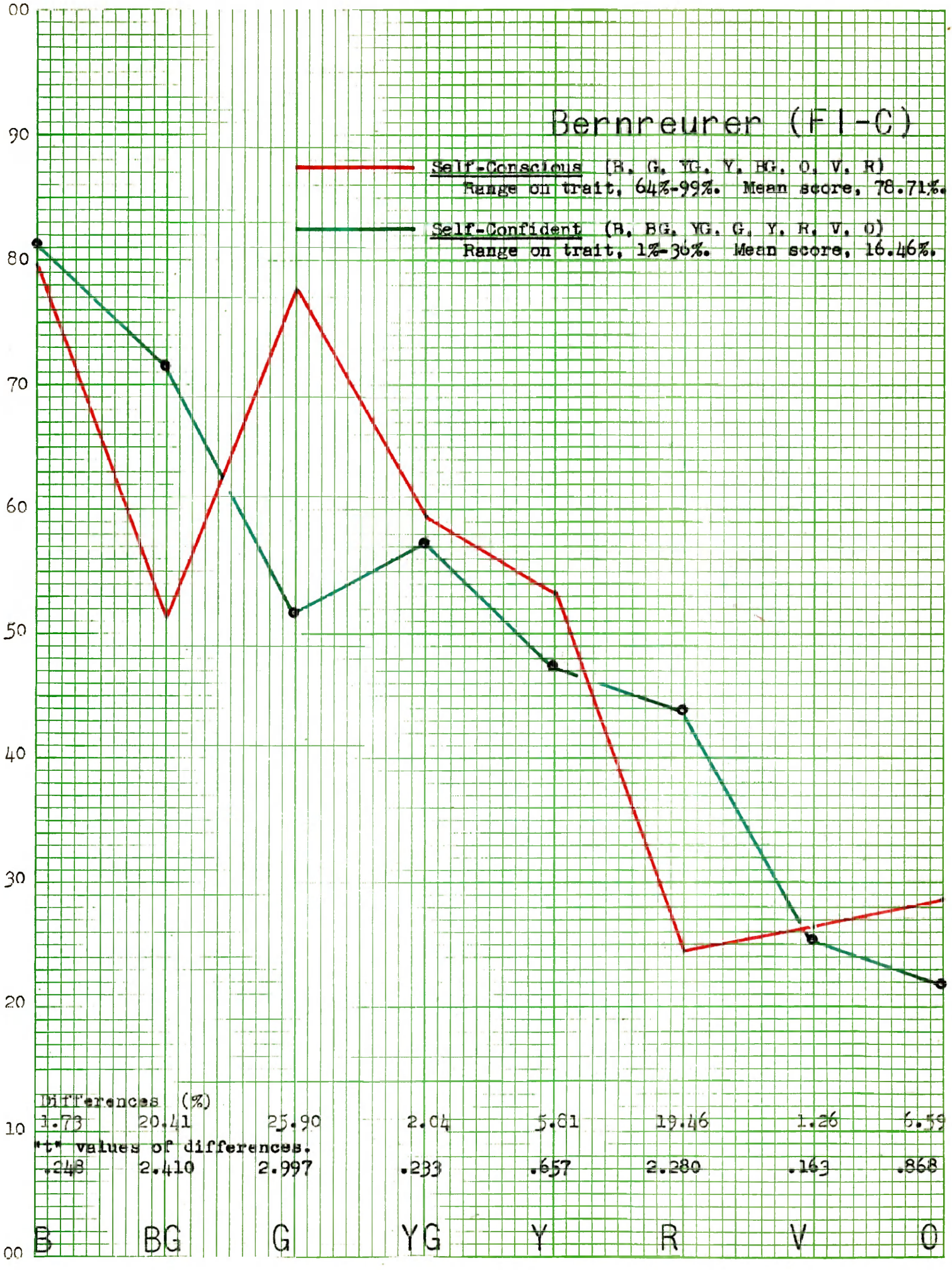
and the Self-confident sub-groups. It seems advisable, therefore, to discuss these three graphs (Graph III, Graph IV, and Graph V) at the same time. In order to simplify the discussion, the sub-group titles, Neurotic and Well-adjusted, will be used to describe the results of all three graphs.

A first, rapid scrutiny of the three graphs (the next three pages) should serve to reveal the fact that the color preference patterns of the Neurotic sub-group and the Well-adjusted sub-group, the Introvert sub-group and the Extrovert sub-group, the Self-conscious sub-group and the Self-confident sub-group differ significantly in terms of the frequency of choice of three colors; Blue-Green, Green, and Red. The group of women who represent Neuroticism prefer Blue-Green significantly less, Green significantly more, and Red significantly less than do the Well-adjusted women. The two groups, in the case of each of the three graphs, prefer Blue, Yellow-Green, Yellow, Violet, and Orange to about the same degree. It would seem that Neurotic and Well-adjusted people, on the level of the group, could be differentiated on the basis of their proportionate color preference for the colors Blue-Green, Green, and Red.

It would seem, if color preference pattern and personality structure are really related, that the differences observed between the color preference patterns of


Bernreuter (BI-N)
Neurotic (B, G, YG, Y, BG, O, V, R)
Range on trait, 64%-99%. Mean score, 78.71%.
Well-Adjusted (B, BG, YG, G, Y, R, V, O)
Range on trait, 1%-36%. Mean score, 16.46%.
(b) Well-Adjusted (B, BG, YG, Y, R, G, V, O)
Range on trait, . Mean score, .
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
1.73 20.41 25.90 2.04 5.81 19.46 1.26 6.59
"t" values of differences.
.248 2.410 2.997 .233 .657 2.280 .163 .868
B BG G YG Y R V O


Bernreuter (B5-1)
Introvert (B, G, YG, Y, BG, O, V, R)
Range on trait, 64%-99%. Mean score, 78.71%.
Extrovert (B, BG, YG, G, Y, R, V, O)
Range on trait, 1%-36%. Mean score, 16.46%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
1.73 20.41 25.90 2.04 5.81 19.46 1.26 6.59
"t" values of differences.
.248 2.410 2.997 .233 .657 2.280 .163 .868
B BG G YG Y R V O


Bernreurer (FI-C)
Self-Conscious (B, G, YG, Y, BG, O, V, R)
Range on trait, 64%-99%. Mean score, 78.71%.
Self-Confident (B, BG, YG, G, Y, R, V, O)
Range on trait, 1%-36%. Mean score, 16.46%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
1.73 20.41 25.90 2.04 5.81 19.46 1.26 6.59
"t" values of differences.
.248 2.410 2.997 .233 .657 2.280 .163 .868
B BG G YG Y R V O

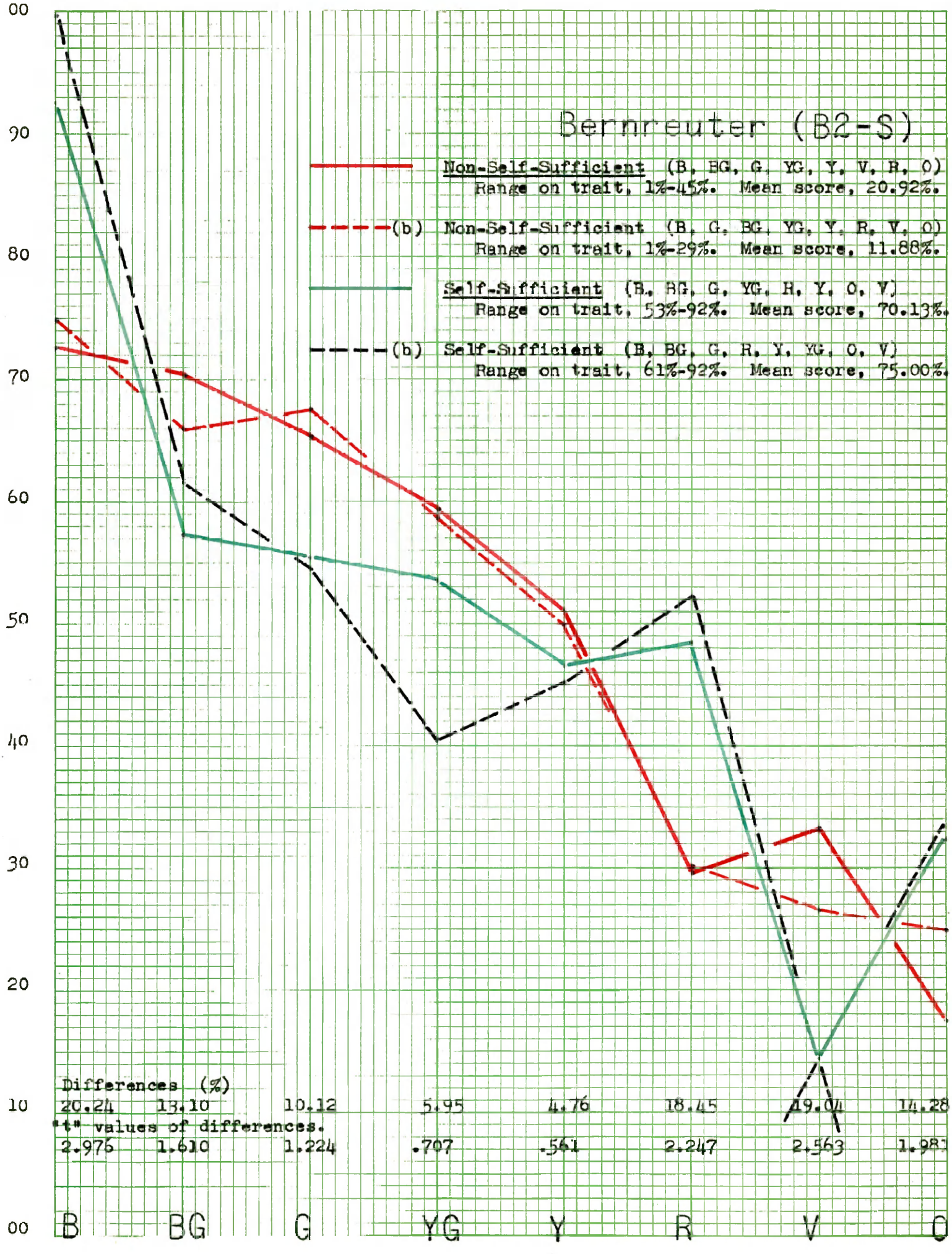
these sub-groups should increase if the differences between the two sub-groups, in terms of the polarity of the aspects of personality they represent, are increased. In order to check this hypothesis, four women, the four women with the highest scores, were removed from the Well-adjusted group (the other group was to small to handle in this fashion). These women were removed because they least illustrated Well-adjusted personality make-up according to the "Bernreuter Personality Inventory." The mean score of this new sub-group dropped from 16.46% to 10.44%. Its color preference pattern was determined in the same way as was used on the original sub-groups. The black line represents the new sub-group color preference pattern. Comparing, now, the black and red lines on Graph III, it will be noticed that the relationships that existed between the red and green lines are still present. Not only are the same general relationships retained, but the differences are uniformly increased in every case.

Neurotic individuals are emotionally unstable, agitated, nervous individuals.. If it is permissable to assume, for a moment, that Green tends to be a soothing, subduing color, and that Red tends to be an exciting color, several interesting hypothesis are possible. First, the Neurotic individuals prefer, or tolerate, those colors that would, according to the previous definition, be

least apt to agitate them further. They tend to reject those colors, Red, Violet, and Orange, which would conceivably give them further discomfort. The Well-adjusted individuals, on the other hand, like (or tolerate) a wider range of colors. There isn't the wide difference between their preference for Green and for Red that characterizes the Neurotic sub-group. (On the basis of this information, it might be assumed that Neurotic individuals, on the group basis, know what is best for them. If given a little help, they would seem to be able to reduce their condition. This, however, is very flimsy hypothesizing. It would seem valuable to continue to check the other graphs for this same type of information.)

Bernreuter's "PERSONALITY INVENTORY"---trait B2-S.

When the color preference patterns of the sub-groups, Non-Self-Sufficient and Self-Sufficient, of the trait B2-S are graphically portrayed, the general pattern differs from that previously studied. Inspecting, first, the solid red and green lines, it will be noticed that the largest differences in the two patterns occur at Blue, Red, Violet, and Orange. From Blue-Green to Yellow, the patterns almost coincide. Even though there are rather large differences at Violet and Orange, further inspection seem necessary, for neither group actually portrays a real preference for these colors. The Self-Sufficient sub-group, those individuals who prefer to be alone, rarely ask for encouragement or sympathy, and tend to ignore the advice of others, prefer Blue significantly more, Red significantly more, Violet significantly less, and Orange significantly more than does the Non-Self-Sufficient group. Although the picture this graph presents differs from the graph of Neurotic and Well-adjusted people, one rather important similarity can be noticed. Again, the group that prefers Green to the greatest extent dislikes Red to the greatest extent. In this respect, the two graphs illustrate a certain correlation. It would appear that the Non-Self-Sufficient people, as a group, present at least a portion of that syndrome of personality make-up


Bernreuter (B2-S)
Non-Self-Sufficient (B, BG, G, YG, Y, V, R, O)
Range on trait, 1%-45%. Mean score, 20.92%.
(b) Non-Self-Sufficient (B, G, BG, YG, Y, R, V, O)
Range on trait, 1%-29%. Mean score, 11.88%.
Self-Sufficient (B, BG, G, YG, R, Y, O, V)
Range on trait, 53%-92%. Mean score, 70.13%.
(b) Self-Sufficient (B, BG, G, R, Y, YG, O, V)
Range on trait, 61%-92%. Mean score, 75.00%.
00
90
80
70
60
50
40
30
20
10
00
B
BG
G
YG
Y
R
V
O
Differences (%)
20.24 13.10 10.12 5.95 4.76 18.45 19.04 14.28
"t" values of differences.
2.976 1.610 1.224 .707 .561 2.247 2.563 1.98

called Neurotic. In truth, every testee who scored as Neurotic, also scored as Non-Self-Sufficient. Some of the Non-Self-Sufficient individuals did, however, appear to be Well-adjusted.

The two original groups were, again, reduced in number so that they illustrated, to a still greater extent, the type of personality structure that was the criterion by which these sub-groups were formed in the first instance. The new (b) Non-Self-Sufficient sub-group contained individuals whose scores ranged from 1% to 29%. The group mean was thus reduced from the original 20.92% to 11.88%. The New Self-Sufficient group was composed of individuals whose mean score had increased from 70.13% to 75.00%. Checking, now, the dotted red and black lines, it will be observed that many of the original differences have been increased. The Self-Sufficient people prefer Blue to a greater extent than they did before---and prefer it more than do the Non-Self-Sufficient people to an even greater extent than they did before. The difference between the two sub-groups has been reduced in the case of Blue-Green. This was, however, a marginal difference before. The pattern of preference in the case of Green and Red (and these colors will be considered together from this point on) has been more firmly established. In both cases the difference has been increased. The difference that the two sub-groups

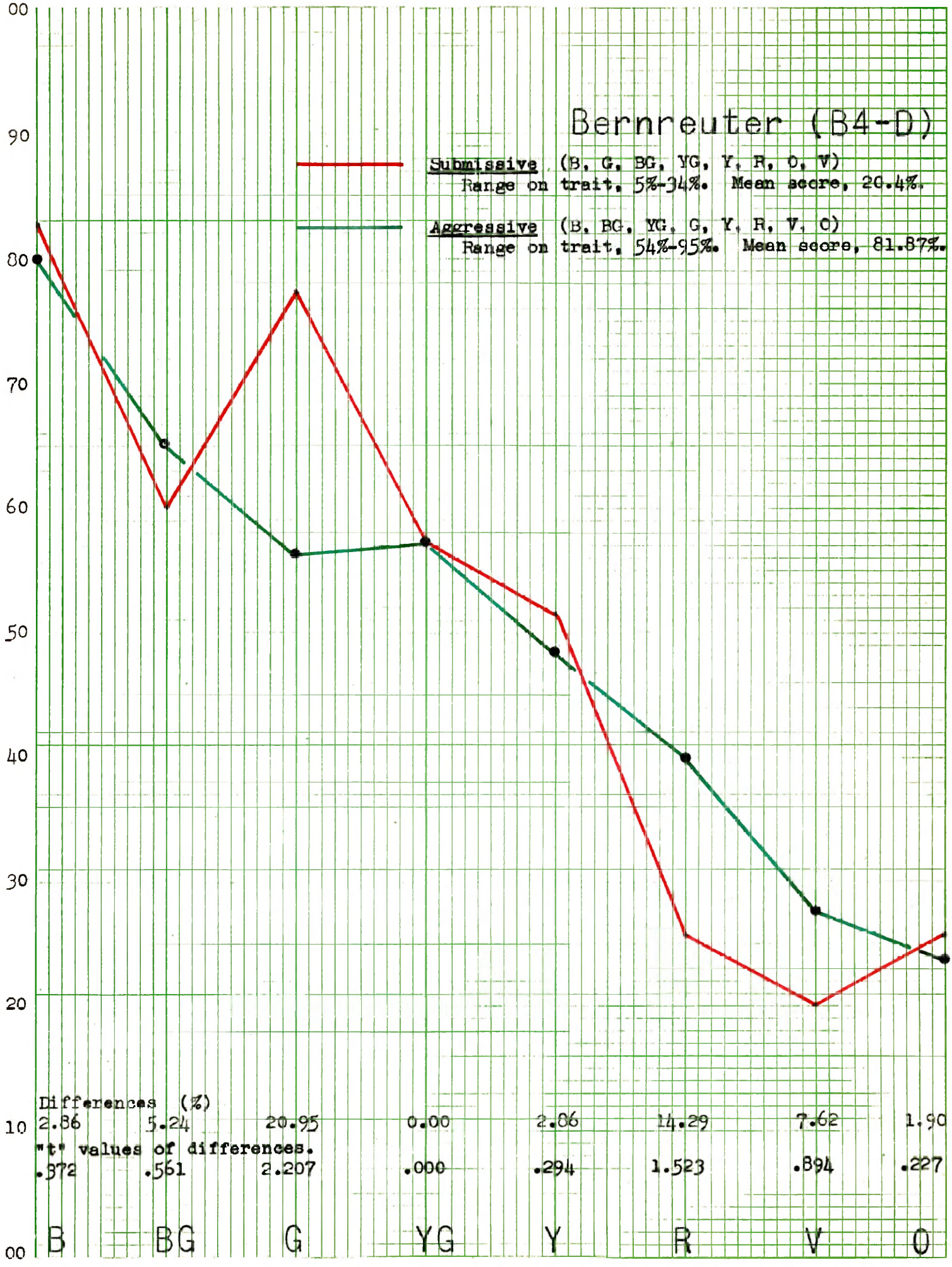
show in regard to preference for Yellow-Green represents an increase of about 12% over the previous difference. The difference is now significant. The differences that previously characterized their preferences for Violet and Orange have disappeared.

