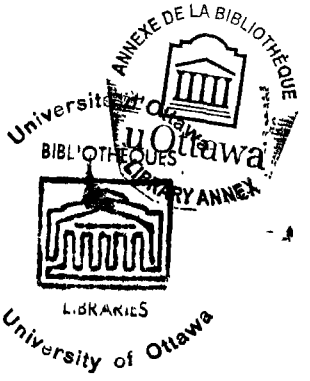
DIVERGENT PRODUCTION PROFILES AND OCCUPATIONAL MEMBERSHIP

by L.W. Slivinski

Thesis presented to the Faculty of Psychology of the University of Ottawa as partial fulfillment of the requirements for the degree of Master of Arts in Psychology



Ottawa, Canada, 1971

ACKNOWLEDGMENTS

This thesis was prepared under the supervision of Professor Gilles J. Chagnon. The writer would like to express gratitude for his interest and counsel.

The writer is also grateful to Mr. J.A.C. Prefontaine for his assistance in obtaining subjects and use of the computer services for this project.

CURRICULUM STUDIORUM

Leonard W. Slivinski was born November 15, 1941, in Vancouver, British Columbia. He received the Bachelor of Social Science degree from St. Patrick's College, Ottawa, Ontario, in 1965.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Research results on divergent-production (creativity) are confusing and in some cases contradictory. Very little attempt has been made to provide an overall systematic investigation of this area. One of the basic problems is the lack of agreement on just what is creativity. Furthermore, researchers explore "creativity" from many aspects and points of view.

The confusion of research results on creativity may in part be due to the lack of establishing which creative expression is pertinent to the group under investigation. This present study is an attempt to test one aspect of Guilford's theory of creativity which is based upon his Structure of Intellect Model. Guilford states that there is the possibility that diverse occupational groups will exhibit differing profiles of creative expression. This creative expression will most likely depend upon the mode of communication that people of a particular occupation use. In Guilford's model there are four modes of creative expression: semantic, symbolic, figural and behavioral. The author of this research wishes to determine if six logically different occupational groups have different divergent-production profiles and also to establish whether these profiles correspond to a particular creative expression.

The first chapter of this thesis presents a review of the literature dealing with creativity. It considers the different approaches and points of view that a researcher may have in his investigation of this area. This chapter concentrates on Guilford's Structure of Intellect Model and in particular those aspects of his theory which have greater consequence for this thesis.

The second chapter presents the experimental procedure and the statistical analysis used to test the research hypothesis.

The final chapter presents and discusses the statistical results.

CHAPTER I

REVIEW OF THE LITERATURE

This chapter, which presents the theoretical background of the project, begins by examining the current status of the literature in the area of creativity. The general areas and approaches will be summarized with special emphasis on Guilford's theory.

1. Review of the Conceptual Frameworks in the Study of Creativity

Creativity has been the subject of much discussion. Philosophers, historians and other thinkers have tried to come to grips with this phenomenon. However, it is only recently that the social sciences in general and psychology in particular have concerned themselves with the objective study of the creative person. Guilford[1] in 1950 examined the index of the Psychological Abstracts for each year since its beginning. There were 121,000 titles listed in the past 23 years and only 186 were indexed as definitely relating to the subject of creativity. From 1950 to date, a multitude of studies have emerged and creativity has blossomed in many

---

1 J.P. Guilford, "Creativity", American Psychologist, Vol. 5, No. 9, 1950, p. 445.

areas. By 1965, there were over 4,176 articles on this topic[2].

Review articles[3,4,5,6,7,8,9,10,11] have pointed out that there is much confusion in this field. As Yamamoto

---

2 T.A. Razik, Bibliography of Creativity Studies and Related Areas, Creative Education Foundation and State university of New York at Buffalo, 1965, 451 p., see also J.P. Guilford, "Creativity: Retrospect and Prospect", Journal of Creative Behavior, Vol. 4, No. 3, 1970, p. 149-168.

3 S.E. Golann, "Psychological Study of Creativity", Psychological Bulletin, Vol. 60, No. 6, 1963, p. 548-565.

4 B. Mackler and F.C. Shontz, "Creativity: Theoretical and Methodological Considerations", the Psychological Record, Vol. 15, No. 2, 1965, p. 217-238.

5 M. Raychaudhuri, "Creativity and Personality, A Review of Psychological Researches", Indian Psychological Review, Vol. 2, No. 2, January 1966, p. 91-102.

6 D.W. Taylor, "Thinking and Creativity", Annals New York Academy of Sciences, Vol. 91, 1960, p. 108-127.

7 E.P. Torrance, "Research Notes from Here and There, Current Research on the Nature of Creative Talent", Journal of Counseling Psychology, Vol. 6, No. 4, 1959, p. 309-316.

8 P.E. Vernon, "Creativity and Intelligence", Educational Research, Vol. 6, No. 3, 1963-1964, p. 163-169.

9 K. Yamamoto, Creativity and Intellect: A Review of Current Research and Projection, Paper read at Minnesota Psychological Association, Minneapolis, April 1961.

10 K. Yamamoto, "Validation of Tests of Creative Thinking: A Review of Some Studies", Exceptional Children, Vol. 31, No. 6, 1965, p. 281-290.

11 K. Yamamoto, "Research Frontier, "Creativity" - A Blind Man's Report on the Elephant", Journal of Counseling Psychology, Vol. 12, No. 4, 1965, p. 428-434.

states, "one thing is clear in any case: this is not one, big family in which peace and togetherness prevail"[12]. The confusion and discrepancies are a result of the number of approaches and areas in which creativity is studied. These approaches and areas overlap and intertwine. A number of authors have attempted to organize and integrate these diverse areas by providing a conceptual framework from which to work. A brief outline of these attempts is presented here.

a. Definition of Creativity

The literature reveals that there are at least some one hundred definitions of creativity with the list expanding every day. Repucci[13] has classified these definitions into six major groups. The groups are not mutually exclusive since each definition may contain elements which may belong to more than one group. The definitions were grouped according to their main theme.

The first class is labeled "Gestalt" or "Perception" where the major emphasis is upon the recombination of ideas or the reconstruction of a "Gestalt". Wertheimer[14],

---

12 Yamamoto, Op. Cit., p. 428.

13 L.C. Repucci, Definitions and Criteria of Creativity, The Dow Chemical Company, mimiographed paper, (no date), 1-10 p.

14 M. Wertheimer, Productive Thinking, New York, Harper, 1945, xi-224 p.

Mooney[15] and Von Fange[16] fall into this category.

The second group of definitions could be called "end product" or "innovation" oriented definitions. Stein[17], a representative of this group, defines creativity as "that process which results in a novel work that is accepted as tenable or useful or satisfying by a group at some point in time". Harmon[18] is another who falls into this category.

The third group of definitions could be classified as "aesthetic" or "expressive". Here, the main emphasis is upon self-expression where the individual has a need to express himself in a manner which is unique to himself.

---

15 R.L. Mooney, "Cultural Blocks and Creative Possibilities", Educ. Leadership, Vol. 13, No. 5, 1956, p. 273-278.

16 E.K. Von Fange, The Creative Process in Engineering, General Electric Co., Creative Engineering Program, 1954.

17 M.I. Stein, "Creativity and Culture", Journal of Psychology, Vol. 36, Second half, 1953, p. 311-322.

18 L.R. Harmon, "The Development of a Criterion of Scientific Competence", in Scientific Creativity: Its Recognition and Development, C.W. Taylor and F. Barron, Ed., New York, John Wiley and Sons, Inc., 1963, p. 44-52.

Northrop[19], Compton[20], Thurstone[21] and Ghiselin[22] would be proponents of this approach.

A fourth class of definitions could be grouped under the classification of "dynamic" or "psychoanalytic". Creativity is thus defined as a certain interactional strength ratio of the id, ego and superego. Anderson[23], Kris[24], and Kubie[25] would be exponents of this group.

---

19 F.S.C. Northrop, "Philosophy's statement of the problems of Creativity", in The Nature of Creative Thinking, F. Olsen, Ed., New York, Industrial Research Institute Inc., 1952, p. 16-22.

20 A.H. Compton, "Case Histories: Creativity in Science", in The Nature of Creative Thinking, F. Olsen, Ed., New York, Industrial Research Institute, Inc., 1952, p. 23-31.

21 L.L. Thurstone, "Criteria of Scientific Success and the Selection of Scientific Talent", in Criteria of Success in Science, W.J. Drogden, Technical Report No. 4, Office of Scientific Personnel, National Academy of Sciences - National Research Council, Washington, D.C., April 1954, p. 29-36.

22 B. Ghiselin, The Creative Process, Berkeley, University of California Press, 1952, 259 p.

23 H.H. Anderson, External and Internal Criteria of Creativity, Paper presented at a Symposium on Creativity, Chicago, Midwestern Psychological Association, May 1959.

24 E. Kris, "On Preconscious Mental Processes", in Organization and Pathology of Thought, D. Rapport, Ed., New York, Columbia University Press, 1951, p. 474-496.

25 L.S. Kubie, Neurotic Distortion of the Creative Process, Lawrence, Kansas, University of Kansas Press, 1958, 151 p.

The fifth class of definitions could be grouped under the title of "solution thinking". The emphasis here is upon the thinking process rather than upon the actual solution of the problem. Spearman[26], Duncker[27] and Guilford[28] are representatives of this group.

Repucci[29] labels his last class of definitions by the term "varia" simply because there is no easy way of categorizing them. In this group one finds such men as Rand[30], Lowenfeld[31], Read[32], and Shepard[33].

---

26 C. Spearman, Creative Mind, New York, Appleton and Co., 1931, 153 p.

27 D. Duncker, "On Problem Solving", Psychological Monographs, Vol. 58, No. 270, 1945, ix-113 p.

28 J.P. Guilford, The Nature of Human Intelligence, New York, McGraw-Hill, 1967, vii-538 p.

29 Repucci, Op. Cit., 1-10 p.

30 H.J. Rand, "Creativity - Its Social, Economic, and Political Significance", in The Nature of Creative Thinking, F. Olsen, Ed., New York, Industrial Research Institute, Inc., 1952, p. 12-15.

31 V. Lowenfeld, Creative and Mental Growth, New York, The Macmillian Co., 1952, 408 p.

32 G.M. Read, Profile of Human Materials, Address delivered at the Centennial Symposium on Modern Engineering, Philadelphia, University of Pennsylvania, 1955.

33 H.A. Shepard, "The Destructive Side of Creativity", The Chemist, August 1957, p. 303-307.

Another way of categorizing the various types of definitions of creativity has been introduced by Taylor[34]. His classification is based upon a hierarchy of "levels of creativity". The levels from the most fundamental to highest form include expressive creativity, productive creativity, inventive creativity, innovative creativity and emergentive creativity.

b. Theories of Creativity

The second major approach in the attempt to summarize the area of creativity deals with categorizing the various theories underlying this concept. This approach overlaps with the one just mentioned. The major breakdown for the theories of creativity is: (1) psychoanalytic theory which is based upon sublimation[35], or "regression in the service of the ego"[36,37] or the preconscious system[38];

---

34 I.A. Taylor, "The Nature of the Creative Process", in Creativity, P. Smith, Ed., New York, Hastings House, 1959, p. 51-82.

35 S. Freud, Civilization and its Discontents, New York, Doubleday, 1958, 105 p.

36 E. Kris, Psychoanalytic Explorations in Art, New York, International Universities Press, 1952, 358 p.

37 R. Schafer, "Regression in the Service of the Ego", in Assessment of Human Motives, G. Lindzey, Ed., New York, Renehart, 1958, p. 119-148.

38 L.S. Kubie, Neurotic Distortion of the Creative Process, Lawrence, Kansas, University of Kansas Press, 1958, 151 p.

(2) associationistic theory where the associative elements are formed into new combinations which meet specific requirements or which are useful in some way; (3) gestalt theory where creativity is viewed as an insight fully formed - it comes to the individual as a flash; (4) existential theory where creativity is defined "as the process of bringing something new into birth through the vehicle of the encounter"[39]; (5) interpersonal theory where heavy emphasis is placed on the creator as innovator and on other persons who recognize this creation; (6) trait theory where creativity is described as traits which can be differentiated among people.

c. Golann's Conceptual Framework

The third major conceptual framework to the study of creativity is presented by Golann[40]. He categorizes the study of creativity under four aspects: (1) products where the creative action alters the universe of meaning itself by introducing into it some new element of meaning and/or some new order of significance; (2) process, where the study of creativity is looked at how one arrives at the creative act;

---

39 B. Mackler and F.C. Shontz, "Creativity: Theoretical and Methodological Considerations", Psychological Record, Vol. 15, No. 2, 1965, p. 221.