The new picture of the color preference patterns might well be compared with the last graphs studied. The colors red and green, operating more or less together, still form the dominant factor of the picture. In this respect, the four traits studied to this point are similar. The increase of the difference between preference frequencies for blue, and the decrease in the preference frequency for Blue-Green, implies a new factor. The development of a significant difference in proportionate color preference for Yellow-Green is also of interest. As this discussion continues, it would seem advisable to watch for other traits that illustrate this large difference where yellow-green and Blue are concerned.

Bernreuter's "PERSONALITY INVENTORY"---trait B4-D.

Graph VII, which illustrates the color preference patterns of the sub-groups (Submissive and Aggressive) of the Bernreuter trait B4-D, shows many of the characteristics that were so typical of the Graphs of traits B1-N, B3-1, and F1-C. The people that comprise the Submissive sub-group have a color preference pattern that is reminiscent of the sub-groups Neurotic, Introvert, and Self-conscious. The Submissive individuals prefer Green 20.95% more than do the Aggressive individuals. They prefer Red 14.29% less than the people who comprise the Aggressive sub-group.

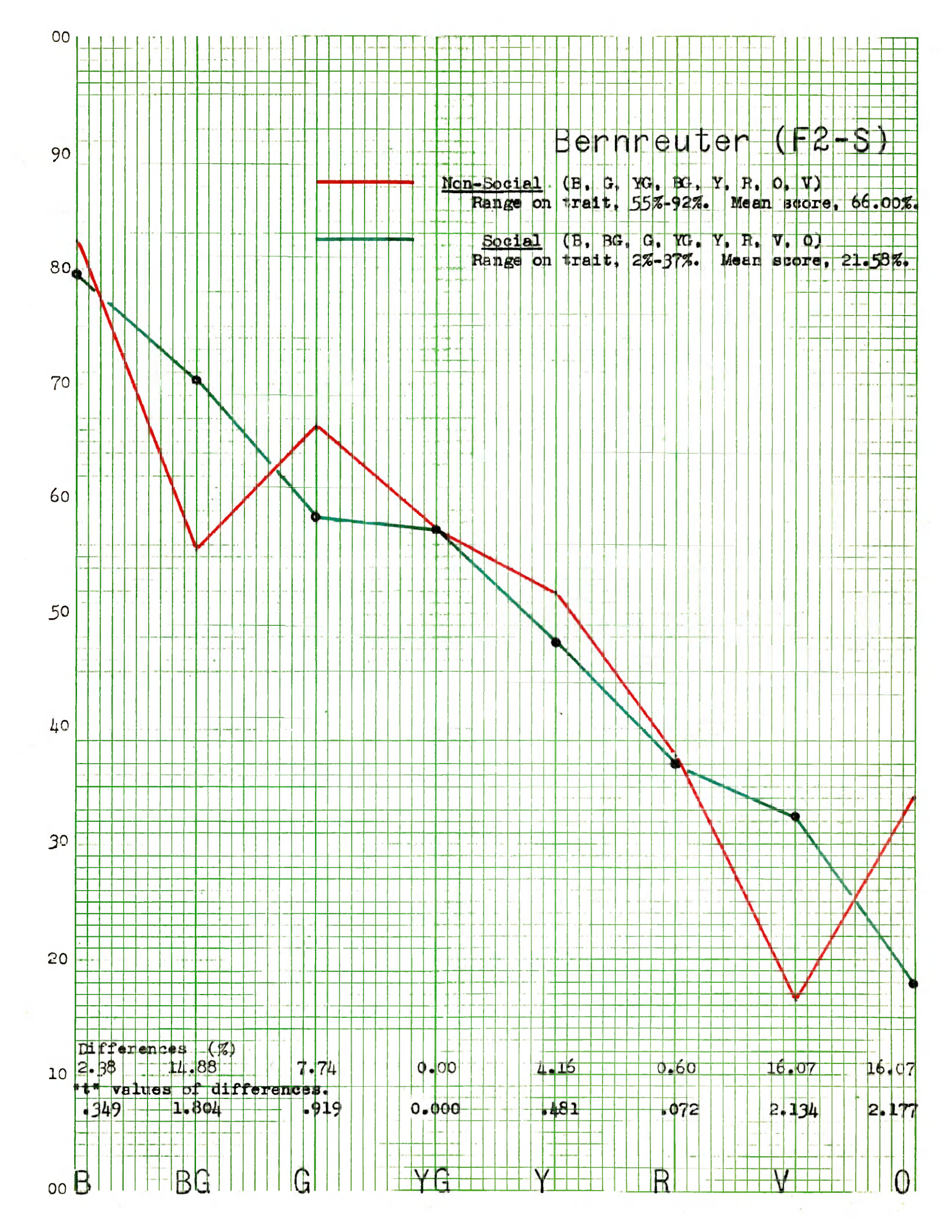
It is apparent that these two sub-groups are not differentiated as clearly as the others have been on the basis of their color preference patterns. The difference between their proportionate color preferences for Green is significant. The difference between their proportionate color preferences for Red, however, only closely approaches a significant level. The significant difference that characterized Blue-Green in the first three graphs (Graph III, Graph IV, Graph V) is lacking here. The Green-Red relationship is present, but in a less extreme form. The lack of a difference at Blue, Yellow-Green, and Orange or Violet suggests a lack of correlation between this trait and trait B2-S (Self-Sufficient and Non-Self-Sufficient).


Bernreuter (B4-D)
Submissive (B, G, BG, YG, Y, R, O, V)
Range on trait, 5%-34%. Mean score, 20.4%.
Aggressive (B, BG, YG, G, Y, R, V, O)
Range on trait, 54%-95%. Mean score, 81.87%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
2.86 5.24 20.95 0.00 2.86 14.29 7.62 1.90
"t" values of differences.
.372 .561 2.207 .000 .294 1.523 .894 .227
B BG G YG Y R V O

Bernreuter's "PERSONALITY INVENTORY"---F2-S.

Graph VIII, which can be found on the following page, presents a new picture. The Red-Green relationship, which dominated many of the previous graphs, is completely lacking here. The colors Green, Yellow-Green, Yellow, and Red are apparently of little value in differentiating between the Social and Non-Social sub-groups. The difference between the proportionate color preferences of these two sub-groups for Blue-Green is almost large enough, 14.88%, to approach the level of significance. The group of women who comprise the Non-Social sub-group prefer Violet significantly less, and Orange significantly more than do the "Social" women. These colors might possibly be of value in differentiating between these two sub-groups.

The apparent lack of correlation between this trait and Bernreuter's trait B3-I, as far as the color preference patterns of the sub-groups are concerned, is of interest. If a trait can be thought of as a dimension of personality, as a bi-polar scale, it is possible to picture these two traits in a more understandable way. Assuming that trait B3-I can be illustrated as a vertical component of personality, then trait F2-S must function as a horizontal one. Thus, an individual can be Extroverted and Social, or Extroverted and Non-Social. She

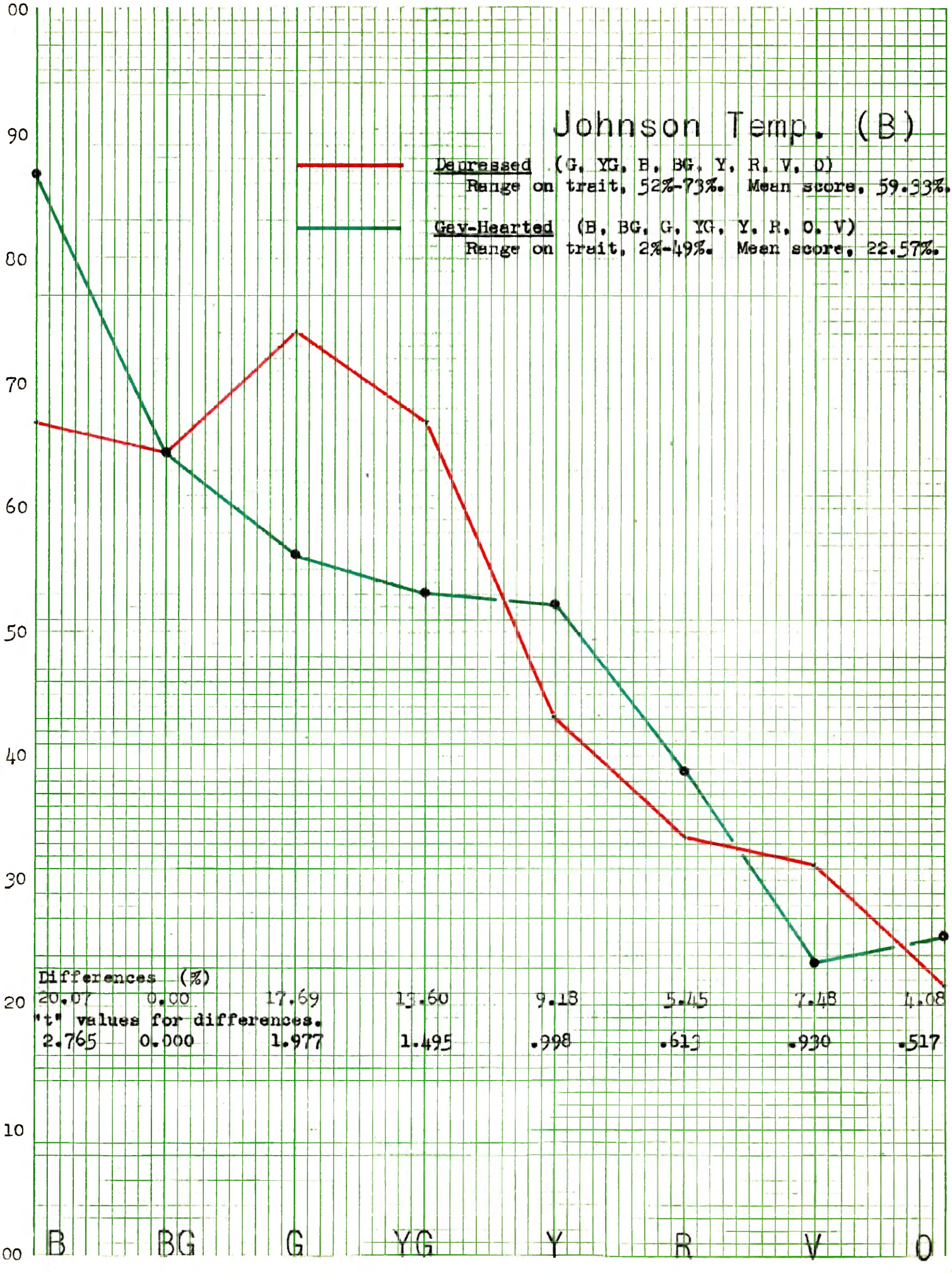

Bernreuter (F2-S)
Non-Social (B, G, YG, BG, Y, R, O, V)
Range on trait, 55%-92%. Mean score, 66.00%.
Social (B, BG, G, YG, Y, R, V, O)
Range on trait, 2%-37%. Mean score, 21.58%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
2.38 14.88 7.74 0.00 4.16 0.60 16.07 16.07
"t" values of differences.
.349 1.804 .919 0.000 .481 .072 2.134 2.177
B BG G YG Y R V O

could be Introverted and social, or Introverted and Non-Social. These two traits bear about the same relationship to each other as do the traits "S" and "T" of the "PERSONALITY INVENTORY STDCR". (These two traits will be discussed later.) The same variation in proportionate color preferences for Red and Green occurs in the traits "S" and "T".

"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "B" (Depressed-Gay-Hearted)

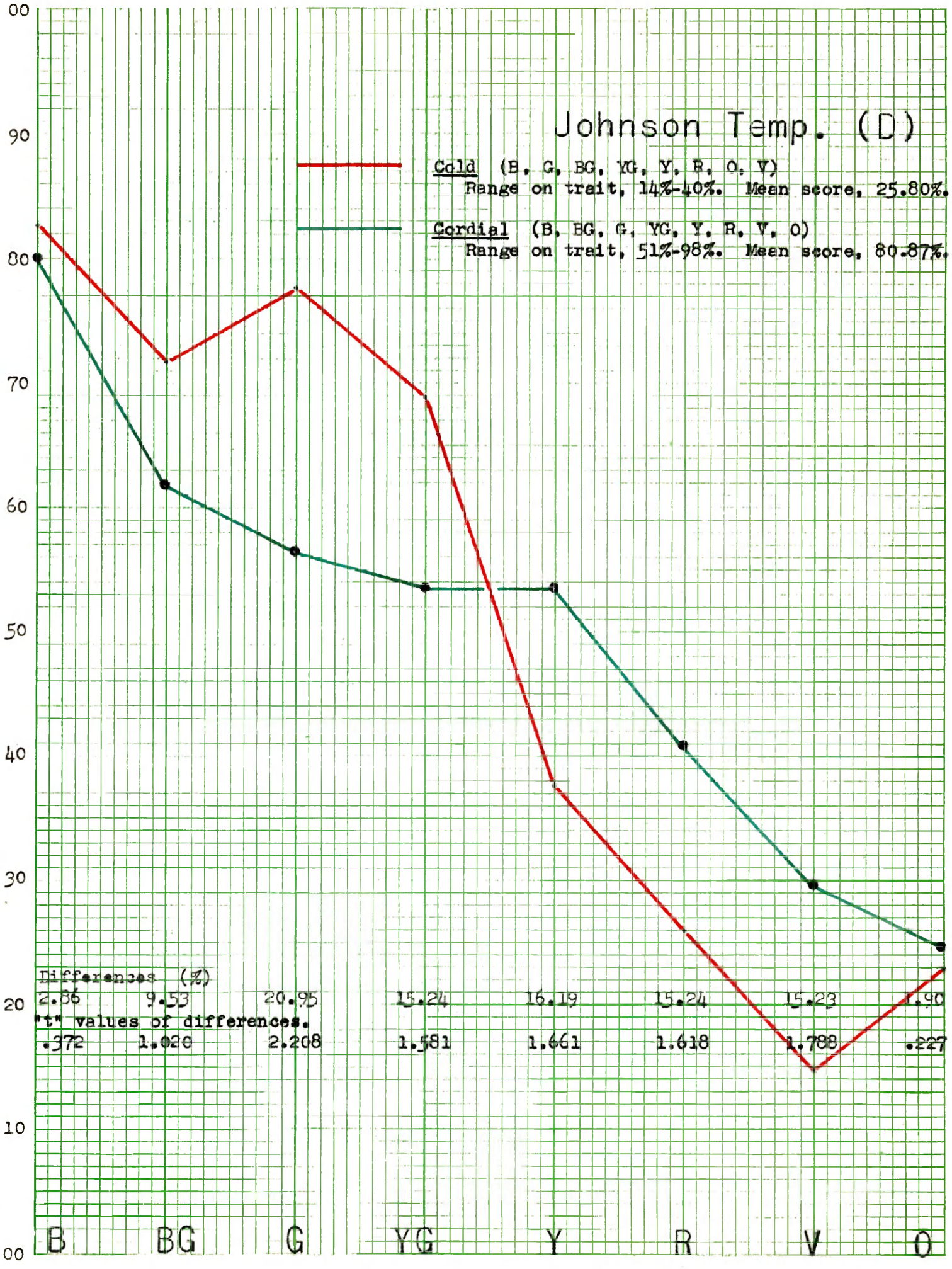
The color preference patterns of the Depressed and Gay-Hearted sub-groups differ significantly in proportionate color preference for two colors---and closely approach the level of significance in a third color. The women who comprise the Depressed sub-group prefer Blue significantly less, Green significantly more, and Yellow-Green more than do the Gay-Hearted women. The Gay-Hearted women express a color preference pattern that is reminiscent of the color preference pattern of the Self-Sufficient sub-group studied previously. The same comparison could be made between the Depressed sub-group and the Non-Self-Sufficient sub-group. The wide difference that separated the sub-groups of the Bernreuter trait, B2-S, in regard to Red is lacking here, but on the whole, the general picture is similar.

This comparison in terms of color preferences is backed up by the scores of the individuals in the two traits. All of those women who tended towards depression also tended towards non-self-sufficiency.


Johnson Temp. (B)
Depressed (G, YG, B, BG, Y, R, V, O)
Range on trait, 52%-73%. Mean score, 59.33%.
Gay-Hearted (B, BG, G, YG, Y, R, O, V)
Range on trait, 2%-49%. Mean score, 22.57%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
20.07 0.00 17.69 13.60 9.18 5.45 7.48 4.08
"t" values for differences.
2.765 0.000 1.977 1.495 .998 .613 .930 .517
B BG G YG Y R V O

"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "D" (Cold and Cordial)

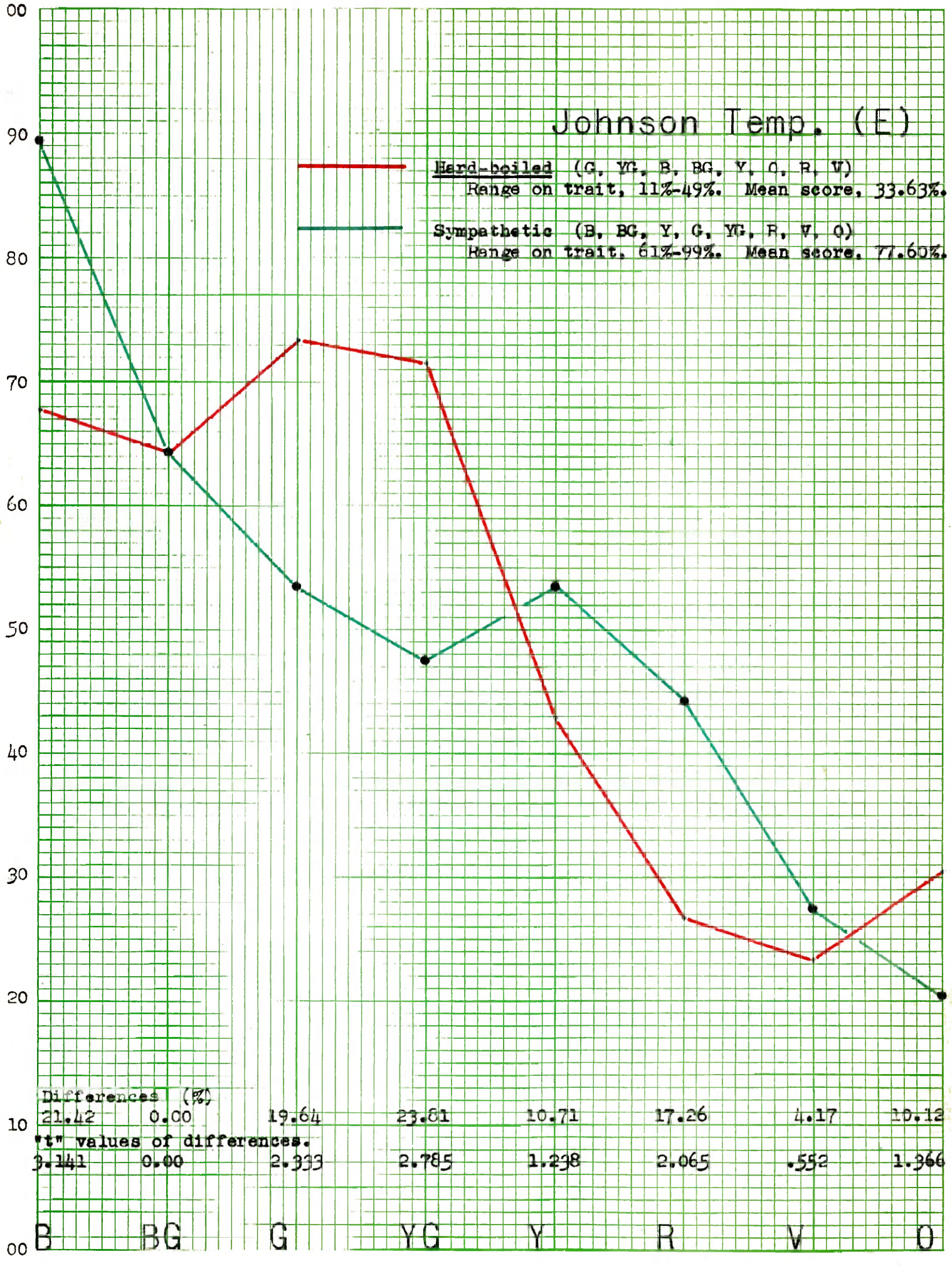
The color preference patterns of the two sub-groups of women who represent Cold and Cordial personality characteristics, as illustrated by Graph X, are interesting. The women who comprise the Cold aspect of this trait prefer, to a greater extent than do the Cordial women, the colors Blue, Blue-Green, Green, and Yellow-Green. These colors are considered by many persons to be the cool colors of the spectrum. The women of the Cordial sub-group, on the other hand, display a greater tolerance, or taste, for the warmer colors Yellow, Red, Violet, and Orange. The most useful colors in differentiating between these two groups are Green, Yellow-Green, Yellow, Red, and Violet. Of these colors, only Green involves a difference that is significant. The other colors mentioned closely approach the significant level, and might well contain an indication of the possible results that could accrue to a similar experiment with a larger sample.