40 S.E. Golann, "Psychological Study of Creativity", Psychological Bulletin, Vol. 60, No. 6, 1963, p. 548-565.

(3) measurement, where the attempt is to devise or adapt tests that would measure creative abilities, and (4) personality, where the emphasis is upon studying the underlying motivation of creative behavior and/or the study of personality characteristics.

d. Philosophical Approach

The philosophical approach is the fourth attempt to provide a conceptual framework in studying creativity. Non-positivistic holistic philosophy states that if one was to study creativity, he must study the whole man but this study defies "any objective analysis based upon causal laws. Instead, such acts should be grasped through subjective and empathetic understanding of the experience and interpreted in purposive terms"[41]. The positivistic holistic approach states that while the emphasis is upon the study of the whole man, one is still able to differentiate. The non-positivistic elementarists do not tend to analyze the creative process but they do break down the various processes usually through intuition, speculation and casual observations. The positivistic-elementaristic approach tends to reduce creativity to fine elements by applying a hard line empiricism.

---

41 Yamamoto, Op. Cit., p. 429.

2. Guilford's Approach to Creativity

Structure of the Intellect Model

Guilford's theory of creativity centers around his Structure of the Intellect Model. The ideas basic to his structure-of-intellect model were formulated in the late 1950's, and were successively refined until the present date. This research bases itself upon his model as it existed in 1966.

> The model is a three-way classification of intellectual abilities designed to encompass and organize intellectual-aptitude factors. (...)
>
> The three dimensions of the model specify (a) the operation, (b) the content, and (c) the product of a given kind of intellectual act. (...) Each factor hypothesized or accounted for by the model is uniquely located and defined by specifying a category on each of the three dimensions. The three categories that specify each factor are coded in terms of a trigram symbol specifying the operation, content, and product, respectively, for the factor.[42]

The first principle regarding the structure of intellect is that primary abilities differ according to the kind of material or context dealt with by the individual. These are four: symbolic, figural, behavioral and semantic. Within each of the four categories as to content, factors differ with respect to the kinds of operations performed on

---

42 J.P. Guilford, and R. Hoepfner, "Structure-of-Intellect Factors and Their Tests, 1966", Reports from the Psychological Laboratory, University of Southern California, June 1966, p. 3.

the material. There are basically five kinds of operations as indicated by five kinds of factors, namely, cognition, memory, divergent thinking, convergent thinking and evaluation. The application of the different kinds of operations applied to the different kinds of contents yields six kinds of products - units, classes, relations, systems, transformations and implications.

The three dimensions and their categories with the appropriate code are presented below[43].

The Operations Dimension - Major kinds of intellectual activities or processes; things that the organism does with the raw materials of information, information being defined as that which the organism discriminates.

C - Cognition. Immediate discovery, awareness, rediscovery, or recognition of information in various forms; comprehension or understanding.

M - Memory. Retention or storage, with some degree of availability, of information in the same form it was committed to storage and in response to the same cues in connection with which it was learned.

D - Divergent-Production. Generation of information from given information, where the emphasis is upon variety and quantity of output from the same source. Likely to

---

43 Idem, Ibid., p. 3-4

involve what has been called transfer. This operation is most clearly involved in aptitudes of creative potential.

N - Convergent Production. Generation of information from given information, where the emphasis is upon achieving unique or conventionally accepted best outcomes. It is likely the given (cue) information fully determines the response.

E - Evaluation. Reaching decisions or making judgments concerning criterion satisfaction (correctness, suitability, adequacy, desirability, etc.) of information.

Contents - Broad classes or types of information discriminable by organism.

F - Figural. Information in concrete form, as perceived or as recalled possibly in the form of images. The term "figural" minimally implies figure-ground perceptual organization. Visual spatial information is figural. Different sense modalities may be involved, e.g., visual kinesthetic.

S - Symbolic. Information in the form of denotative signs, having no significance in and of themselves, such as letters, numbers, musical notations, codes, and words, when meanings and form are not considered.

M - Semantic. Information in the form of meanings to which words commonly become attached, hence most notable in verbal thinking and in verbal communication but not identical with words. Meaningful pictures also often convey semantic information.

B - Behavioral. Information, essentially non-verbal, involved in human interactions where the attitudes, needs, desires, moods, intentions, perceptions, thoughts, etc., of other people and of ourselves are involved.

Products - Forms that information takes in the organism's processing of it.

U - Units. Relatively segregated or circumscribed items of information having "thing" character. May be close to Gestalt psychology's "figure on a ground".

C - Classes. Conceptions underlying sets of items of information grouped by virtue of their common properties.

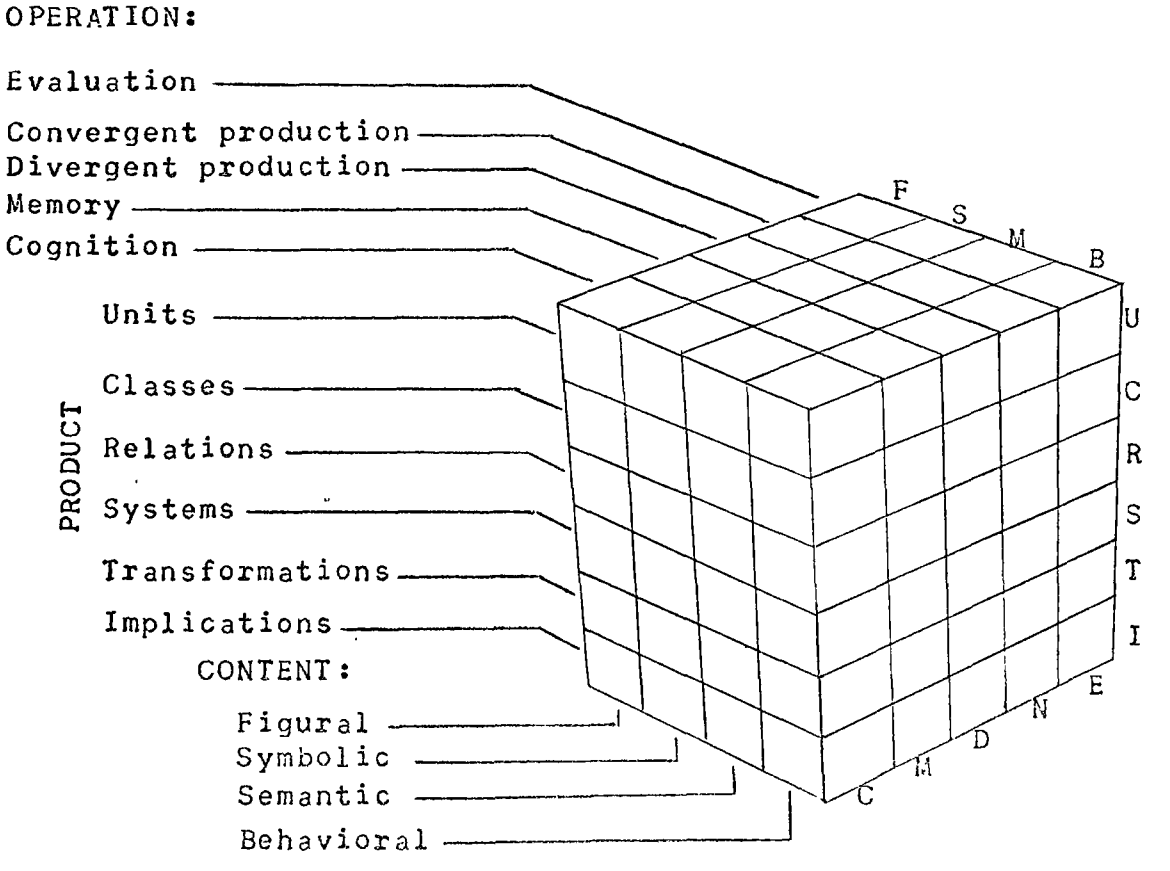
R - Relations. Connections between items of information based upon variables or points of contact that apply to them. Relational connections are more meaningful and definable than implications.

S - Systems. Organized or structured aggregates of items of information; complexes of interrelated or interacting parts.

T - Transformations. Changes of various kinds (redefinition, shifts, or modification) of existing information or in its function.

I - Implications. Extrapolations of information, in the form of expectancies, predictions, known or suspected antecedents, concomitants, or consequences. The connection between the given information and that extrapolated is more general and less definable than a relational connection.

Graphically, the model would look like this:



Starting in 1950, Guilford, through the use of factor analysis, started to identify various tests to measure his 120 hypothesized factors. By 1966, 78 of these factors were found. For each factor, there is an average of three tests to measure it.

This study is concerned with creativity as defined by Guilford[44]. Guilford states that "in its narrow sense, creativity refers to the abilities that are most characteristic of creative people. Creative abilities determine whether the individual has the power to exhibit creative behavior to a noteworthy degree"[45]. He goes on further to state that:

> creative personality is then a matter of those patterns of traits that are characteristic of creative persons. A creative pattern is manifest in creative behavior, which includes such activities as inventing, designing, contriving, composing and planning. People who exhibit these types of behavior to a marked degree are recognized as being creative.[46]

Guilford describes creative thinking as invention which is a form of production. In invention one gets away from conventional answers; hence conclusions are not uniquely determined. This ability of production is mainly tapped by the category

---

44 Guilford, Op. Cit., vii-538 p.

45 J.P. Guilford, "Creativity", American Psychologist, Vol. 14, No. 9, 1950, p. 444.

46 Idem, Ibid., p. 444.

of divergent-production which includes the factors of fluency, flexibility, originality and elaboration. It covers all the contents and products in his Structure of Intellect Model. It also includes redefinition abilities in the convergent-production category and implications in the evaluative category. Thus creativity is seen in terms of factors from the divergent-production category and of certain other operations when they produce transformations.

Another important feature of Guilford's theory is that everyone possesses a certain amount of creativity.

> It is probably only a layman's idea that the creative person is peculiarly gifted with a certain quality that ordinary people do not have. This conception can be dismissed by psychologists, very likely by common consent. The general psychological conviction seems to be that all individuals possess to some degree all abilities, except for the occurrence of pathologies. Creative acts can therefore be expected, no matter how feeble or how infrequent of almost all individuals. The important consideration here is the concept of continuity. Whatever the nature of creative talent may be, those persons who are recognized as creative merely have more of what all of us have. It is this principle of continuity that makes possible the investigation of creativity in people who are not necessarily distinguished.[47]

This same assumption is also held by C.W. Taylor. He states that "the common assumption among most psychological

---

47 Idem, Ibid., p. 446.

researchers is that all persons have some creative potential, though there are wide individual differences in degree"[48].

The third main feature of Guilford's theory that has an important bearing upon this research is his distinction between creative potential and creative production. Creative productions are those products that catch the public's eye and are usually in tangible form such as a poem, a painting, a philosophical system or a scientific theory. Creative potential, on the other hand, is an individual's readiness to produce novel ideas and/or products. His readiness depends upon many things, but especially upon the items of information he has stored in his memory. It is also very important what a person does with this information. A disposition to enable one to make use of his information in new ways is an individual's creative potential. Some of these dispositions are temperament, attitudes, interests, needs and aptitudes. For Guilford, the investigation of creative potential took the form of investigating the disposition of aptitudes.

3. The Problem and Theoretical Hypothesis

From the review of the literature one can see that wide discrepancies exist in the area of creativity. Almost

---

48 C.W. Taylor, Creativity: Progress and Potential, New York, McGraw-Hill, 1964, p. 8.

all the researchers in this area use the term "creative" or "creativity" with very little discrimination and without trying to see how one approach related to another. There has been very little attempt to see how the various "creativity" tests relate to one another, and whether there is any common characteristic(s) running through these tests to which the common term "creativity" may be legitimately applied.