Johnson Temp. (D)
Cold (B, G, BG, YG, Y, R, O, V)
Range on trait, 14%-40%. Mean score, 25.80%.
Cordial (B, BG, G, YG, Y, R, V, O)
Range on trait, 51%-98%. Mean score, 80.87%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
2.86
9.53
20.95
15.24
16.19
15.24
15.23
1.90
"t" values of differences.
.372
1.020
2.208
1.581
1.661
1.618
1.788
.227
B
BG
G
YG
Y
R
V
O

"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "E" (Hard-Boiled and Sympathetic)

A glance at Graph XI, which portrays the color preference patterns of the sub-groups, Hard-Boiled and Sympathetic, will reveal the fact that a noticeable correlation exists between this Graph and Graph IX (Depressed and Gay-Hearted). The Hard-Boiled sub-group, as is true of the Depressed sub-group, prefer Blue significantly less (very significantly), Green significantly more, Yellow-Green very significantly more, and Red significantly less than do the women who comprise the Sympathetic sub-group. The Blue and Blue-Green factor, which was first niticed in Graph VI (Non-Self-Sufficient and Self-Sufficient), and later in Graph IX, is present here. The Green and Red factor, that functioned so strongly in the first three graphs (Neurotic and Well-Adjusted, Introvert and Extrovert, and Self-Conscious and Self-Confident), is also present.

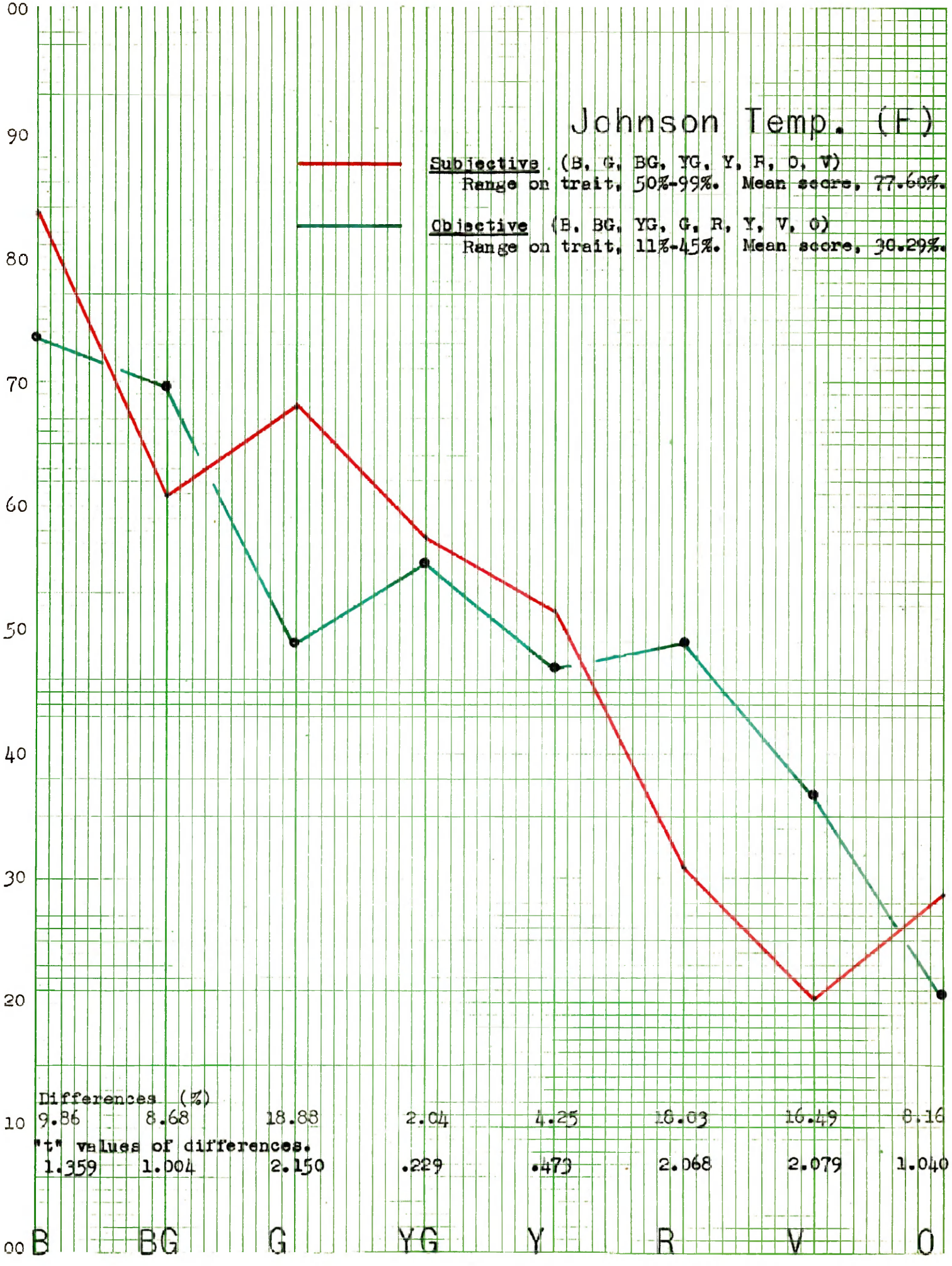
Actually, the correlation that appears to exist between the color preference patterns represented by Graph X and Graph XI is upheld by the scores of the individuals tested. In sixteen cases out of twenty, the individual who tended to be cold was also Hard-Boiled, and the person who tended towards Sympathetic behavior also tended to be Cordial. Thus, the color preferences of the Individuals that make up these groups reflects their personality make-up.


Johnson Temp. (E)
Hard-boiled (G, YG, B, BG, Y, O, R, V)
Range on trait, 11%-49%. Mean score, 33.63%.
Sympathetic (B, BG, Y, G, YG, R, V, O)
Range on trait, 61%-99%. Mean score, 77.60%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
21.42 0.00 19.64 23.81 10.71 17.26 4.17 10.12
"t" values of differences.
3.141 0.00 2.333 2.785 1.238 2.065 .552 1.366
B BG G YG Y R V O

"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "F" (Subjective---Objective)

Graph XII (Subjective and Objective presents, to a lesser degree, the color preference patterns that characterized the Neurotic and Well-Adjusted sub-groups that were discussed previously. The differences found at Blue and Blue-Green, neither of which are significant, disagree with the results of the other graph, as does the large difference at Violet. The significant differences at Red and Green, along with the similarity of proportionate color preference for Yellow-Green and Yellow, resembles closely the other Graph. All of the women who suggested Objectivity also were Well-Adjusted. Seven out of thirteen of the women who were Subjective were also Neurotic. The scores agree in fourteen out of a possible twenty cases. The color preference patterns reflect this. There is also a marked similarity between this Graph and and the Graph that portrays the Bernreuter trait, B4-D (Submissive--Agressive). The color preference pattern of the Subjective sub-group closely resembles that of the Submissive Sub-group. This parallel also characterizes the color preference patterns of the two sub-groups, Objective and Aggressive.

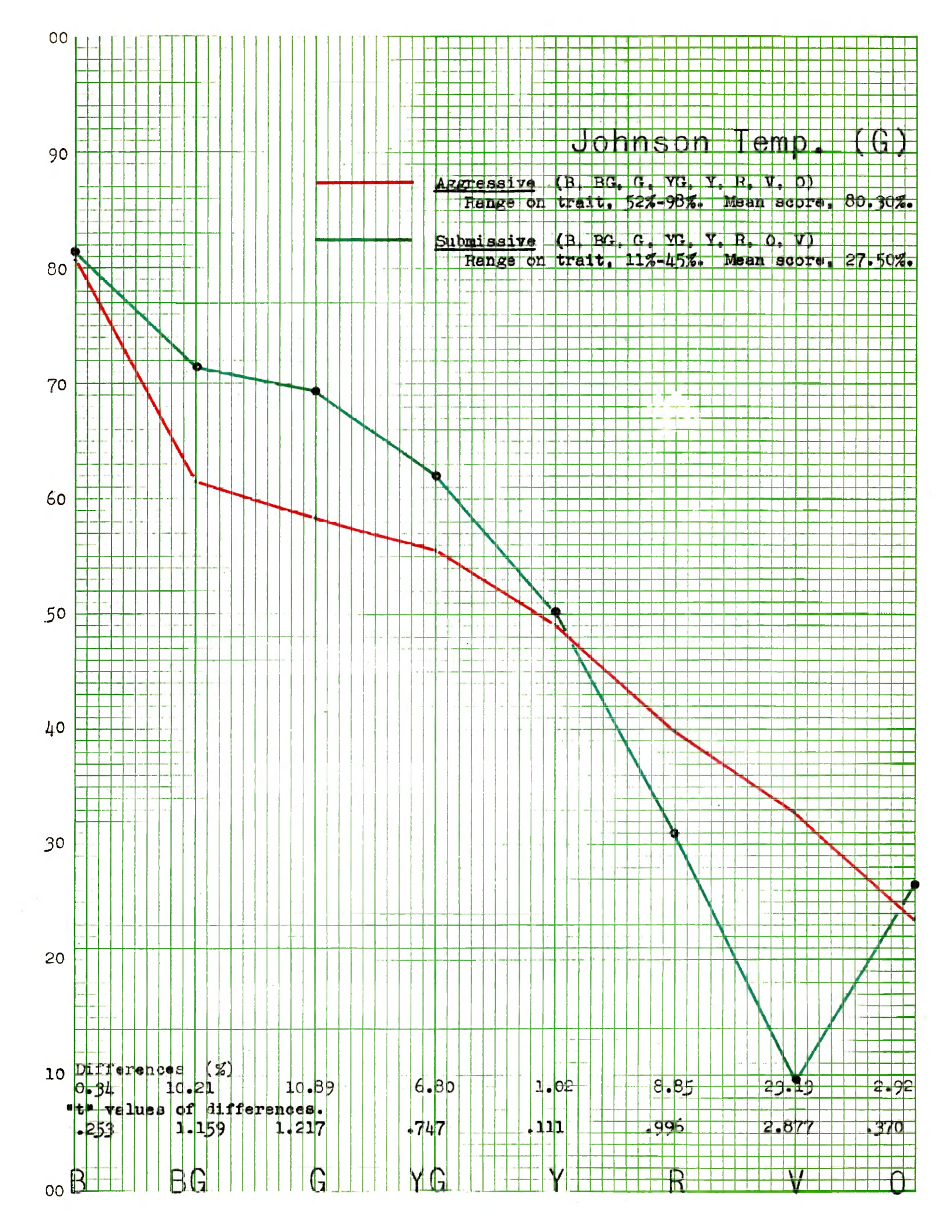
Three colors, then, are of importance in differentiating these two sub-groups; Green, Red, and Violet. The differences in proportionate color preferences for these


Johnson Temp. (F)
Subjective (B, G, BG, YG, Y, R, O, V)
Range on trait, 50%-99%. Mean score, 77.60%.
Objective (B, BG, YG, G, R, Y, V, O)
Range on trait, 11%-45%. Mean score, 30.29%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
9.86 8.68 18.88 2.04 4.25 18.03 16.49 8.16
"t" values of differences.
1.359 1.004 2.150 .229 .473 2.068 2.079 1.040
B BG G YG Y R V O

three colors are all significant. The subjective sub-group prefers Green significantly more, Red significantly less, and Violet significantly less than does the Objective sub-group.

"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "G"
(Aggressive and Submissive)

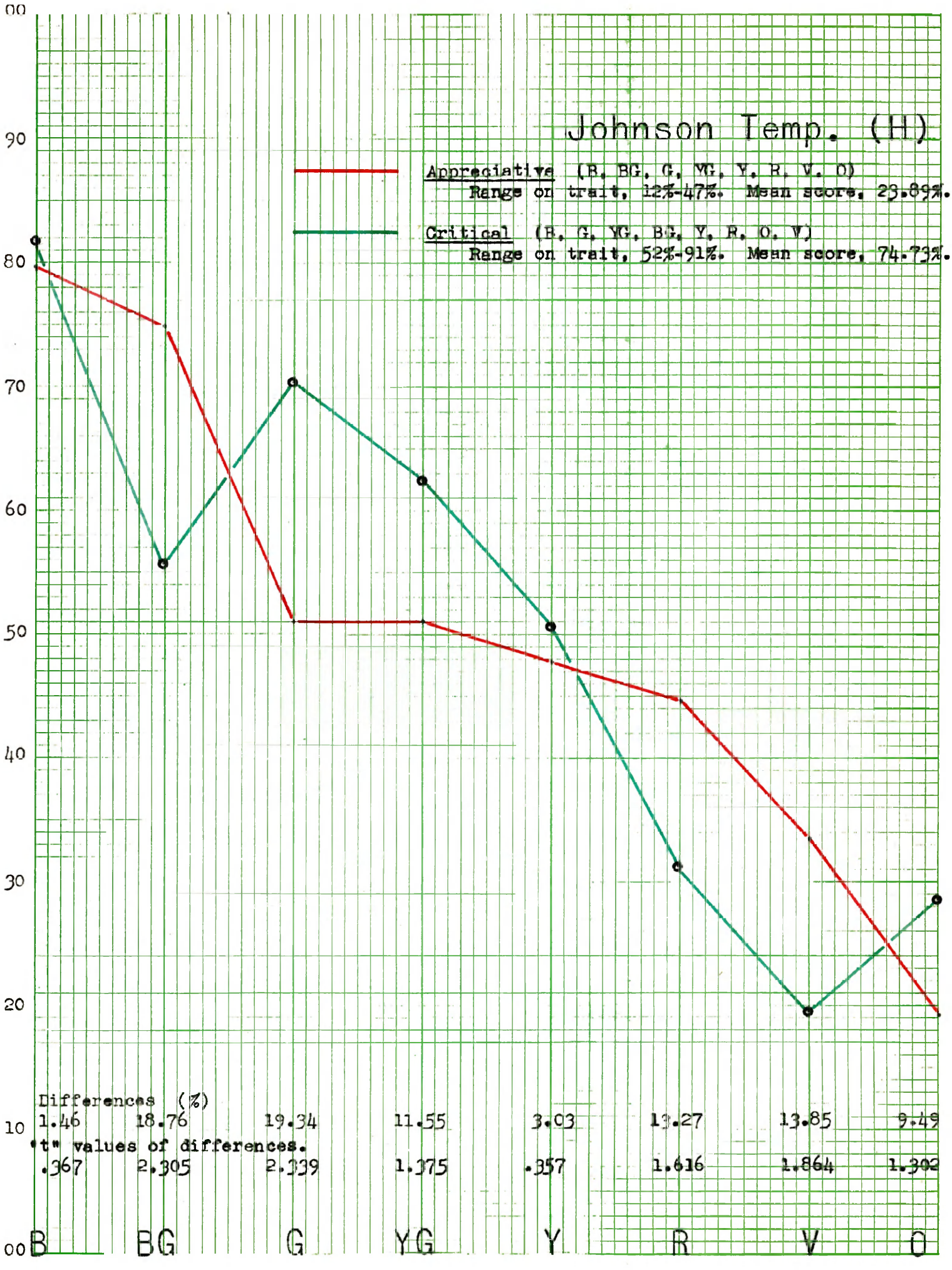
The graph for trait "G" presents only one proportionate color preference difference that is large enough to suggest significance. The color Violet is liked significantly less by the Submissive sub-group than it is by the Aggressive sub-group (very significantly less.) Again, as in Graph VII, which deals with the Bernreuter sub-groups, Submissive and Aggressive, the Submissive sub-group likes Green more, and Red less, than do the women of the Aggressive sub-group. In this trait, however, the differences between the two groups are less extensive. It would be very interesting to attempt to ascertain the reason for the difference at Violet. If the difference represented the difference in associations that the color brought to the minds of the individuals who composed the two groups, it would be of value to determine the nature of these associations.


Johnson Temp. (G)
Aggressive (B, BG, G, YG, Y, R, V, O)
Range on trait, 52%-98%. Mean score, 80.30%.
Submissive (B, BG, G, YG, Y, R, O, V)
Range on trait, 11%-45%. Mean score, 27.50%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
0.34 10.21 10.89 6.80 1.02 8.85 29.19 2.92
"t" values of differences.
.253 1.159 1.217 .747 .111 .996 2.877 .370
B BG G YG Y R V O

"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "H"
(Appreciative--Critical)

Graph XIV, which portrays the polar sub-groups of trait "H" (Appreciative and Critical), mirrors the Graphs that illustrate the color preference patterns of the sub-groups of Bernreuter's traits B1-N, B3-I, and F1-C. The significant difference at Blue-Green, as well as the significant, or large, differences at Green, Red, and Violet, reflect the differences found on the other graphs. It would appear that the Critical individual and the Neurotic (or Introverted and Self-Conscious) individual, as well as the Appreciative and Well-Adjusted individual, had much in common. This apparent similarity is, substantiated by the scores of the individuals who comprise the sub-groups. In fifteen cases out of twenty, individuals who scored as Appreciative or Critical scored also as Well-Adjusted, and the women who scored as Critical also scored as Neurotic.