Guilford in his theory states that the "(...) all-round creative person is probably the exception rather than the rule"[49]. He goes on to write that creative ability seems to be a specialized affair and that creative abilities may be regarded as special intellectual abilities. He points out that "the consensus of the philosophers seems to have been that creativity is the same wherever you find it"[50], however, he does not subscribe to this idea. "Within the factorial frame of reference there is much room for different types of creative abilities."[51] He goes on to state that although certain groups of creative individuals may have factors in common, "there is much room for variation of pattern of abilities"[52]. Besides there being intradifferences

---

49 J.P. Guilford, "Creativity: Its Measurement and Development" in A Source Book for Creative Thinking, S.J. Parnes and H.F. Harding, Ed., New York, Charles Scribner's Sons, 1962, p. 162.

50 Guilford, Op. Cit., p. 451.

51 Idem, Ibid., p. 451.

52 Idem, Ibid., p. 451.

of patterns of abilities, there would also seem to be inter-differences of patterns of abilities. A somewhat similar view is also held by D.W. Taylor[53], V. Lowenfeld[54], and L.L. Thurstone[55].

These different "types of creative abilities" or patterns of abilities would seem to depend upon the kind of information with which the person is dealing. "This circumstance strongly suggests that creative talents depend upon the media in which the person is working - for example, whether he deals with lines and colors, sounds, or words, as in the various arts."[56] These media, information or content are four in number: symbolic, semantic, figural and behavioral.

Guilford seems to go a little further than just stating that certain groups may possess different expressions

---

53 D.W. Taylor, "Thinking and Creativity", Annals New York Academy of Sciences, Vol. 91, 1960, p. 108-127.

54 V. Lowenfeld, "Creativity: Education's Stepchild", in A Source Book for Creative Thinking, S.J. Parnes and H.F. Harding, Ed., New York, Charles Scribner's Sons, 1962, p. 9-17.

55 L.L. Thurstone, "The Scientific Study of Inventive Talent", in A Source Book for Creative Thinking, S.J. Parnes and H.F. Harding, Ed., New York, Charles Scribner's Sons, 1962, p. 51-62.

56 J.P. Guilford,"Creativity: Yesterday, Today and Tomorrow", Journal of Creative Behavior, Vol. 1, No. 1, 1967, p. 8.

of creativity. He predicts a certain amount of directionality. In discussing the classification of the kinds of abilities according to content, he speaks roughly of four kinds of intelligence.

> The abilities involving the use of figural information may be regarded as "concrete" intelligence. The people who depend most upon these abilities deal with concrete things and their properties. Among these people are mechanics, operators of machines, engineers (in some aspects of their work), artists, and musicians.
>
> In the abilities pertaining to symbolic and semantic content, we have two kinds of "abstract" intelligence. Symbolic abilities should be important in learning to recognize words, to spell, and to operate with numbers. Language and mathematics should depend very much upon them, except that in mathematics some aspects, such as geometry, have strong figural involvement. Semantic intelligence is important for understanding things in terms of verbal concepts and hence is important in all courses where the learning of facts and ideas is essential.
>
> In the hypothesized behavioral column of the structure of intellect, which may be roughly described as "social" intelligence, we have some of the most interesting possibilities. Understanding the behavior of others and of ourselves is largely non-verbal in character. (...) The abilities in the area of social intelligence (...) will possess considerable importance in connection with all those individuals who deal most with other people: teachers, law officials, social workers, therapists, politicians, statesmen, and leaders of other kinds.[57]

---

57 J.P. Guilford, "Three Faces of Intellect", The American Psychologist, Vol. 14, No. 8, August 1959, p. 477-478.

Guilford states the above very succinctly when he says that "we should expect that the creative abilities of artists will be found to involve some factors other than those among creative abilities in fields such as science and management"[58].

The same message appears and reappears in almost all of Guilford's writings. Once again, he is not alone in his contentions. Taylor[59] in his book states that it is very likely that multiple types of creative talent exist and that creativity can be expressed in many different ways and media.

Although Guilford says that different occupational groups may exhibit differing patterns of creative abilities, he does not state what these patterns are statistically.

At the present moment, there has been very little research done on the relationship between modes of creative expression and occupational groups. The author to date has found only 3 studies which have statistically dealt to some degree with this relationship. Welch[60] administered four tests, two figural and two semantic, to professional artists

---

58 J.P. Guilford, "Creative Abilities in the Arts", Psychological Review, Vol. 64, No. 2, 1957, p. 117.

59 C.W. Taylor, Ed., Creativity: Progress and Potential, New York, McGraw-Hill, 1964, ix-241 p.

60 L. Welch, "Recombination of Ideas in Creative Thinking", Journal of Applied Psychology, Vol. 30, No. 6, 1946, p. 638-643.

and non-artists. The figural tests differentiated the groups while the semantic tests failed to do so. In a follow-up study by Fisichelli and Welch[61] the same four tests were administered to the same two groups plus a group of art majors. The professional artists were higher than the art majors on one of the semantic tests. The art majors were higher than the non-artists on the two figural and one of the semantic tests.

Jones[62] in his study investigated the possibility of predicting creative writing and creative drawing. He administered a battery of tests which included four of Guilford's semantic tests and six of his figural tests. The conclusion he reached was that the divergent figural tests can better predict creative drawing than can divergent semantic tests. He found that overall the differential validities were in the direction predicted.

Although the evidence from the above studies shows promise that the content of divergent-production tests will relate differentially with logically different occupations,

---

61 V.R. Fisichelli and L. Welch, "The Ability of College Art Majors to Recombine Ideas in Creative Thinking", Journal of Applied Psychology, Vol. 31, No. 3, 1947, p. 278-282.

62 C.A. Jones, Some Relationships Between Creative Writing and Creative Drawing of Sixth Grade Children, Unpublished doctoral dissertation, Pennsylvania State University, 1960.

there still have been no studies to show if the creative profiles differ according to content as related to different occupations.

It is the primary purpose of this research to empirically establish creativity profiles in terms of 15 of Guilford's divergent-production factors and to see if these profiles are linked to occupational groups.

The null hypothesis reads: when divergent-production test scores from six heterogeneous occupational groups are analyzed into dissimilar profiles by the BC-TRY method, then there are no significant differences between occupational groups within each divergent-production profile.

CHAPTER II

EXPERIMENTAL DESIGN

This chapter presents the operational definitions, the tools that will be used, the subjects, the procedures and the analysis of results.

1. Operational Definitions and Tools

In the previous chapter, Guilford's definition of creativity was presented. In general, Guilford defines creativity as those factors in the divergent-production area. "It is believed that abilities in the divergent-production category are among those uniquely important for creative thinking (...)"[1]. He also states that "we might therefore equate creative thinking with divergent-production"[2]. It must be pointed out however, that for Guilford creativity is much more than just divergent-production.

---

1 J.P. Guilford, "The Factorial Structure of Intelligence", in Frontiers in Psychology, R.W. Russell, Ed., Chicago, Scott Foresman and Co., 1964, p. 123.

2 J.P. Guilford and P.R. Merrifield, "The Structure of Intellect Model: Its Uses and Implications", Report from the Psychological Laboratory, The University of Southern California, No. 24, p. 11.

> Potential for creativity is not a single thing but, from the standpoint of aptitudes, it is a great many intellectual abilities that contribute directly or indirectly to successful creative production. Among the abilities contributing more directly are those in the divergent-production and transformation categories of the structure of intellect. As in problem solving in general, many other abilities may make their contributions at some time.[3]

In this research, creativity will be operationally defined as fifteen divergent-production factors within the structure of the intellect model. The tests that were used were chosen for one or more of the following reasons: (1) it was the only test available to measure that factor, (2) it was the best or one of the best measurements of that factor in terms of the factor loading and reliability, (3) it was the only test of that factor that the publisher wished to release and (4) it was the most objective test to score.

The factors and the tests used to measure them are as follows:

- Make a Figure - measuring factor DFU. The subject (hereafter referred to as S) is given two or three line elements and is instructed to make different combinations with them in a limited time.
- Word Beginnings Test - measuring factor DSU. The S is to write as many words as he can with predetermined letters.

---

3 J.P. Guilford, "What To Do About Creativity in Education", 11th Annual Western Regional Conference on Testing Problems, M.H. Elliott, Chairman, Educational Testing Service, Los Angeles, California, 1962, p. 9.

- Thing Category Test - measuring factor DMU. The S is to think up and write as many things as he can that are alike in some way.
- Figural Similarities - measuring factor DFC. The S is to choose from a number of given figures those which go together.
- Name Grouping - measuring factor DSC. The S is given a list of names and is to group them according to what they have in common.
- Utility Test (flexibility) - measuring factor DMC. The S is to list uses for a common object.
- Number Rules - measuring factor DSR. The S is given a starting number and is to relate one or more number to it in various ways in order to achieve a given result.
- Associational Fluency - measuring DMR. The S is to write synonyms for each of several given words.
- Designs - measuring DFS. The S is given five figural elements and is to combine them in various ways to produce designs as might appear on linoleum or fabrics.
- Make a Code Test - measuring DSS. The S is to invent a variety of code systems using numbers and letters.
- Expressional Fluency - measuring DMS. The S is to construct a variety of four-word sentences having been given four initial letters.

- Match Problems - measuring DFT. The S is given a set of adjacent squares or triangles of the same size. Each line is composed of a match and the S is to take away a specified number of matches so as to leave a specified number of squares or triangles with no matches left over.
- Plot Titles (clever) - measuring DMT. The S is to write titles for a short story with only the clever titles being accepted.
- Production of Figural Effects - measuring DFI. The S having been given a very simple line or two is to build upon the given information to produce a figure of some degree of complexity.
- Limited Words - measuring DSI. The S is given a pair of words and is to make a number of new word pairs from the letters included in the original pair of words.

One of the qualities of a good measuring instrument is its reliability. Very little data has been presented in the literature concerning test-retest reliability on the tests used in this study. Due to the amount of time required for testing in this research, test-retest reliability was not available.

Split-half reliabilities (part one with part two) extended by the Spearman-Brown prophecy formula have been computed. They range from .489 for the Plot Titles Test to .857 for the Associational Fluency Test. Table I presents the split-half reliabilities found in this study and some of those found in other studies. The reliabilities as found in this study compare favorably with those found in the research literature.

Since most of the divergent-production tests are "subjectively" scored, there is always the problem of consistency of marking over time. To see if there were any effects of marking over time, a set of 40 exams on eight of the subjectively scored tests were remarked by the same scorers eight months later. Table II presents the Pearson r's and the correlated "t" differences between the two different scoring times. The Pearson r's indicate generally high reliability for all the tests. The correlated "t" tests indicate that the Make a Code Test ($p < .01$), the Thing Category Test ($p < .05$) and the Production of Figural Effects ($p < .05$) have significant differences between the first and second scoring times. It would seem that the markers were more lenient on the first marking for the Production of Figural Effects and Make a Code Test. They were more lenient on the second marking for the Thing Category Test. However, since the mean differences between the first and second marking on

TABLE I.- Reliability Coefficients*
for Selected Guilford Tests

	A	B	C	D	E	F	G	H	I
Make a Figure Test	.725	.79						.79	.80
Word Beginning Test	.636								
Thing Category	.598				.55[a]				
Figural Similarities	.684	.23							.66
Name Grouping	.651	.47				.66			.66
Utility Test	.846	.42				.72			.64
Number Rules	.779	.80							.75
Associational Fluency	.857		.63						.70
Expressional Fluency	.686	.66		.61[b]					.67
Designs	.547	.64							.70
Production of Figural Effects	.662	.82							.82
Limited Words	.818	.36							
Match Problems	.622	.70			.65[a]			.61	.61
Plot Titles	.489	.44		.74[b]			.62		.58
N in Each Sample	207	205	219	221	208	177	240	188	---

* Split-half reliabilities corrected with Spearman-Brown prophecy formula except where otherwise indicated.

(cont'd on next page)

any of these three tests was not greater than two points, it would seem that the difference in marking is more random than constant.

---

a Test-retest reliability.

b Alternate form reliability.

A As found in this study.

B R. Hoepfner, and J.P. Guilford, "Figural Symbolic and Semantic Factors of Creative Potential in 9th Grade Students", Reports from the Psychological Laboratory, University of Southern California, Report No. 35, June 1965, p. 9.