Four colors are apparently of value in differentiating between the Appreciative and Critical sub-groups. These colors are Blue-Green, Green, Red, and Violet. The Critical (as was true of the Neurotic, Introverted, and Self-Conscious sub-groups) sub-group preferred Blue-Green significantly less, Green significantly more, and Red and Violet much less than did the individuals of the Appreciative sub-group. The real difference between

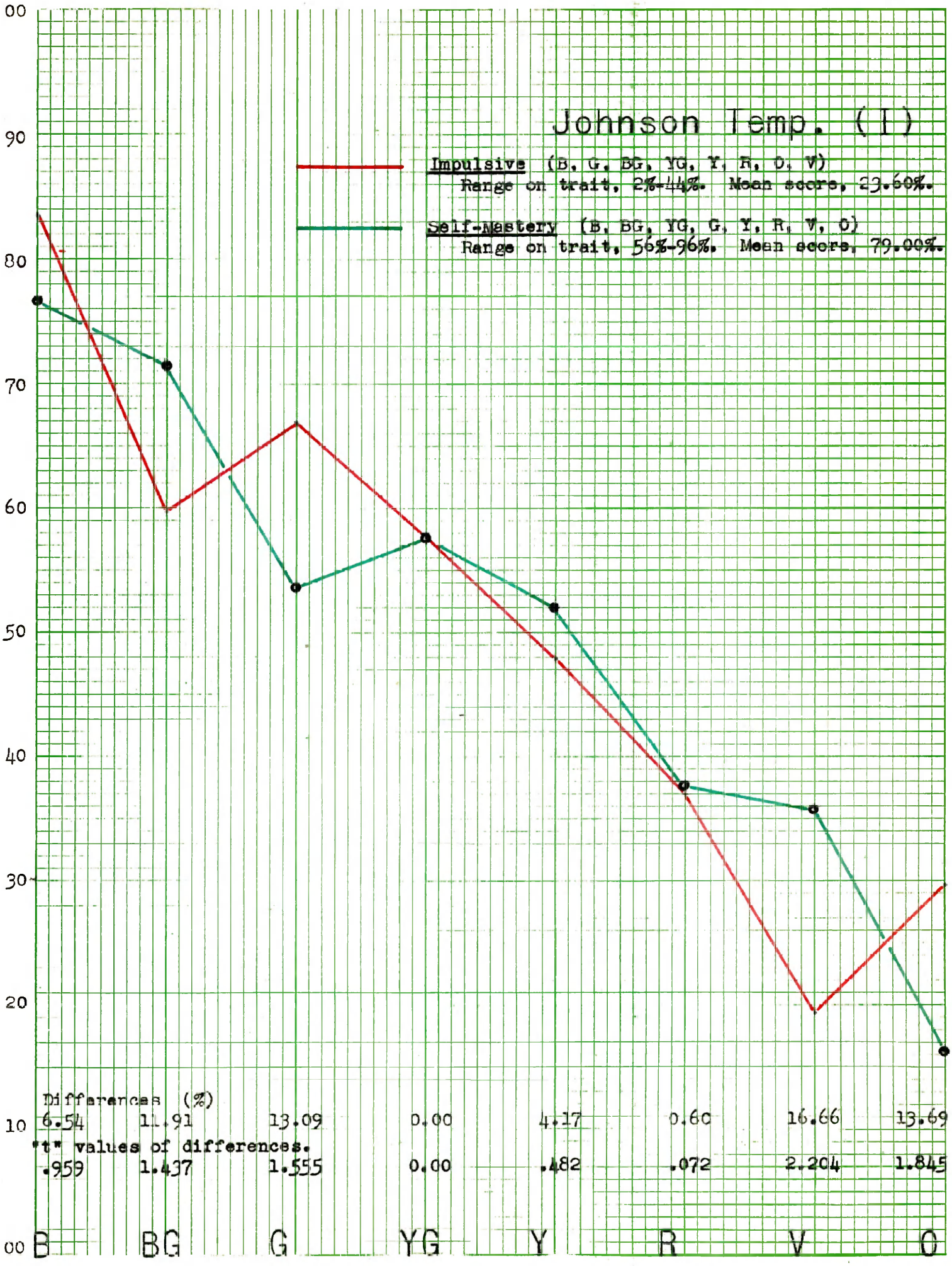

Johnson Temp. (H)
Appreciative (B, BG, G, YG, Y, R, V, O)
Range on trait, 12%-47%. Mean score, 23.89%.
Critical (B, G, YG, BG, Y, R, O, V)
Range on trait, 52%-91%. Mean score, 74.73%.
00
90
80
70
60
50
40
30
20
10
00
B
BG
G
YG
Y
R
V
O
Differences (%)
1.46
18.76
19.34
11.55
3.03
13.27
13.85
9.49
"t" values of differences.
.367
2.305
2.339
1.175
.357
1.616
1.864
1.302

these two color preference patterns stems from the fact that the Critical individuals apparently have, as a group, more extreme likes or dislikes for colors than do the women of the other group. The Critical sub-group exhibits strong preference for Blue, Green, and Yellow-Green. Their frequency of preference falls off rapidly from this point on, with three colors closely grouped at the lower extreme. The Appreciative sub-group, on the other hand, show strong preference for Blue and Blue-Green, exhibit moderate preference (or tolerance) for four others (Green, Yellow-Green, Yellow, and Red), and then dip more slowly to a level of apparent dislike (with one color in a marginal position, and the other quite low). This discussion seems to bring to light another factor that differentiates these sub-groups from each other. It is a matter of consistency and extent of preference on the group level. The Neurotic, Introverted, Self-Conscious, Non-Self-Sufficient, Submissive, Depressed, Cold, Hard-Boiled, Subjective, Submissive (Johnson Temperament Analysis), and Critical women tend more to acclaim or avoid colors---the same colors. The sub-groups that represent the opposite polar aspect of these traits tend, on the other hand, to portray less extreme preferences in either direction, and tend to tolerate most colors. The point of consistency must be stressed again, for the previous statement doesn't

adequately explain it. The Appreciative individuals (and all the other sub-groups that are being considered with them) tend to give many of the colors a proportionate color preference of about fifty percent. This does not mean that the individuals within the groups prefer these colors half of the time to the extent of a fourth or fifth position in the field of eight, but rather that there is less consistency of preference position in the case of these individuals. They tend, on the individual level to give these colors all positions from first to last place, and, on the group level, very few colors are consistently liked very much, or disliked very much.

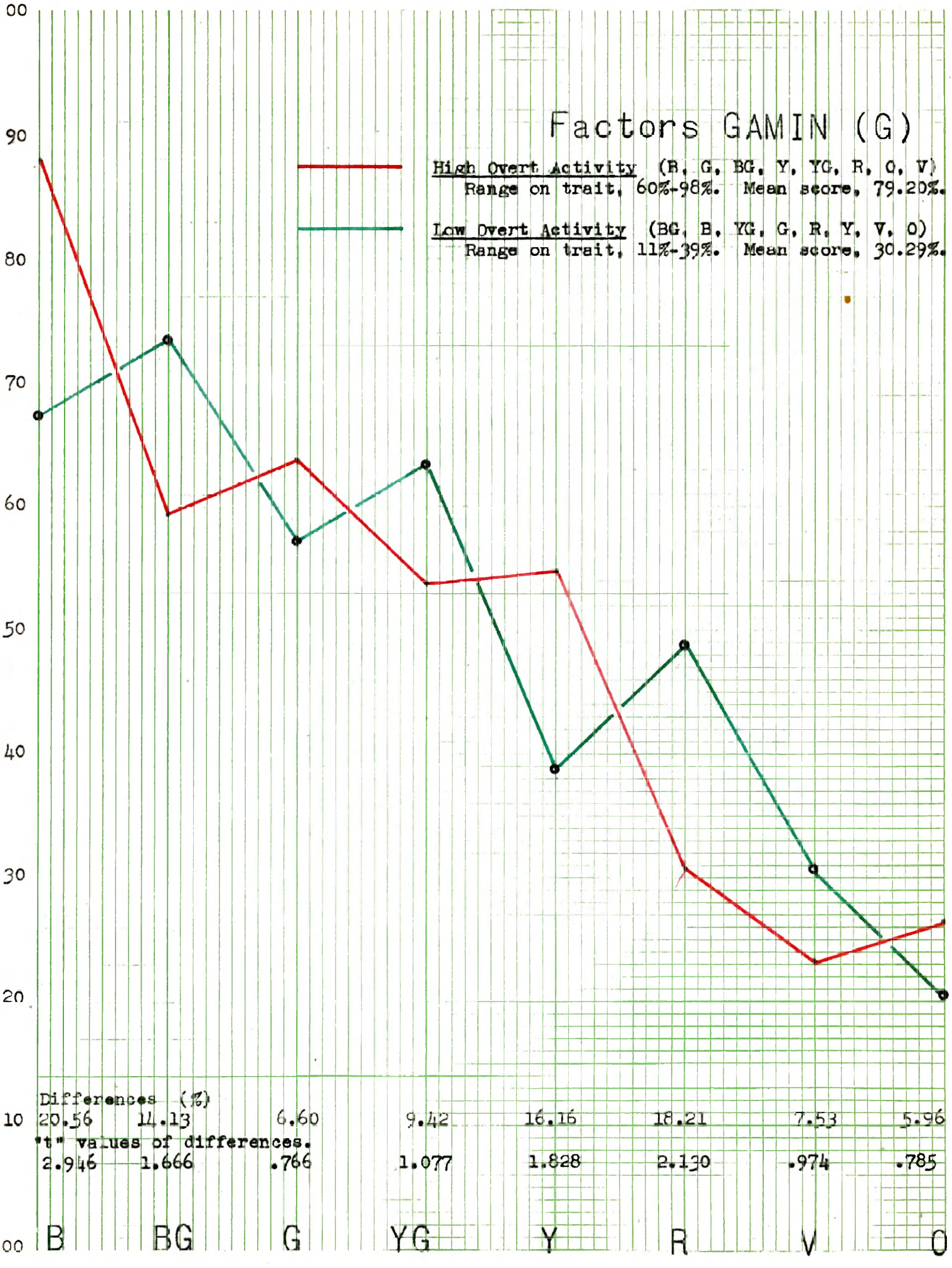
"THE JOHNSON TEMPERAMENT ANALYSIS"---trait "I"
(Impulsive and Self-Mastery)

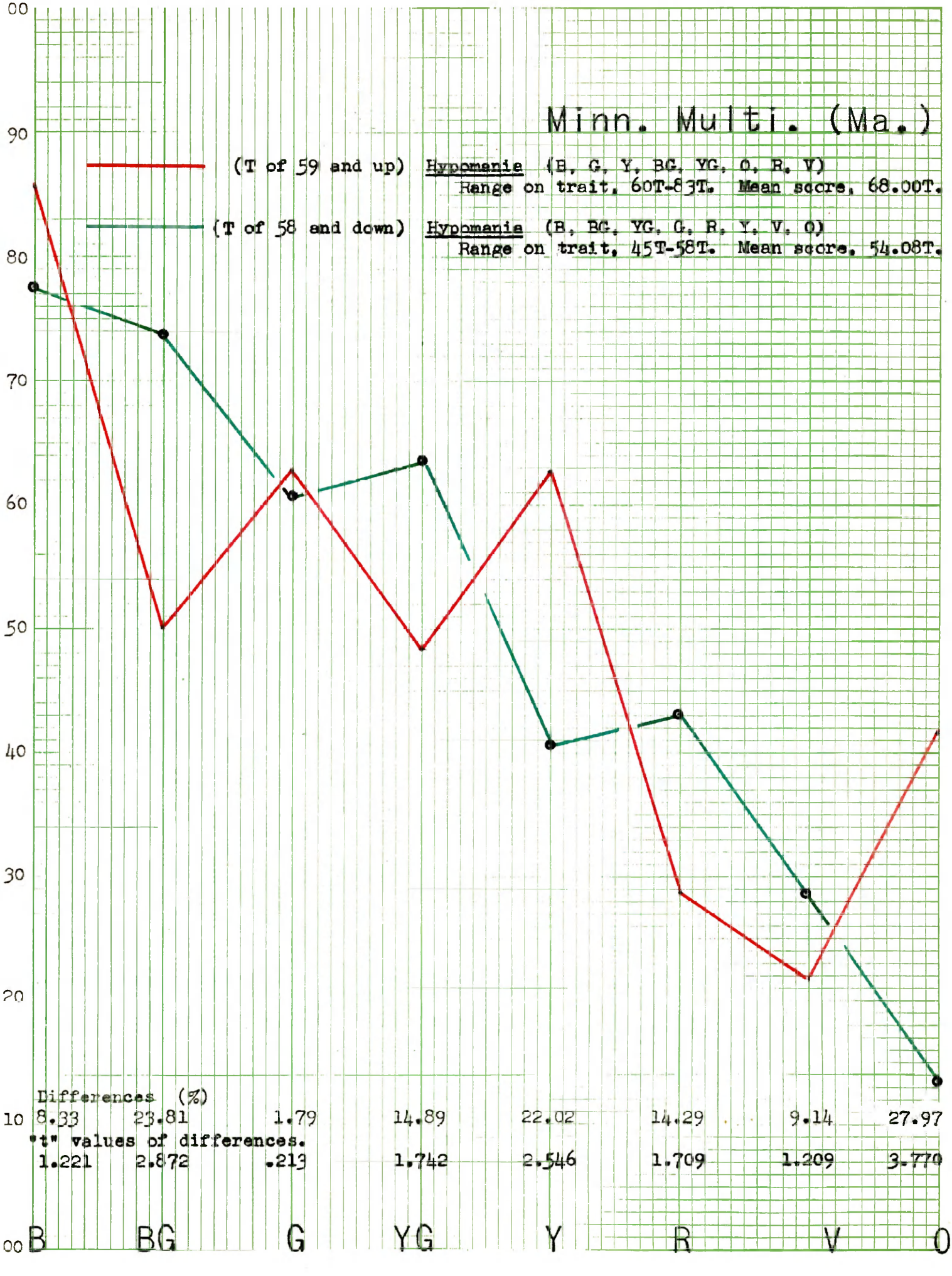
Graph XV, which illustrates the Johnson trait "I" (Impulsive and Self-Mastery), is characterized by few significant differences. This fact may be due, in part, to the fact that most of the testees who comprise the Impulsive sub-group tended to assume a position, on this trait scale, near the middle. Six of the twelve individuals who comprised this sub-group scored above thirty percent. The women in the Impulsive sub-group did prefer Blue-Green less, and Green more, than did the women characterized by Self-Mastery. The proportionate color preferences of these two groups disagreed significantly only at Violet, however, where the Impulsive sub-group preferred this color less than did the Self-Mastery sub-group. In all other colors, these two groups seem the same.


Johnson Temp. (I)
Impulsive (B, G, BG, YG, Y, R, O, V)
Range on trait, 2%-44%. Mean score, 23.60%.
Self-Mastery (B, BG, YG, G, Y, R, V, O)
Range on trait, 56%-96%. Mean score, 79.00%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
6.54 11.91 13.09 0.00 4.17 0.60 16.66 13.69
"t" values of differences.
.959 1.437 1.555 0.00 .482 .072 2.204 1.845
B BG G YG Y R V O

"FACTORS GAMIN"---trait "G" (High Overt Activity--Low Overt Activity)
"MINN, MULTI. PERSONALITY INVEN."----trait "Ma." (Hypomanic--Normal)

Since these two graphs (Graph XVI and Graph XVII) present very similar patterns, they will be discussed at the same time. The only real difference between them is the larger scope of the differences that separate the sub-groups that are illustrated by Graph XVIII. The "High Overt Activity" and the Hypomanic" (T of 59 and up) sub-groups prefer, to a greater extent than do their complimentary sub-groups (Low Overt Activity and Hypomania-normal), the primary colors--with the exception of Red. The "Low Overt Activity" and Hypomania-normal sub-groups prefer, to a greater extent than do the other sub-groups, the secondary colors---with the exception of Orange. This rather unusual pattern of proportionate color preference relationships is apparently broken by the inversion of the sub-group preferences for Red and Orange. It is a variation that might have been expected. The Red and Green factor, which has been seen to operate in most of the Graphs, is also apparent here. No sub-group has ever preferred both Red and Green more than, or less than, did its complimentary sub-group. These two basic primaries figure in almost every Graph, and appear to be of importance in differentiating between the sub-groups that represent the polar aspects of the various traits.


Factors GAMIN (G)
High Overt Activity (B, G, BG, Y, YG, R, O, V)
Range on trait, 60%-98%. Mean score, 79.20%.
Low Overt Activity (BG, B, YG, G, R, Y, V, O)
Range on trait, 11%-39%. Mean score, 30.29%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
20.56 14.13 6.60 9.42 16.16 18.21 7.53 5.96
"t" values of differences.
2.946 1.666 .766 1.077 1.828 2.130 .974 .785
B BG G YG Y R V O


Minn. Multi. (Ma.)
(T of 59 and up) Hypomania (B, G, Y, BG, YG, O, R, V)
Range on trait, 60T-83T. Mean score, 68.00T.
(T of 58 and down) Hypomania (B, BG, YG, G, R, Y, V, O)
Range on trait, 45T-58T. Mean score, 54.08T.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
8.33 23.81 1.79 14.89 22.02 14.29 9.14 27.97
"t" values of differences.
1.221 2.872 .213 1.742 2.546 1.709 1.209 3.770
B BG G YG Y R V O

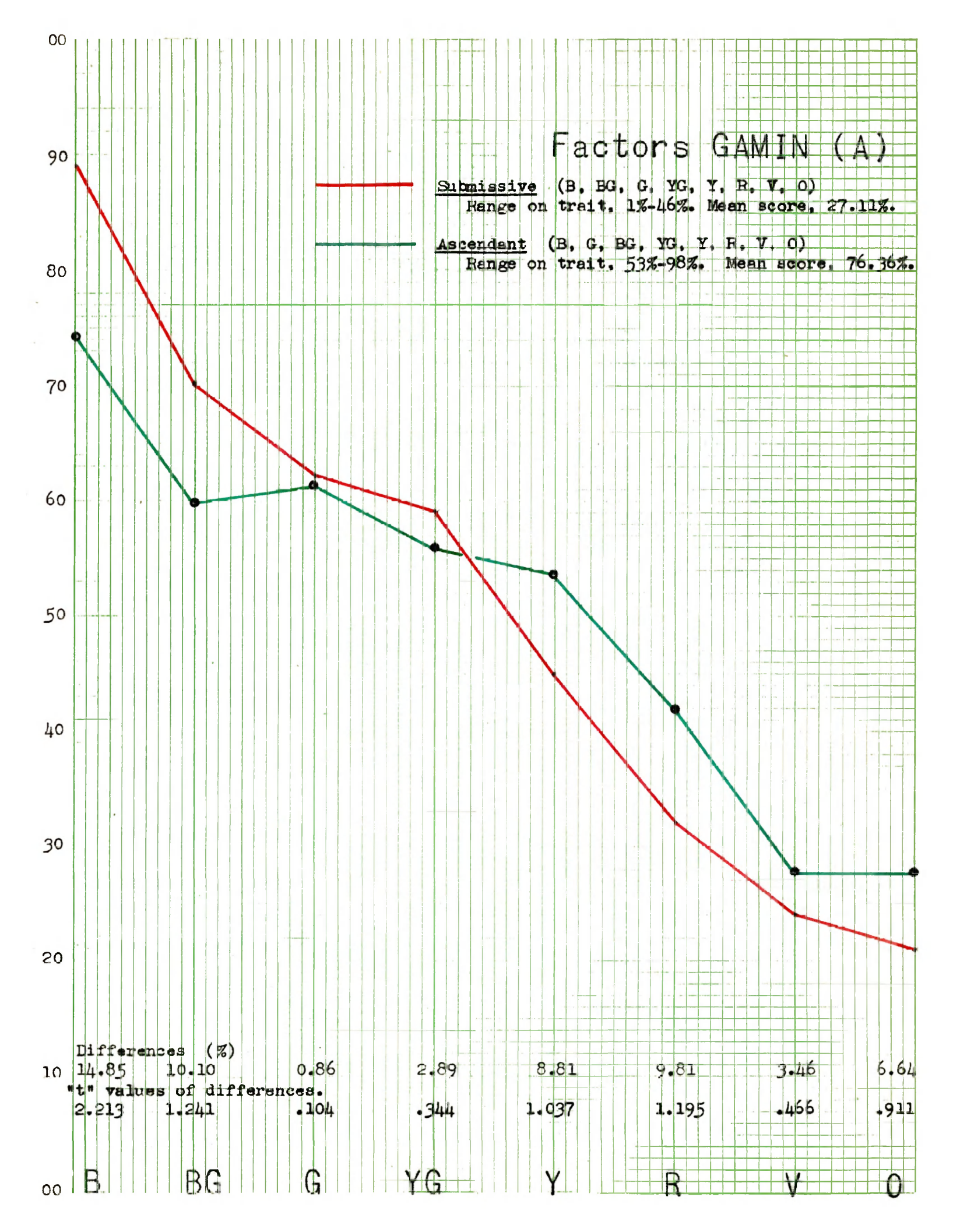
Observing more closely, first, the graph of Factor "G", it will be noticed that the "High Overt Activity" sub-group prefers Blue significantly more, Red significantly less, Blue-Green less, and Yellow more than does the "Low Overt Activity" sub-group. Although Blue-Green and Yellow do not present significant differences, they do involve differences in proportionate color preference that are large enough to approach closely a significantly level.

Graph XVII, on the other hand, presents color preference patterns that differ more extensively. The sub-group that represents an excessive presence of Hypomanic pattern of behavior prefers Blue-Green very significantly less, Yellow very significantly more, and Orange very significantly more than does the sub-group that is comprised of those women who illustrate a normal tendency towards Hypomania. The differences at Red and Yellow closely approach a significant level.

These two graphs are very similar, and suggest the correlation that exists between these two traits.

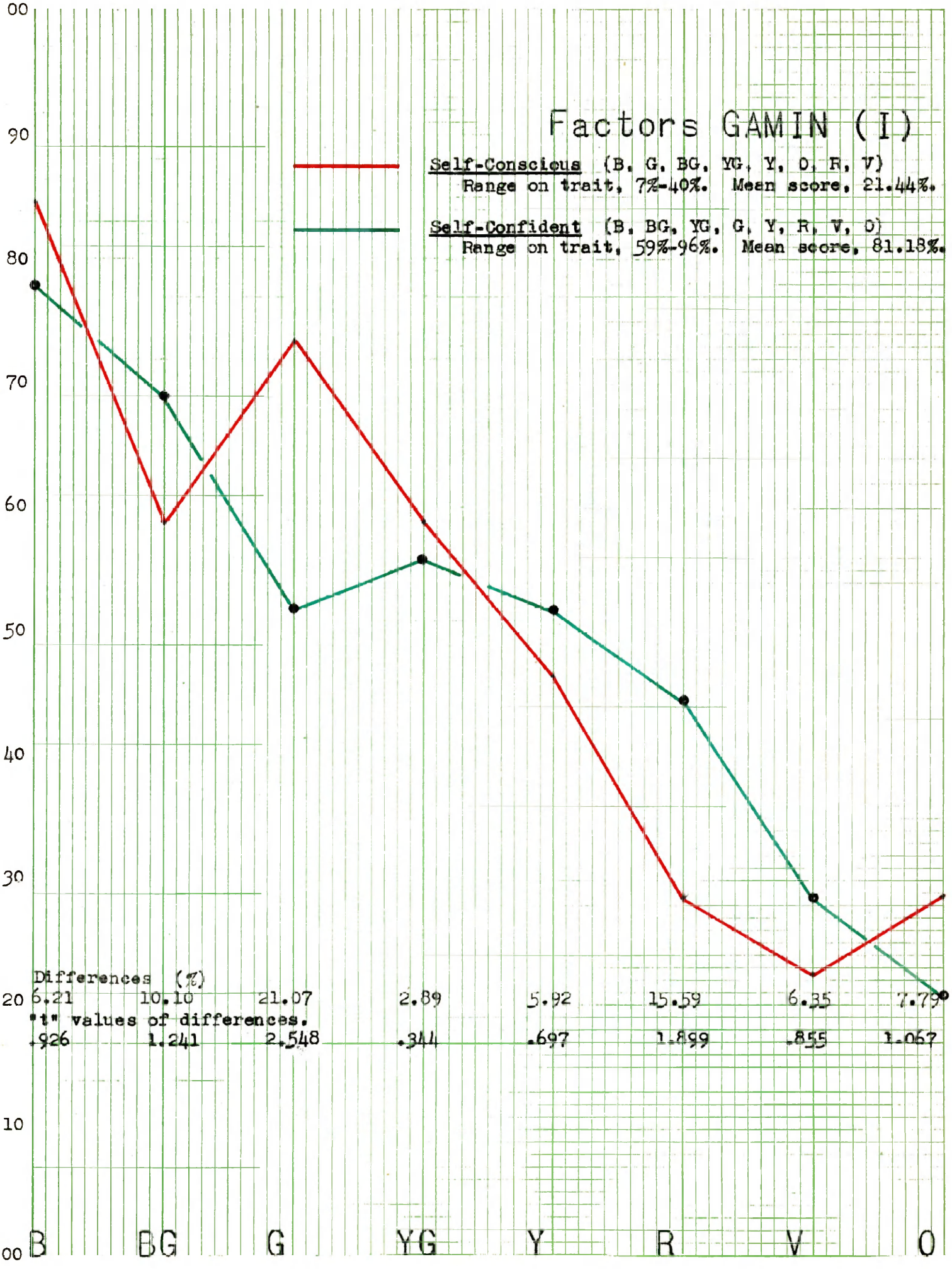
"FACTORS GAMIN"---trait "A" (Submissive and Ascendant)

In-so-far as this sample of women is concerned, color preference is of little value in differentiating between Submissive and Ascendant sub-groups. These two sub-groups differ significantly in respect to preference frequency for the color Blue, but this is the only color that can be considered of value. The remainder of the colors reflect differences that are reminiscent of, in a very weak manner, previous patterns. It would seem valuable to analyze this trait again, with a larger number of individuals in the sub-groups, and with more extreme individuals in each sub-group.


Factors GAMIN (A)
Submissive (B, BG, G, YG, Y, R, V, O)
Range on trait, 1%-46%. Mean score, 27.11%.
Ascendant (B, G, BG, YG, Y, R, V, O)
Range on trait, 53%-98%. Mean score, 76.36%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
14.85 10.10 0.86 2.89 8.81 9.81 3.46 6.64
"t" values of differences.
2.213 1.241 .104 .344 1.037 1.195 .466 .911
B BG G YG Y R V O

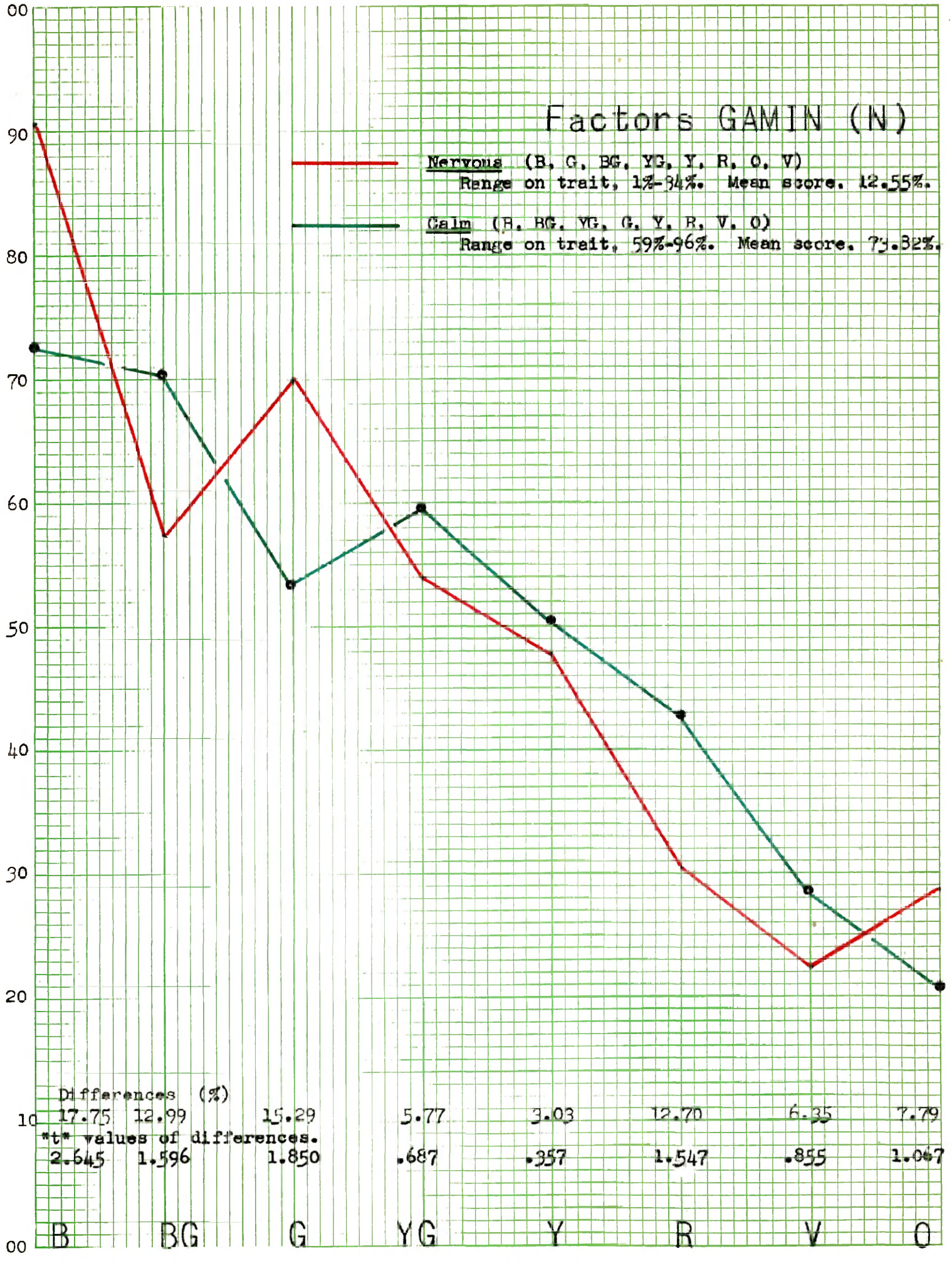
"FACTORS GAMIN"---trait "I". (Self-Conscious and Self-Confident)

The two sub-groups that illustrate the polar aspects of this trait, Self-Conscious and Self-Confident (Graph XIX), display significant differences in their proportionate color preferences for the colors Red and Green. The Self-Conscious sub-group prefers Green significantly more and Red significantly less than does the Self-Confident sub-group. The difference at Blue-Green, which was more dominate in the Graph that illustrated the trait Bl-N, is noticeable, though not significant. The similarities between the proportionate color preference patterns of the Neurotic women and the Self-Conscious women, between the women of the Self-Confident sub-group and the women that comprise the Well-Adjusted sub-group, are quite evident.


Factors GAMIN (I)
Self-Conscious (B, G, BG, YG, Y, O, R, V)
Range on trait, 7%-40%. Mean score, 21.44%.
Self-Confident (B, BG, YG, G, Y, R, V, O)
Range on trait, 59%-96%. Mean score, 81.18%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
6.21 10.10 21.07 2.89 5.92 15.59 6.35 7.79
"t" values of differences.
.926 1.241 2.548 .344 .697 1.899 .855 1.067
B BG G YG Y R V O

"FACTORS GAMIN"---trait "N" (Nervous and Calm)

The proportionate color preference patterns of the sub-groups, Nervous and Calm, pictured in the graph on the following page, differ in regard to the colors Blue, Blue-Green, Green, and Red. The only significant difference is at Blue, but the differences at Blue-Green, Green, and Red are of interest. With the exception of the extreme preference shown for Blue, the color preference pattern of the Nervous sub-group resembles that for the Neurotic sub-group of trait Bl-N. The women that comprise the Nervous sub-group prefer Blue significantly more, Blue-Green less, Green more (almost significantly), and Red less than do the women of the Calm sub-group.

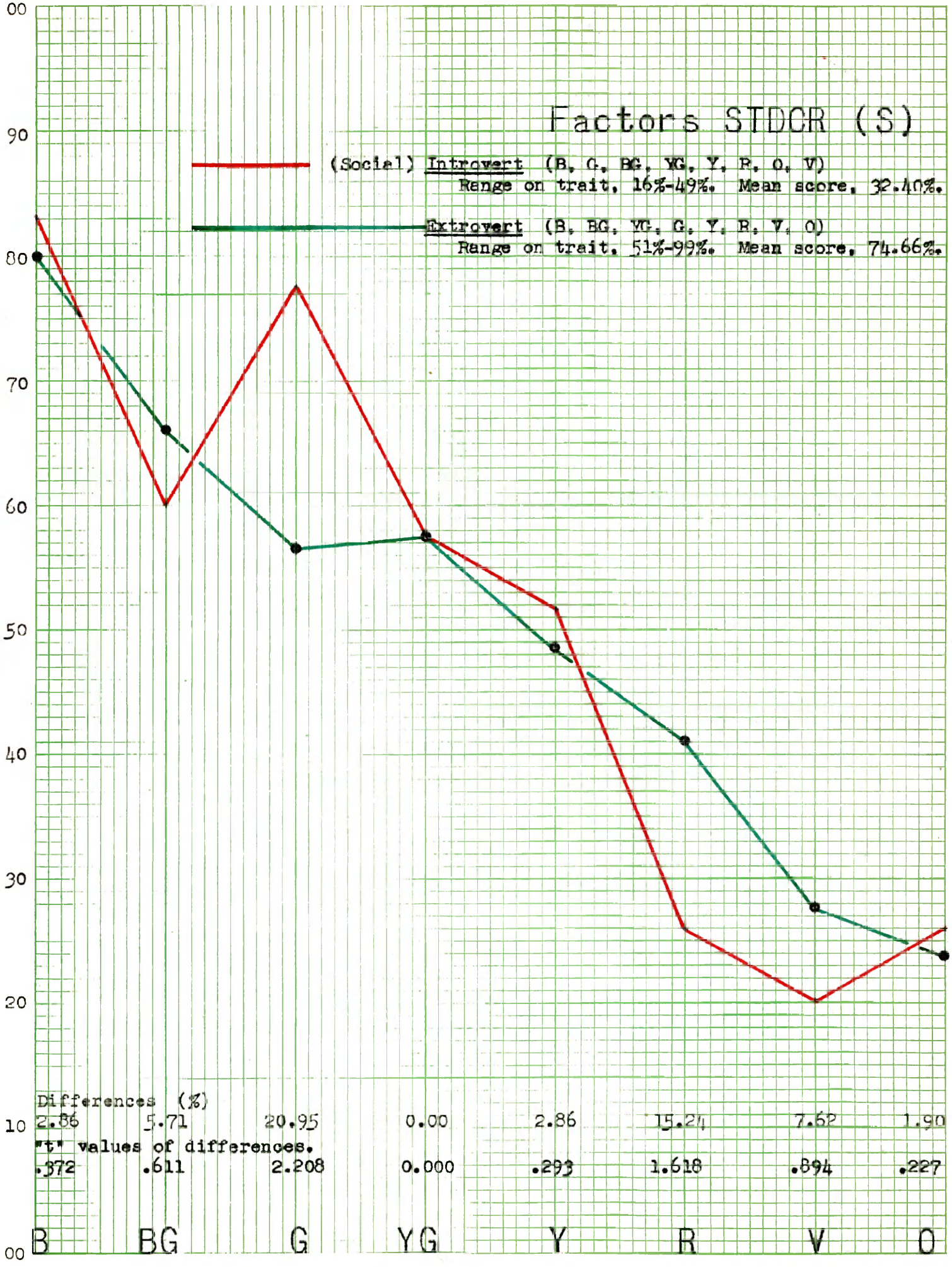

Factors GAMIN (N)
Nervous (B, G, BG, YG, Y, R, O, V)
Range on trait, 1%-84%. Mean score. 12.55%.
Calm (B, BG, YG, G, Y, R, V, O)
Range on trait, 59%-96%. Mean score. 74.32%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
17.75 12.99 15.29 5.77 3.03 12.70 6.35 7.79
t values of differences.
2.645 1.596 1.850 .687 .357 1.547 .855 1.047
B BG G YG Y R V O