C P.R. Merrifield, J.P. Guilford, P.R. Christensen, and J.W. Frick, "The Role of Intellectual Factors in Problem Solving", Psychological Monographs: General and Applied, Vol. 76, No. 10, Whole No. 529, 1962, p. 11.

D P.R. Christensen and J.P. Guilford, "An Experimental Study of Verbal Fluency Factors", The British Journal of Statistical Psychology, Vol. XVII, Part 1, May 1963, p. 9.

E H.W. Stokes and R.P. Kropp, Note on the Kit of Reference Tests, personal correspondence with the author, 1968.

F J.L. Dunham, J.P. Guilford, and R. Hoepfner, "Abilities Pertaining to Classes and the Learning of Concepts", Reports from the Psychological Laboratory, University of Southern California, No. 39, November 1966, p. 11.

G M. O'Sullivan, J.P. Guilford, and R. de Mille, "The Measurement of Social Intelligence", Reports from the Psychological Laboratory, University of Southern California, No. 34, June 1965, p. 16.

H K.I. Hoffman, J.P. Guilford, R. Hoepfner, and W.J. Doherty, "A Factor Analysis of the Figural-Cognition and Figural-Evaluation Abilities", Reports from the Psychological Laboratory, University of Southern California, No. 40, December 1968, p. 17.

I J.P. Guilford, Tests Selected to Represent Structure-of-Intellect Abilities, personal correspondence to Dr. H.P. Edwards, December 3, 1970.

TABLE II.-

Pearson "r" Coefficients and Correlated "t" Differences on a Sample of Forty Remarked Tests

Tests	Pearson "r"	Correlated "t"
Make a Figure (DFU)	.98	-0.13
Word Beginnings Test (DSU)	.96	1.85
Thing Category Test (DMU)	.98	-2.63
Utility Test (DMC)	.94	0.53
Designs (DFS)	.66	1.69
Make a Code (DSS)	.87	3.48
Expressional Fluency (DMS)	.84	1.19
Production of Figural Effects (DFI)	.87	2.50

$p < .05 = 2.02$

$p < .01 = 2.70$

$p < .001 = 3.55$

Interrater agreement is another problem with the subjectively scored tests when more than one person is scoring them. In this study, two persons were trained to score the tests. However, both persons scored all the tests and where disagreement arose, they solved the differences between themselves by going back to the scoring guides and reaching a consensus.

2. The Subjects

Six different occupational groups were logically chosen for this research. Fifty individuals from each of the following occupations voluntered for this study, namely, junior administrators, statisticians, language teachers, translators, draftsmen and patent officers.

The selection of occupational groups for this study was logically based upon Guilford's writings. Pages 19-21 of this thesis contains some of Guilford's general pronouncements regarding creative expression within occupational fields. Briefly, Guilford has stated[4,5,6] that mechanics,

---

4 J.P. Guilford, "Three Faces of Intellect", American Psychologist, Vol. 14, No. 8, 1959, p. 477.

5 J.P. Guilford, "The Factorial Structure of Intelligence", in Frontiers in Psychology, R.W. Russell, Ed., Scott Foresman and Co., 1964, p. 122.

6 J.P. Guilford, M. Hendricks and R. Hoepfner, "Solving Social Problems Creatively", Journal of Creative Behavior, Vol. 2, No. 3, 1968, p. 156.

operators of machines, engineers, pictorial artists, musicians and designers will most likely be expressive in the figural mode of creativity. The mathematician, the modern logician, individuals who work with language, and people who operate with numbers will most likely exhibit the symbolic mode of creativity. The semantic mode of creativity will most likely be manifested in those occupations where the learning of facts and ideas is essential, in creative writing, in the scientist, in the planner and in teachers. The salesman, the policeman, the diplomat, the statesman, leaders of other kinds, the social worker, law officials, therapists, and anyone who has much to do with influencing and managing others will most likely express the behavioral mode of creativity. Based on the above knowledge, the six groups were chosen.

According to the job description, an administrator's position includes one or more of the following duties:

- The provision of assistance to management in making the optimum use of the personnel employed in the organization by providing leadership and advice, and by exercising specialized skills.
- The development, recommendation and implementation of policies, standards and solutions to problems.
- The ensuring of consistent application of policies and standards.

The statistician's job includes one or more of these duties:

- The conduct of fundamental or applied research in economics, econometrics, demography and sociology.
- The planning, collecting, processing, analysis, evaluation and presentation of information, including the development and application of statistical concepts in the design or procedures for these purposes.
- The planning, development and evaluation of projects, programmes, or policies having economic or sociological consequences.
- The writing and editing of papers and reports.
- The provision of advice regarding the economic or sociological implications of projects, programmes or policies.
- The supervision or direction of any of the above duties.

The work of the patent examiner includes one or more of the following duties:

- The examination of applications for patents of invention.
- The classification of patent applications and patents.
- The inspection of the manufacture, processing, labeling and advertising of foods, drugs, cosmetics and medical devices for the purposes of protecting the public from

health hazards and fraudulent or misleading advertising or labeling.

- The inspection of the manufacture, storage, transportation and handling of explosives.
- The inspection for assurance of quality of goods and services purchased under contract by the Government of Canada.
- The writing and editing of papers and reports.
- The provision of advice.
- The supervision or direction of any of the above duties.

The draftsman's job would include one or more of the following duties:

- The drafting of drawings for documenting and communicating engineering or architectural plans and information.
- The drawing of maps and charts.
- The assembly, evaluation, selection and presentation of data for the construction of maps and charts.
- The illustration of information in graphic or pictorial form.
- The supervision of any of the above duties.

The work of the translator would include one or more of the following duties:

- The translation or simultaneous or consecutive interpretation of one language to another.
- The revision, including editing, proof-reading or checking, of translated material.
- The performance of terminological and linguistic research.
- The training of translators and interpreters.
- The supervision or direction of any of the above duties including the maintenance of production standards and quotas.

According to the job description, the language teacher's position includes the following duties:

- The planning, development, conduct or evaluation of specialized educational programmes such as language training.