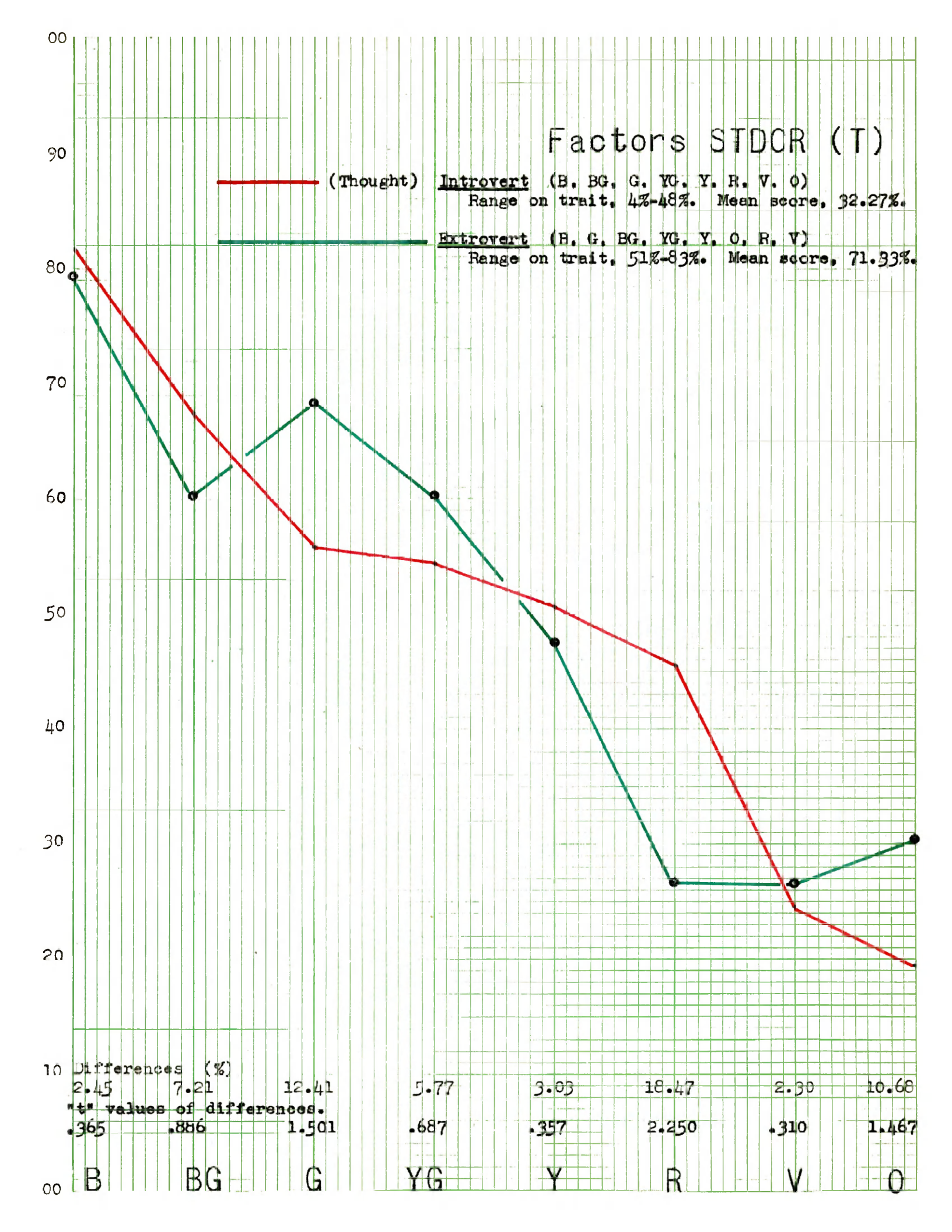
"FACTORS STDCR"---traits "S" and "T"
(Introvert-Extrovert, Social)
(Introvert-Extrovert, Thought)

As was mentioned previously, the two traits "S" and "T" will be treated together. The proportionate color preference patterns of the sub-groups of these traits present variations that are most easily understood when observed together.

Looking first at Graph XXI, it will be noticed that the women who comprise the Introvert sub-group (social) prefer Green significantly more, and Red much less than do the women of the Extrovert sub-group. Experience with previous graphs should suggest the propriety of the contrasting color preferences of these two sub-groups.

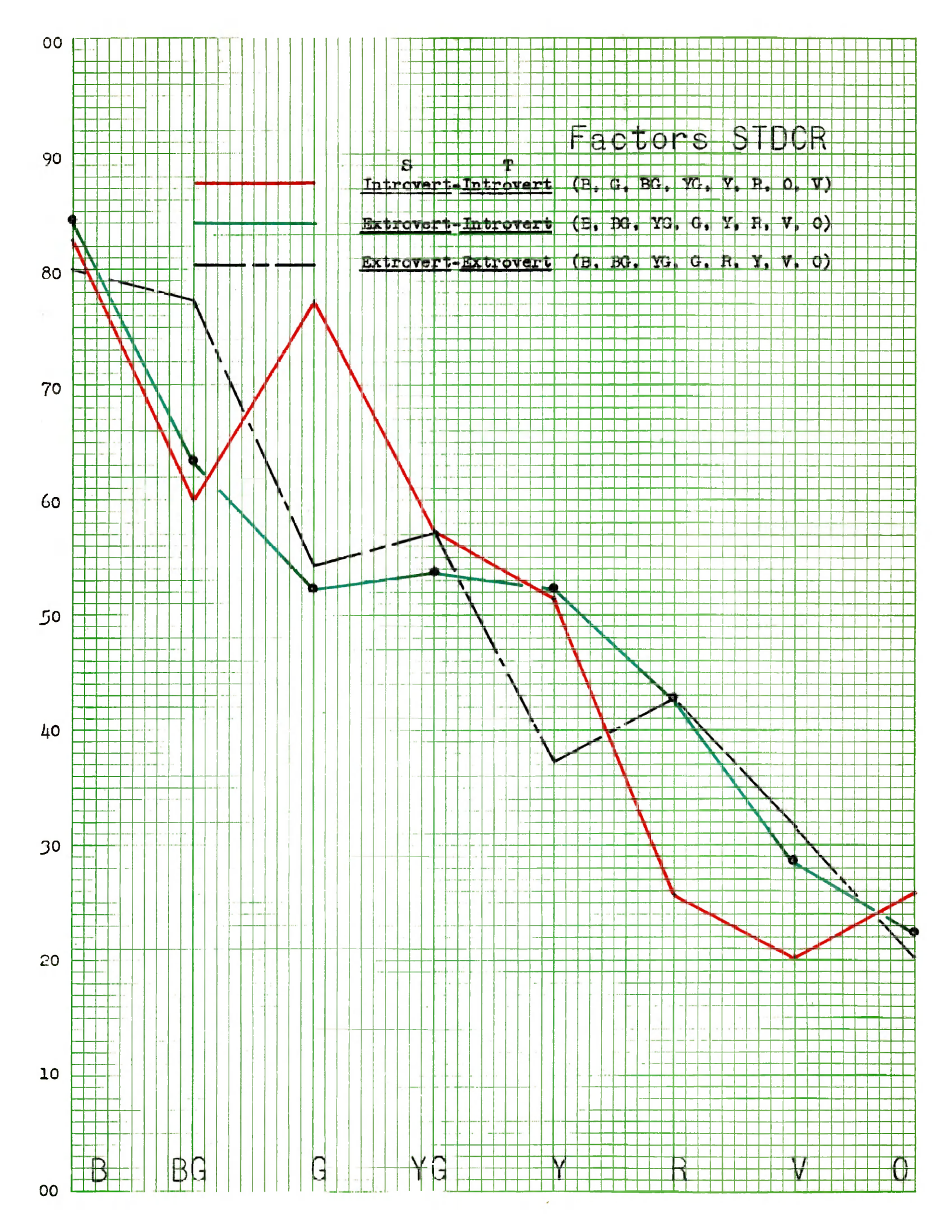
Turning to the next graph (Graph XXII,-----the women who comprise the Introvert (thought) sub-group display a proportionate color preference pattern that echoes the pattern of the Social Extrovert sub-group. In this graph, the women who make-up the Introvert sub-group prefer green much less, and Red significantly more than do the Extroverted women. The apparent conflict between the trait preferences illustrated by these two graphs, the apparent reversal in preferences raises the question of the relationships that one trait bears to the other. It is easy to distinguish the relationship that trait "S" (Graph XXI) bears to trait Bl-N, for instance. The woman who tends


Factors STDCR (S)
(Social) Introvert (B, G, BG, YG, Y, R, O, V)
Range on trait, 16%-49%. Mean score, 32.40%.
Extrovert (B, BG, YG, G, Y, R, V, O)
Range on trait, 51%-99%. Mean score, 74.66%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
2.86 5.71 20.95 0.00 2.86 15.24 7.62 1.90
"t" values of differences.
.372 .611 2.208 0.000 .293 1.618 .894 .227
B BG G YG Y R V O


Factors STDCR (T)
(Thought) Introvert (B. BG. G. YG. Y. R. V. O)
Range on trait, 4%-48%. Mean score, 32.27%.
Extrovert (B. G. BG. YG. Y. O. R. V)
Range on trait, 51%-83%. Mean score, 71.33%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
2.45 7.21 12.41 5.77 3.03 18.47 2.30 10.68
"t" values of differences.
.365 .886 1.501 .687 .357 2.250 .310 1.467
B BG G YG Y R V O

towards Social-Introvertism displays a proportionate color preference pattern which is very similar to that of the woman who tends towards Neuroticism. The same correlation exists between the color preference patterns of the sub-groups that represent the opposite polar aspects of the traits. Trait "T", however, presents a slightly different problem. The traits "S" and "T" are very evidently different personality factors---but how different? In what ways do they differ?

In an attempt to answer these questions, a third graph was prepared, Graph XXIIb. This graph illustrates the proportionate color preference patterns of three sub-groups. These three new sub-groups were formed on the basis of a two-trait classification. The two sub-groups of Graph XXI were the basis of the new system. They were, in turn, sub-divided on the basis of the women's ratings in terms of trait "T". Thus, there should have been four new sub-groups----(1) $\overset{S}{\text{Introvert}}$-$\overset{T}{\text{Introvert}}$, (2) $\overset{S}{\text{Introvert}}$-$\overset{T}{\text{Extrovert}}$, (3) $\overset{S}{\text{Extrovert}}$-$\overset{T}{\text{Introvert}}$, and (4) $\overset{S}{\text{Extrovert}}$-$\overset{T}{\text{Extrovert}}$. Actually, there were too few Social-Introverts to make the first two classifications practical, so all of these individuals were placed in one sub-group, "Introvert-Introvert". There were five women in this sub-group. The color preference pattern of this first sub-group is the same as that of the Introverts of Graph XXI. It will be discussed at greater length later. The second


Factors STDCR
S T
Introvert-Introvert (B, G, BG, YG, Y, R, O, V)
Extrovert-Introvert (B, BG, YG, G, Y, R, V, O)
Extrovert-Extrovert (B, BG, YG, G, R, Y, V, O)
00
10
20
30
40
50
60
70
80
90
00
B
BG
G
YG
Y
R
V
O

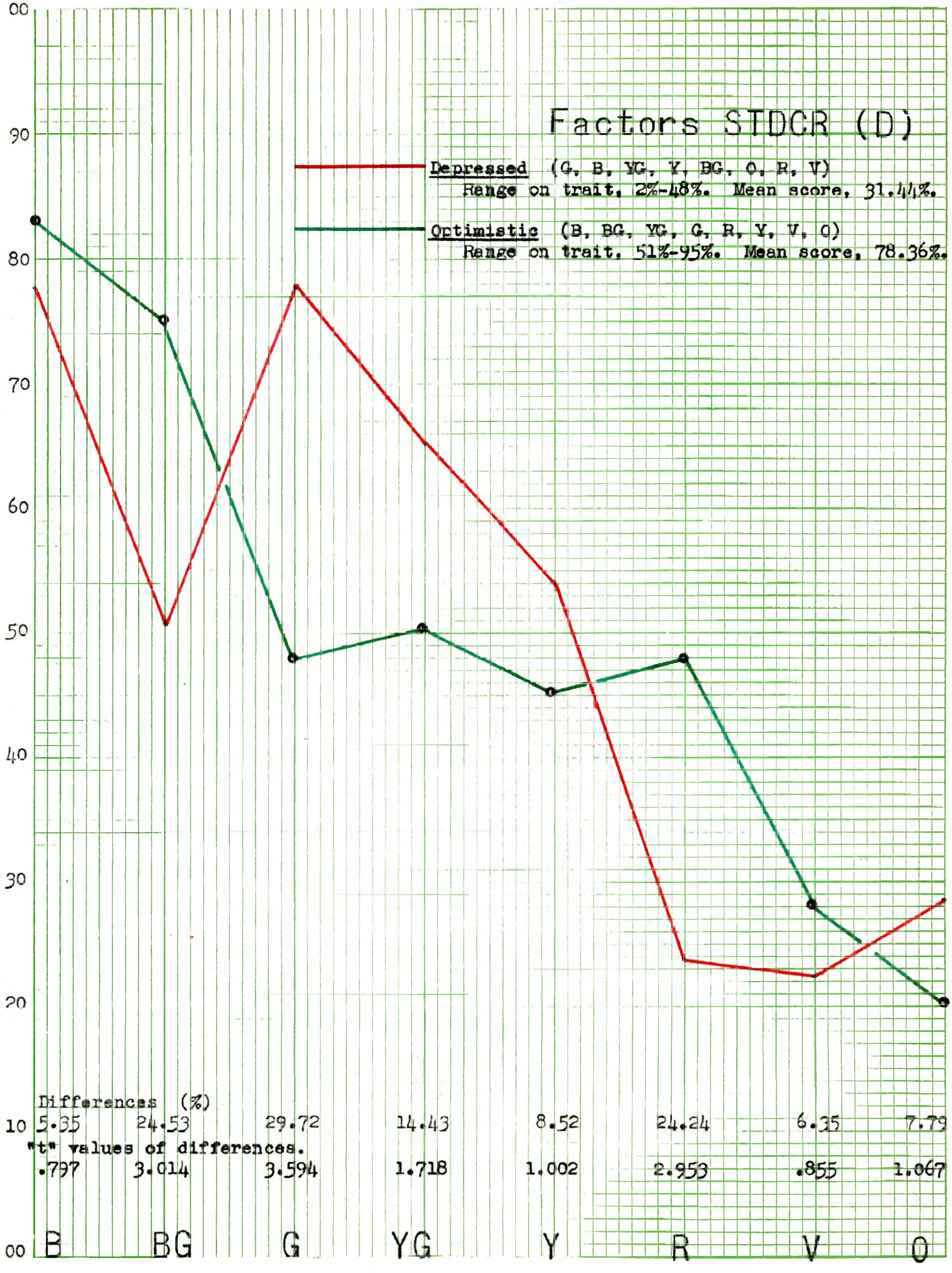
sub-group, "Extrovert-Introvert", is made up of nine women. This is, evidently, one of the strongest points of difference between the two traits. The proportionate color preference pattern of this sub-group is illustrated by the solid Green line. The color preference pattern of this group, it will be noticed, is predominantly the color preference pattern of the Extrovert sub-group of trait "S", and the Introvert sub-group of trait "T". The third sub-group, which is made-up of those women who tend to display the characteristics of Social-Extrovertism and Thought-Extrovertism, displays a slightly different color preference pattern than the previous sub-group. The proportionate color preference pattern of this sub-group, which is comprised of six women, is illustrated by the broken green line. The proportional color preference for Blue-Green is about 14% greater, and the preference for Yellow is approximately 15% less. The relationship between these two traits can be most easily expressed as two vectors (dimensions)that intersect at right angles. Such a basic plan allows for four quadrants, quadrants that correspond to the four sub-groups first listed. In order to give more of an idea as to the nature of the two traits being discussed, more should be said about the first sub-group mentioned, the "Introvert-Introvert" sub-group. This sub-group contained both Introverted and Extroverted women as far as

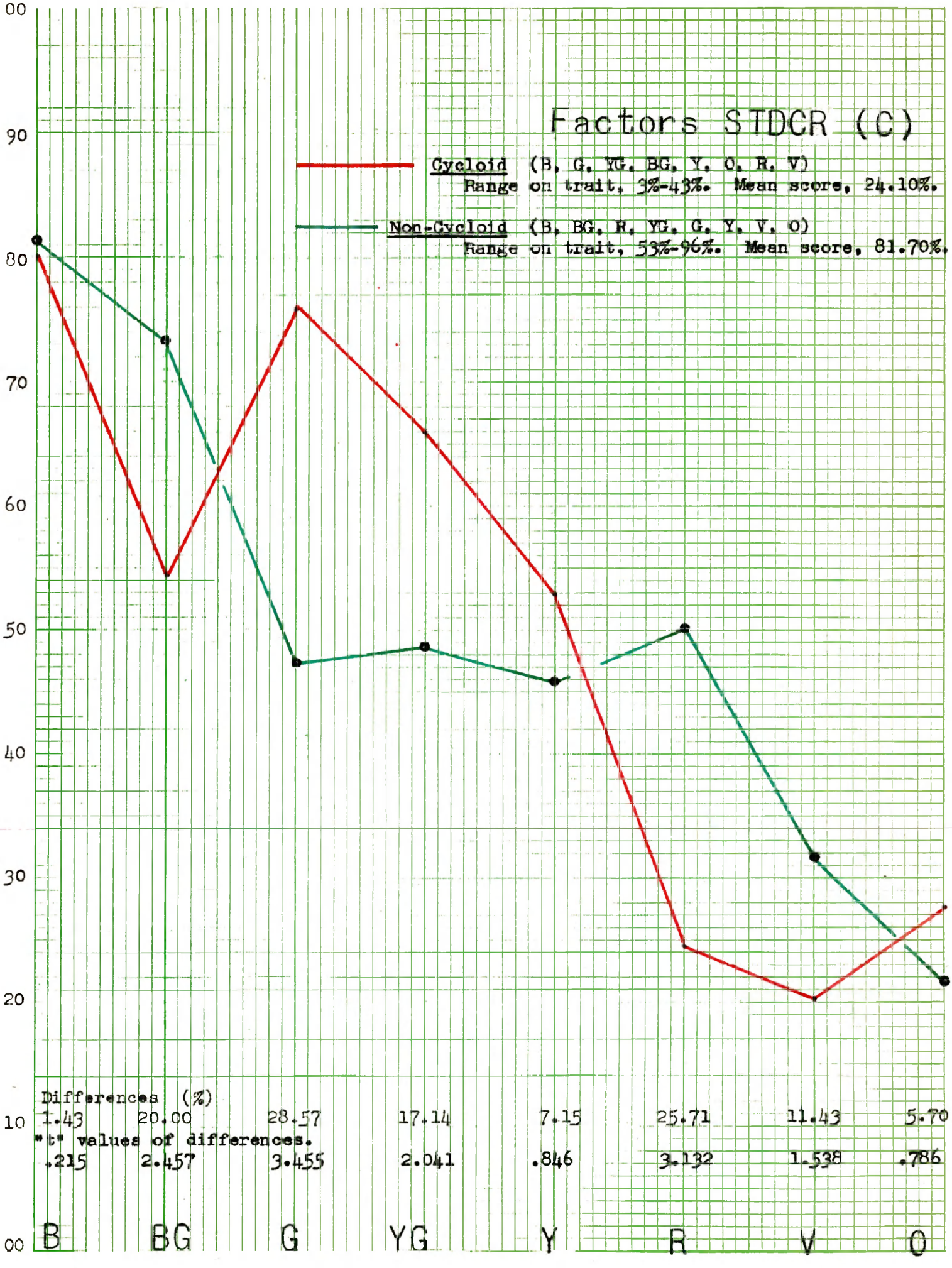
the trait "T" classification was concerned. When this sub-group is broken down further into the two sub-groups suggested earlier, more cause for the differences between the two traits is evident. The Introvert-Extrovert sub-group displays a very large preference for Green, about 85%, and a small proportional preference for Red, 5%. The Introvert-Introvert sub-group, on the other hand, displays a proportional preference of 65% for Green, and a preference of 57% for Red. According to the information of previous graphs, then, the Introvert-Introvert sub-group, as well as the Extrovert sub-groups, has a proportionate color preference pattern that suggests acceptable social adjustment. The proportionate color preference pattern of the women who think as Extroverts--but act as Introverts----suggests the presence of conflict, of Neuroticism.

"FACTORS STDCR"---traits "D" and "C" (Depressed-Optimistic)
(Cycloid-Non-Cycloid)

The proportionate color preference patterns of the sub-groups that represent the polar aspects of the traits "D" and "C" are so similar that both graphs (Graph XXIII and Graph XXIV) will be discussed at the same time.

The Cycloid and Depressed sub-groups, as is also true of the two other sub-groups, express very similar proportional color preferences. The women who comprise these two sub-groups prefer Blue-Green significantly less (very significantly in the case of the Depressed sub-group), Green very significantly more, Yellow-Green significantly more, Red very significantly less, Violet less, and Orange slightly more than do the women of the Non-Cycloid and Optimistic sub-groups. If the colors were arranged in their proper sequence (Blue, Blue-Green, Green, Yellow-Green, Yellow, Orange, Red, and Violet), it would be more easy to recognize the fact that these first two sub-groups prefer colors from Green to Orange more, and colors (hues) from Red to blue less than do the individuals in the other two sub-groups. It is difficult to imagine why the Depressed women dislike Blue-Green more than blue, when actually Blue-Green is closer to Green. This characteristic of the proportional color preferences of the Cycloid and Depressed sub-groups might be partially explained by the over-all preference given blue by most


Factors STDCR (D)
Depressed (G, B, YG, Y, BG, O, R, V)
Range on trait, 2%-48%. Mean score, 31.44%.
Optimistic (B, BG, YG, G, R, Y, V, O)
Range on trait, 51%-95%. Mean score, 78.36%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
5.35 24.53 29.72 14.43 8.52 24.24 6.35 7.79
"t" values of differences.
.797 3.014 3.594 1.718 1.002 2.953 .855 1.067
B BG G YG Y R V O


Factors STDCR (C)
Cycloid (B, G, YG, BG, Y, O, R, V)
Range on trait, 3%-43%. Mean score, 24.10%.
Non-Cycloid (B, BG, R, YG, G, Y, V, O)
Range on trait, 53%-96%. Mean score, 81.70%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
1.43 20.00 28.57 17.14 7.15 25.71 11.43 5.70
"t" values of differences.
.215 2.457 3.455 2.041 .846 3.132 1.538 .786
B BG G YG Y R V O

of the testees. Blue seems to be a pleasing color to all women----regardless of their personality make-up.

"FACTORS STDCR"----trait "R" (Rhathymic-Non-Rhathymic)

The proportionate color preference patterns of the two sub-groups of the trait "R", which are illustrated by Graph XXV, differ rather drastically in terms of several colors. The Rhathymic sub-group, which is designated by the Green line (for it represents the least socially acceptable polar extreme of the trait), prefers Green much more, Yellow significantly more, and Red very significantly less than does the Non-Rhathymic sub-group. The extreme differences at Yellow and Red, particularly at Yellow, seem to be the characteristics, as far as color is concerned, that differentiate between these two sub-groups. In no other graph has a difference this large separated the sub-group proportional color preferences for Yellow.

In as much as the more socially acceptable sub-group has evinced a more extreme preference for Green, and a less extreme preference for Red, it would seem logical to conclude that this trait bears about the same relationship to trait "S" as did trait "T".

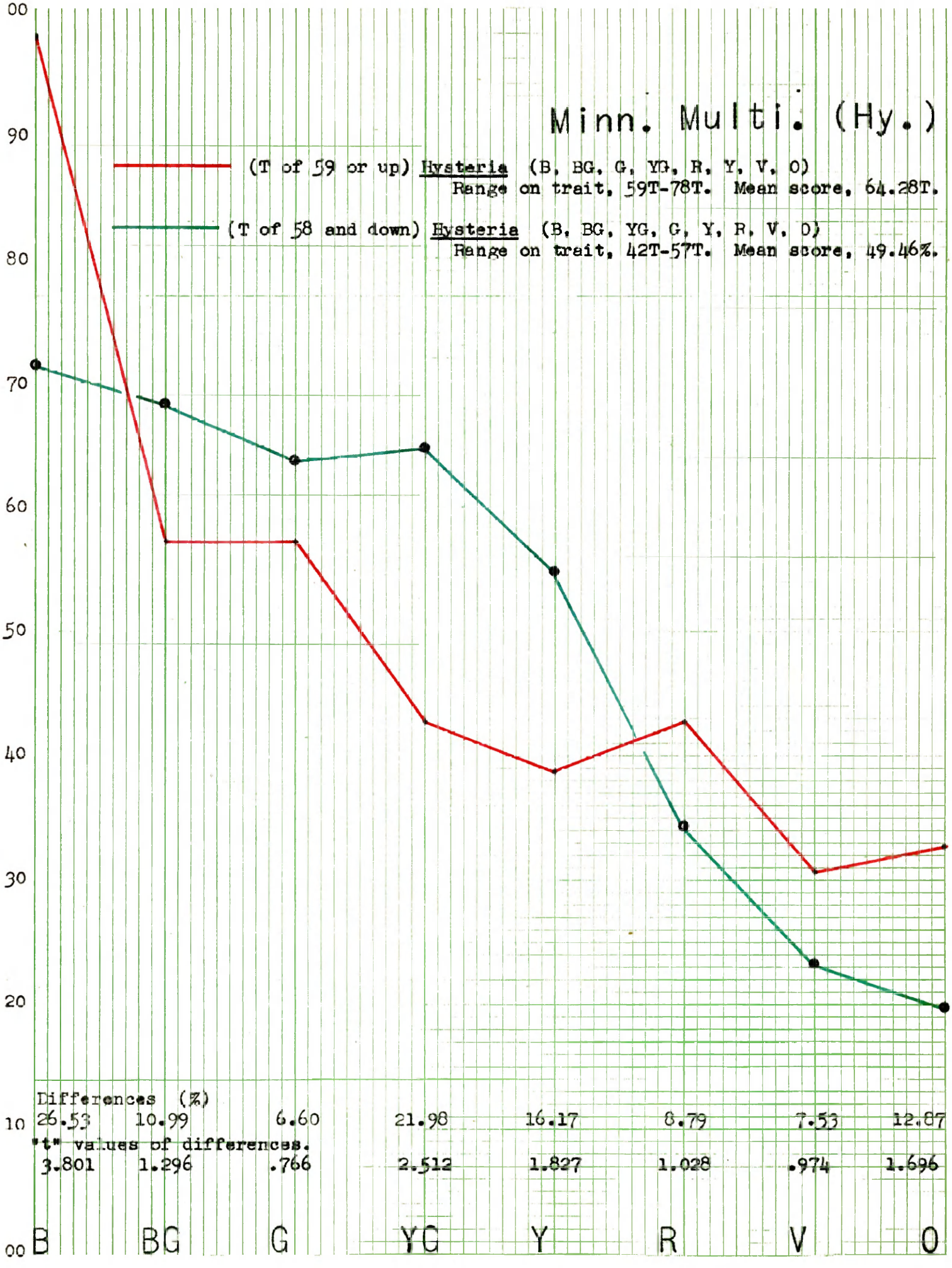

Factors SIDCR (R)
Rhathymic (B, G, BG, YG, Y, R, V, O)
Range on trait, 60%-94%. Mean score, 77.87%.
Non-Rhathymic (B, BG, R, YG, G, V, Y, O)
Range on trait, 30%-48%. Mean score, 37.20%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
2.86 5.71 17.14 3.81 27.62 34.29 3.81 1.90
"t" values of differences.
.372 .611 1.806 .395 2.833 3.640 .447 .227
B BG G YG Y R V O

"THE MINN. MULTI. PERSONALITY INVENTORY"---trait "Hy"
(Hysteria---T of 59 and up)
(Hysteria---T of 58 and down)

The traits of the "Minnesota Multiphasic Personality Inventory" have a slightly different form and meaning than do the traits of the other personality inventories used in this research problem. In the first place, the traits of this inventory are not, in the same fashion as are the traits of the other inventories, bi-polar in nature. There appears to be an implicit assumption, evident in the construction and scoring of the traits, that every individual is characterized by the symptomatic complex of each trait to a certain degree. Thus, the symptomatic complex Hysteria is considered to be a basic, unavoidable part of every individual's personality structure. It is not a pattern of behavior or thinking that can be eliminated. This inventory is used to determine the extent to which a particular symptomatic complex dominates the personality of the individual---not to determine the presence or absence of the complex.

The sub-groups that represent this trait (Hy) cannot be labeled Hysterical and Non-Hysterical, but must rather be called Hysteria (dominant) and Hysteria (normal manifestation).

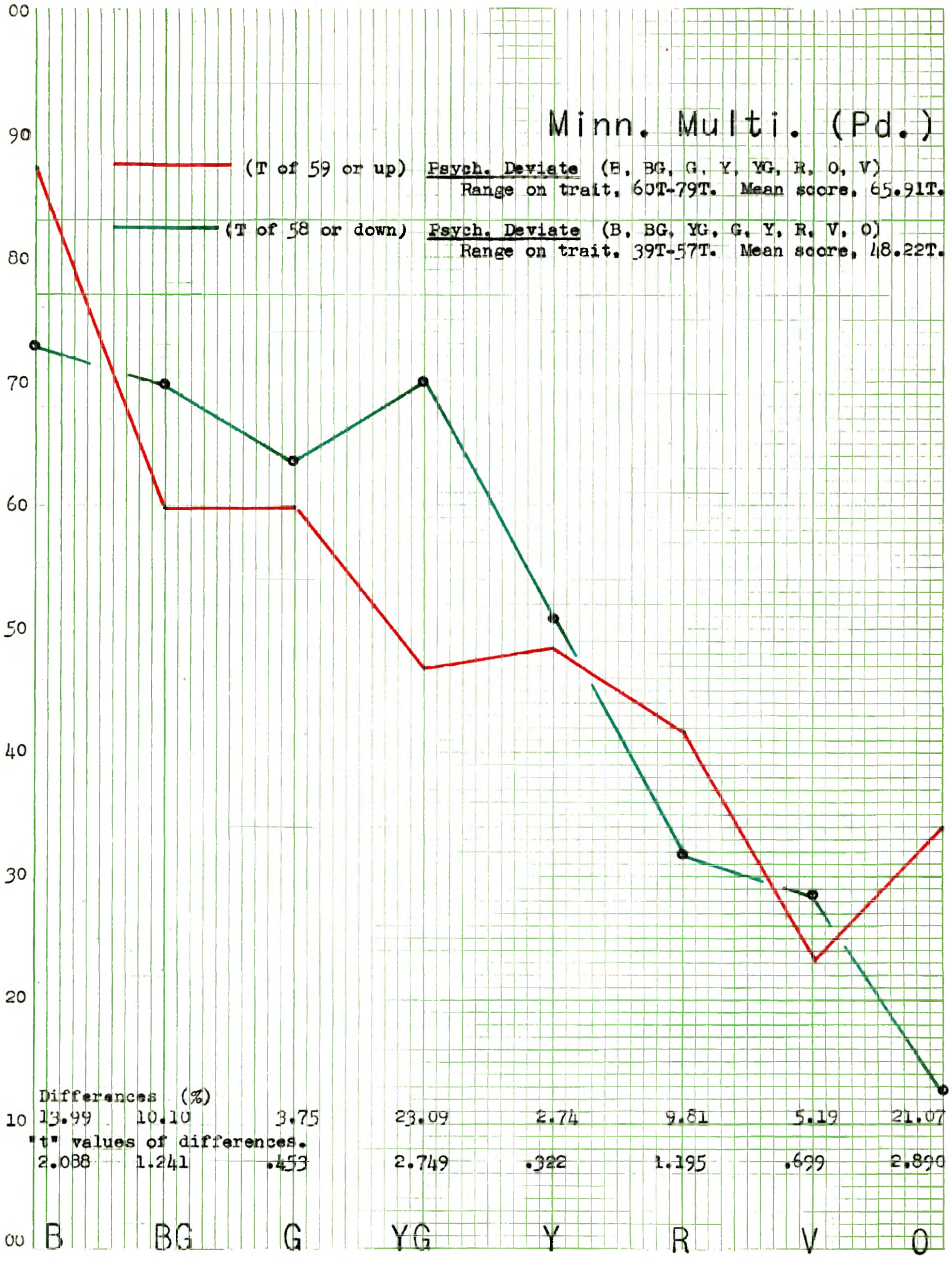
A short scrutiny of Graph XXVI should reveal the fact that the women who comprise the Hysteria (dominant)


Minn. Multi. (Hy.)
(T of 59 or up) Hysteria (B, BG, G, YG, R, Y, V, O)
Range on trait, 59T-78T. Mean score, 64.28T.
(T of 58 and down) Hysteria (B, BG, YG, G, Y, R, V, O)
Range on trait, 42T-57T. Mean score, 49.46%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
26.53 10.99 6.60 21.98 16.17 8.79 7.53 12.87
"t" values of differences.
3.801 1.296 .766 2.512 1.827 1.028 .974 1.696
B BG G YG Y R V O

sub-group prefer the color Blue very significantly more, Yellow-Green significantly less, Yellow much less, and Red, Violet, and Orange more than do the women who are characterized by the symptomatic complex Hysteria to a more normal extent. It is evident that the colors Green and Red are of little value in differentiating between the two sub-groups. This lack of similarity between the proportionate color preference patterns of these two sub-groups and the sub-groups of the trait Bl-N (Neurotic-Well-Adjusted) suggests a possible idea. It suggests the possibility that the extent of dominance of this symptomatic complex does not influence the degree and adequacy of adjustment--in so far as trait Bl-N is concerned. A dominant Hysteria pattern is a method of adjustment.

"THE MINN. MULTI. PERSONALITY INVENTORY"---trait "Pd"
(Psychopathic Deviate---T of 59 and up, Dominant)
(Psychopathic Deviate---T of 58 and down, Normal)

The women who comprise the sub-group "Psychopathic Deviate----Dominant" prefer Blue significantly more, Yellow-Green significantly less, and Orange significantly more than do the women who display a more normal manifestation of this symptomatic complex. Blue and Yellow-Green are again of value in differentiating between the sub-groups--though the difference at Blue is not as large as that illustrated by the previous graph. Close scrutiny suggests the possibility that there is a slight correlation between the two traits ("Hy" and "Pd").

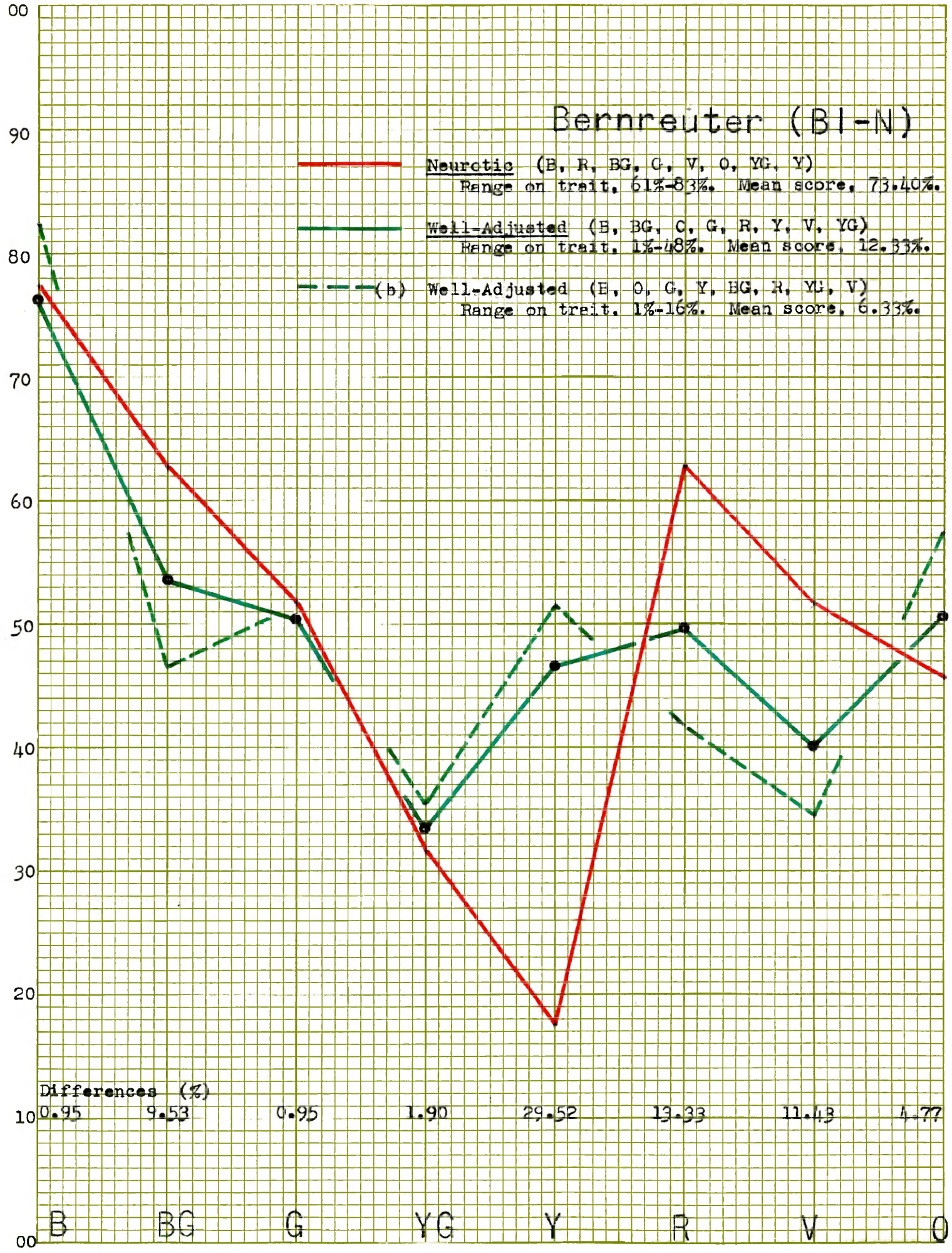

Minn. Multi. (Pd.)
(T of 59 or up) Psych. Deviate (B, BG, G, Y, YG, R, O, V)
Range on trait, 60T-79T. Mean score, 65.91T.
(T of 58 or down) Psych. Deviate (B, BG, YG, G, Y, R, V, O)
Range on trait, 39T-57T. Mean score, 48.22T.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
13.99 10.10 3.75 23.09 2.74 9.81 5.19 21.07
"t" values of differences.
2.088 1.241 .453 2.749 .322 1.195 .699 2.890
B BG G YG Y R V O

A SAMPLE OF THE RESULTS ACHIEVED WITH THE DATA OF THE GROUP OF MEN.

In order to achieve greater clarity in this picture of the equasion and analysis of the factors of color preference pattern and personality structure, it seems advisable to present a sample of the results that accrued to the analysis of the data derived from the group of men. It was mentioned previously that the group of men and the group of women had to be handled separately. The two groups differed significantly in regard to both mean color preference pattern and mean personality trait score. As the results of the analysis of the group of men are presented, it will become even more apparent that such a method of treatment was absolutely necessary.

Bernreuter's "PERSONALITY INVENTORY"---trait B1-N, (Neurotic--Well-Adjusted)

The first glance at graph XXVIII, which presents the mean color preference patterns of the two sub-groups of men (Neurotic and Well-Adjusted), brings to light the fact that the two sub-groups of men are differentiated by different orders. It will be recalled that the Neurotic sub-group of women preferred Blue-Green significantly less, Green significantly more, and Red significantly less than did the Well-Adjusted sub-group. Although the two sub-groups of men differ in their mean proportional color preference for the color Blue-Green, the difference is not significant,


Bernreuter (B1-N)
Neurotic (B, R, BG, G, V, O, YG, Y)
Range on trait, 61%-83%. Mean score, 73.40%.
Well-Adjusted (B, BG, G, G, R, Y, V, YG)
Range on trait, 1%-48%. Mean score, 12.33%.
(b) Well-Adjusted (B, O, G, Y, BG, R, YG, V)
Range on trait, 1%-16%. Mean score, 6.33%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
0.95 9.53 0.95 1.90 29.52 13.33 11.43 4.77
B BG G YG Y R V O

and the Neurotic sub-group displays a greater degree of preference than does the Well-Adjusted sub-group. There is no difference at Green. The most drastic difference, a difference that is not shared by the sub-groups of women, is between the mean proportional color preferences of these two sub-groups in regard to the color yellow. The difference is one of 29.52%, and is very significant. The men that comprise the Neurotic sub-group prefer Yellow significantly less than do the men in the Well-Adjusted sub-group. The Neurotic sub-group prefers, in addition, Red more and Violet more than does the Well-Adjusted sub-group. These mean proportional color preferences illustrate a reversal of the relationships found with the sub-groups of women.

Since the differences that exist between the mean proportional color preferences of these two groups in relation to the colors Blue-Green, Red, and Violet are not quite significant, it might be felt that this particular pattern does not actually constitute a certain reversal of the pattern presented by the two sub-groups of women. In order to test this hypothesis, as well as the consistency of the relationship between color preference pattern and personality structure, the same method used in relation to the sub-groups of women will be tried in this case. The sub-group of Well-Adjusted men, which is the larger group, will be reduced in size so as to reduce the mean trait

score of this sub-group. The differences noted between the mean color preference patterns of these two sub-groups should increase as the difference between their mean trait scores becomes more extreme. The dotted line represents the new sub-group. The Range on trait of the new sub-group has been reduced from 1%-48% to 1%-16%, and the mean trait score has been reduced from 12.33% to 6.33%. In every case--in every color--the relationships noted before have been strengthened---- the differences have been increased. In view of this fact, the first hypothesis, i.e., that the particular reversal of pattern noted in regard to the colors Blue-Green, Red, and Violet, might not actually constitute a real reversal due to the small size of the differences, is not tenable. The second hypothesis, i.e., that an increase in the difference that separates the sub-groups in regard to mean trait score should be echoed by a similar increase in the differences that separate the sub-groups in regard to mean color preference pattern---if color preference pattern and personality structure are related, is apparently founded on a sounder basis of fact.

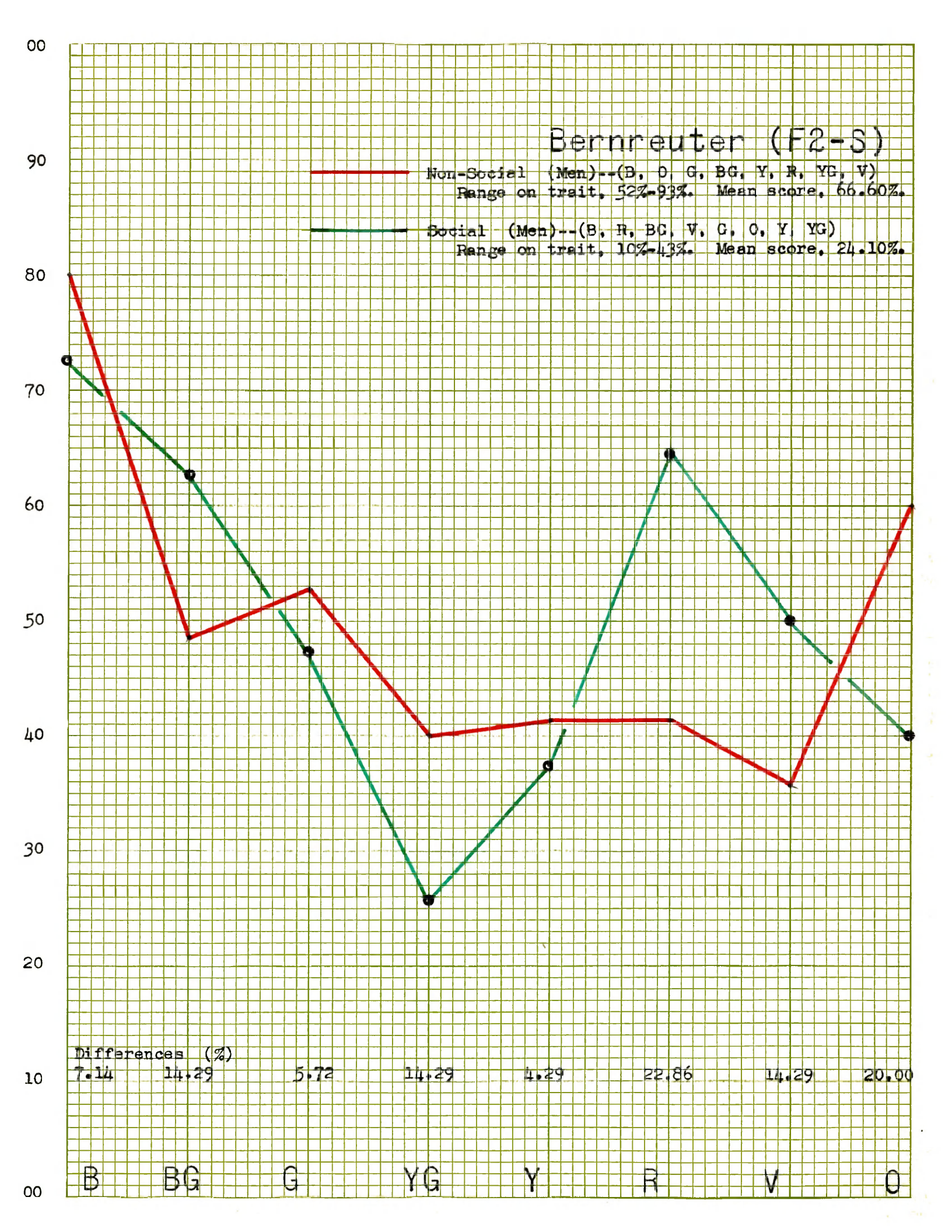
The difference that separates the mean proportional color preferences of the sub-groups at the color Blue-Green has now increased to the point that it has almost become significant. The differences that now separate

the two groups in regard to the colors Red and Violet are significant--or closely approach it. The difference at Red is about 21.00%. The difference at Violet is approximately 17.00%.

The Neurotic sub-group (of men), thus, prefers Blue-Green more, Yellow very significantly less, Red significantly more, and Violet much more (perhaps significantly more) than does the Well-Adjusted sub-group. It will be noted that the Well-Adjusted sub-group displays greater tolerance for all colors, with fewer extreme likes or dislikes. This fact was noted in regard to the mean proportional color preferences of the sub-groups of women that represented the more socially acceptable extreme of the traits in question. The men as a whole group, display a greater tolerance for all of the colors, and less extreme likes or dislikes for any of the colors, than do the women as a whole. In most of the graphs that represent the sub-group proportionate color preference patterns of the women, nine to eleven proportional color preferences will be found to lie above sixty percent or below forty percent. In this graph (Graph XXVIII), which represents the proportionate color preference patterns of the Neurotic and Well-Adjusted sub-groups of men, only seven proportional color preferences exhibit this tendency to be extreme.

Bernreuter's "PERSONALITY INVENTORY"---trait F2-S (Social-Non-Social)

Graph XXIX, which displays the proportionate color preference patterns of the two sub-groups of the trait "F2-S", illustrates reversals in sub-group color preference patterns (with reference to the proportionate color preference patterns of the sub-groups presented in the previous graph) that resemble those found when the graphs of traits "S" and "T" were compared. The Non-Social sub-group, which is composed of ten men, prefers Blue-Green much less, Yellow-Green much more, Red very significantly less, Violet much less, and Orange significantly more than does the sub-group of Social men. When this graph is compared with Graph XXVIII, it would appear that the men who tend towards acceptable social adjustment also tend to be non-social. This, however, is not precisely the case. These two traits bear about the same relationship to each other that was suggested for the the traits "S" and "T". Imagine again these two dimensions of personality as being represented by two lines or scales that intersect at right angles. The quadrant "Neurotic-Social" illustrates the personality characteristics of three men, the quadrant "Neurotic-Non-Social" describes the make-up of two men, seven men fall in the quadrant "Well-Adjusted-Social", and eight men can be described as "Well-Adjusted-Non-Social". It would appear


Bernreuter (F2-S)
Non-Social (Men)--(B, O, G, BG, Y, R, YG, V)
Range on trait, 52%-93%. Mean score, 66.60%.
Social (Men)--(B, R, BG, V, G, O, Y, YG)
Range on trait, 10%-43%. Mean score, 24.10%.
00
90
80
70
60
50
40
30
20
10
00
Differences (%)
7.14
14.29
5.72
14.29
4.29
22.86
14.29
20.00
B
BG
G
YG
Y
R
V
O

that these two traits bear the type of relationship to each other that has been suggested for them. It would appear sensible to consider, in any future study of this type, these two traits together, and to break them down into four sub-groups on the basis of a two-fold classification.

"FACTORS STDCR"----trait "D" (Depressed-Optimistic)
Men and Women

The proportionate color preference patterns of the trait "D" sub-groups of the Men and the Women have been presented on one, final graph, Graph XXX. It was felt that such a portrayal might help to illustrate the multiple relationships that characterize the color preference patterns of the sub-groups and the main groups.

On observing the data presented in Graph XXX, it is apparent that the four sub-groups differ only slightly in regard to proportional preference for the color Blue. This color fails to differentiate between the sub-groups of one sex, the sub-groups of either sex, or between the two sexes. In terms of Blue-Green, the Optimistic (women) sub-group displays a much larger proportional preference than do the other sub-groups. The Depressed (women) sub-group records a significantly larger preference for Green than do the three other sub-groups. This color appears to be of value in isolating those women, on the sub-group basis, who tend towards a depressed pattern of perception. The color Yellow-Green appears to have a point of difference, in so far as proportional preference was concerned, that has differentiated between most all of the sub-groups. The women, as a group, prefer Yellow-Green significantly more than do the men. The Depressed women prefer it much more than do the Optimistic women. The color Yellow seems


Factors STDCR (D)
Depressed (Men)-(B, R, V, BG, O, G, YG, Y)
Range on trait, 4%-39%. Mean score, 20.20%.
Optimistic (Men)-(B, BG, G, R, O, Y, V, YG)
Range on trait, 55%-99%. Mean score, 86.33%.
Depressed (Women)-(G, B, YG, Y, BG, O, R, V)
Range on trait, 2%-48%. Mean score, 31.44%.
Optimistic (Women)-(B, BG, YG, G, R, Y, V, O)
Range on trait, 51%-95%. Mean score, 78.36%.
00
90
80
70
60
50
40
30
20
10
00
B
BG
G
YG
Y
R
V
O

to have differentiated the sub-group of Depressed men. This male sub-group prefers Yellow very significantly less than do the other three sub-groups. The women as a whole prefer Red significantly less than do the men. The women who comprise the Depressed sub-group prefer Red significantly less than do the women of the Optimistic sub-group, while the Depressed men prefer Red much more than do the Optimistic men. The Optimistic men and women differ little in their preference for Red. They appear to neither like nor dislike the color. The Depressed women, on the other hand, differ drastically from the Depressed men in terms of their proportional preference for Red. In terms of their proportional preference for the color Violet, the women display a significantly smaller preference for the color than do the men. The Depressed men prefer Violet significantly more than do the men or women who comprise the other sub-groups. The largest difference separates the Depressed men and the Depressed women. The men and the women are separated by a very significant difference in terms of their proportional preference for the color Orange. Although this color does not differentiate between the Depressed or Optimistic sub-groups of either sex, it certainly differentiates between the sexes.

This graph illustrates, as has no other graph, the necessity for treating the men and the women separately

in research of this type. It illustrates the wide differences in proportional preference that can separate sub-groups of men and women who represent the same polar aspect of the trait. It illustrates, further, that the largest differences, and more extreme preferences, are typical of the less socially acceptable sub-groups, while the sub-groups that represent the more acceptable aspect of the trait (for the men and the women) are very close together in most cases.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

This final chapter will be used to present (1) a summary of the methodology involved in this research problem, (2) the conclusions that have resulted from a thorough analysis of the data obtained from the forty testees, and (3) some suggestions for future research.

SUMMARY.

(1) A test-group, made-up of twenty men and twenty women, was selected from the student body at the University of Omaha.

(2) The "Pseudo-Isochromatic Plates for Testing Color Perception" were used to eliminate those students who displayed any color vision weakness.

(3) Five well-known personality tests, comprising thirty-three trait measures (not necessarily all of them were distinct, because different inventories measured somewhat the same trait in several instances), were administered to the students who made-up the test-group.

(4) The color preference test was then given. The paired comparison method of presentation, in which the eight colors (Blue, Blue-Green, Green, Yellow-Green, Yellow, Orange, Red, and Violet) were shown in all possible combinations, two at a time, was used.

(5) The group of men and the group of women were found to be significantly different both in personality structure and color preference pattern. Therefore, these two groups were treated separately.

(6) On the basis of standings in the traits, as measured by the tests used, the group of men and the group of women were divided into sub-groups. (For instance, the women whose scores on each trait were 51 percentile or greater were placed in one sub-group. Those women whose scores were 50 percentile or less were placed in the other sub-group. These sub-groups, created on the basis of the testee's standing on each of the thirty-three traits, were considered to be representative of the polar aspects of the traits measured.)

(7) The color preference pattern of each sub-group was then determined.

   (a) The number of times a color was preferred (each individual experienced each color in seven different pairings) by all of those individuals who madeup each sub-group was tabulated.

   (b) The totals thus determined (which represented the actual number of choices given each color) were divided by the number of choices possible in the case of each color (which was determined by multiplying the number of choices possible in the case of each color (7) by the number of individuals who made up the sub-group.

The numbers that resulted (represented by percents) were the proportional color preferences of the colors.

(8) The two sub-groups that represented the polar aspects of each trait were than compared in terms of these sub-group color preference patterns (proportional color preferences). The differences that separated these sub-groups, in terms of each proportional color preference, were determined--- as were the "t" values of the differences.

(9) The data were thoroughly analyzed to determine whether or not the sub-groups that represented the polar aspects of each trait differed significantly in terms of proportional color preference pattern.

CONCLUSIONS.

From this study the following conclusions appear to be warranted:

(1) Relationships do exist between personality structure, as measured by standardized personality tests, and sub-group proportional color preference patterns.

(2) There appeared to be a particularly strong linkage between personality structure and the proportional color preferences for Green and Red. In view of the fact that these two colors are very similar in brightness and saturation, it would appear that hue was the characteristic that was responsible for the proportional color preferences given them by the sub-groups,-- as well as for the differences in proportional color

preference that separated the sub-groups.

(3) In every instance, the sub-group that preferred Green more (as contrasted to the other sub-group) preferred Red less. The sub-group that preferred Green more and Red less represented, in almost every case, the less "socially acceptable" polar aspect of the trait in question.

(4) The proportional color preferences given Blue and Blue-Green were also of frequent value in differentiating between the sub-groups representing the polar aspects of the same trait. When the difference at Blue grew large, a large difference was almost always present at Yellow-Green. A large difference between the proportional color preferences for Blue-Green was usually accompanied by a significant presence of the Red-Green factor.

(5) The sub-groups that represented high and low overt activity were differentiated on the basis of their preferences for primary and secondary colors. The individuals characterized by high overt activity appeared to prefer the primary colors more, and the secondary colors less, than did the individuals of the "Low Overt Activity" sub-group.

(6) The general pattern of the proportional color preference patterns of the sub-groups helped to differentiate them. The pattern of the less socially

acceptable sub-group (as far as personality make-up is concerned) was usually characterized by more extreme preferences and fewer "tolerances." The sub-group that represented the more socially acceptable aspect of the trait, on the other hand, usually displayed a proportional color preference of about 50 percent for most colors, and more extreme preference for very few colors. This difference in proportional color preference pattern also differentiated between the men and the women (as groups). The women seemed, on the whole, to be more excessive and consistent in their color preferences.

(7) On the basis of the analysis of the color preference patterns of the sub-groups, it would appear that there was considerable over-lapping in the portion of personality structure inventoried by each trait. Color preference might well be used as a catalytic agent in graphically mapping the structure of personality.

(8) In view of the findings of this study, it appears likely that those colors that are <u>best suited</u> to the surroundings of any particular personality type might be determined on the basis of a personality test---those colors for the individual's home, clothing, etc., that would be most pleasing or least aggrivating. After the personality type had been

determined, the color data gathered for this research problem would be used.

(9) Finally, it is the opinion of this investigator, an opinion based on study of the relationships that exist between the proportional color preference patterns of the sub-groups and the aspects of personality structure that they represent, that the color preference test, modified slightly, might become a usable instrument in testing for personality structure type---or make-up. Such a test would have the advantages of involving little, if any, word symbolism, and of taking little time for administration and grading.

SUGGESTIONS FOR FUTURE RESEARCH.

It would seem advisable to repeat the present study using a greater number of testees. This increase in the size of the sample would permit the sample to be broken down into a greater number of sub-groups on the basis of the scores in each trait (for instance, there could be a sub-group that represented the individuals who scored from 1 to 10 percentile, from 11 to 25 percentile, from 26 to 75 percentile, from 76 to 90 percentile, and from 91 to 100 percentile). It might also be possible to determine what associations, if any, influenced the individual's preference for certain colors. Thus, it could be determined why the individuals who comprised the sub-groups differed in terms of color preference and, con-

sequently, personality structure.

An attempt might also be made to determine the degree of like or dislike that the individual exhibited for the colors. His pattern could then be compared to the group proportional color preference patterns as determined in this research problem.