The groups were selected on a logical basis trying to cover as many diverse occupations that might correspond to Guilford's creative expressions or types. If Guilford's theory of creativity is adequate then (a) an administrator should have a distinct creativity profile in the form of a behavioral expression of creativity or quite possibly the semantic expression of creativity; (b) a statistician should have a distinct creativity profile in the form of a symbolic expression of creativity; (c) a patent officer and a draftsman should have a distinct creativity profile in the form of

a figural expression of creativity and (d) a translator and a language teacher should have a distinct creativity profile corresponding to the semantic expression of creativity.

To ensure that each individual was "logically" in the right position he had to be in that occupation for at least two years. Those that did not meet this criterion were rejected from the study. With the application of this criterion and since the testing was carried out over a two-day period, there was some attrition. The final group consisted of 26 translators, 47 draftsmen, 25 statisticians, 23 administrators, 21 language teachers and 51 patent officers.

3. The Testing Procedure

Groups of participants (N ranged from 15 to 50) were administered the creativity tests during a two-day period. Half the tests were administered one day and the remaining on the following day. The instructions as written on the tests and in the manuals were adhered to. One administrator and one proctor were present for all testing sessions.

4. Statistical Analysis

In this study, the BC-TRY System developed by Tryon and Bailey[7] was used. The BC-TRY System is composed of

---

7 R.C. Tryon and D.E. Bailey, Cluster Analysis, New York, McGraw-Hill, 1970, v-347.p.

24 computer programs. It focuses mainly on the cluster analysis of variables (V-analysis) and the cluster analysis of objects, (i.e., individuals), (O-analysis).

The BC-TRY System performed an O-analysis on the full set of 15 variables. The first step was to convert all the raw scores to standardized scores (Z) with a mean of 50 and a standard deviation of 10. This allowed all dimensions to have equal weight in determining the typology. The next basic step in the O-analysis is to plot each individual's variable scores in multidimensional space. The similarity between the profiles of any two individuals is objectively defined in the Cartesian space as the distance between their two points. This "Euclidian distance" is simply the square root of the sum of the squared deviations on the various variable scores between each pair of individuals. The formula for D is:

$$D = \sqrt{\sum d^2}$$

$$d^2 = (a_1 - a_2)^2 + (b_1 - b_2)^2 + (c_1 - c_2)^2 (\ldots) + (k_1 - k_2)^2$$

where 1 and 2 stand for the individuals and a, b, c (...) k stand for the variables.

The Euclidian distance, D, is not a metric of similarity that is consistent across studies because the magnitude of the D depends upon the number of variables in the study. Therefore, the square root of the mean square difference in

variable scores, RMS, is used. RMS is simply the square root of the K dimensions (variables) divided into the D.

$$RMS = \frac{D}{\sqrt{K}}$$

Since the derivation of the D's between each individual and each other individual is a formidable task, even for the modern computer, the BC-TRY System uses a preliminary step by casting individuals temporarily into Core O-types based on the arbitrary sectioning of the cluster score space. This is usually done on a high (above a Z score of 60), medium (a Z score of 40 to 60) and low (below a Z score of 40) basis. The Z score is the standardized raw score for each variable. The number of arbitrary sectors varies according to the number of dimensions. "The number of sectors is a simple function of the number of categories on each of the dimensions and the number of dimensions. If there are K dimensions and C categories on each of the dimensions, the number of sectors S is equal to $S = C^k$."[8] With the large number of variables in this study, the arbitrary sectors chosen were two: high (a Z score above 50) and low (a Z score below 50).

After the arbitrary sectors for all the variables have been defined, the program assigns individuals to them based upon their actual variable scores. To illustrate the

---

8 Idem, Ibid., p. 153-154.

procedures of the O-analysis a hypothetical example will be presented. Table III presents hypothetical standard scores for eight individuals A, B, (...) H on two variables X and Y. The decision was made to have two categories for all variables. One category would cut the scores above the mean and be called high (H), the other would cut the scores below the mean and be called low (L). In the hypothetical example, the theoretical number of sectionings of scores could be four: HH, LL, HL, LH (which are called "score patterns"). According to the example, three score patterns were found to have individuals within them. The HH score pattern had 3 individuals, the LL score pattern had 1 individual and the HL score pattern had 4 individuals. The decision must now be made on the number of individuals required in a score pattern before it can be labeled a core O-type. The arbitrary decision is usually set at 2 percent of the total sample.

The mean score profile for each core O-type is then computed. Distance (D) measures are now computed between those individuals who have not been assigned to a core O-type and the mean score profile of each core O-type. These individuals are then assigned to the core O-type with which it has its smallest D. However, the BC-TRY has established a

TABLE III.-

Hypothetical Scores for Eight Individuals on Two Variables With Their Corresponding Score Pattern Dichotomized for High (Above 50) and Low (Below 50)

Individuals	Variables		Score Pattern	
	X	Y		
A	56	56	H	H
B	46	46	L	L
C	56	46	H	L
D	59	58	H	H
E	51	51	H	H
F	61	47	H	L
G	58	44	H	L
H	57	41	H	L

criterion "(...) in order to decide when an individual will be excluded from any O-type. A convenient uniqueness criterion is objectively set as follows. No object may be a member of a core O-type if the RMS of its cluster scores from those of a core O-type is greater than 1 standard deviation."[9] The standard deviation used here is in reference to the average standard deviation of the cluster scores (or variables). In a private correspondence to the author, Bailey states that

> If the cluster scores do not all have the same standard deviation a reasonable practice is to take the average of the standard deviations as the criterion. An individual may be separated from the mean point of a core O-type in any direction within the multivariate space. It seems adviseable to compare the distance involved with some standard unit of measurement. It does not seem appropriate to compare the separation of an individual from the core O-type on any one of the particular dimensions, at least for the purposes of deciding whether or not to include the individual in the O-type. Since there are no absolute standards at this point of the analysis, everything having been re-standardized, the standard deviation of the cluster scores is the most likely candidate.[10]

Once the core O-types have been set up, a check is made to see if any "natural" clusters have been divided by the arbitrary cut-off points. A hierarchical structure of the core O-types is set up and those with small D's between them would have similar profiles. The degree of dissimilarity

---

9 Idem, Ibid., p. 156.

10 D.E. Bailey, Tryon-Bailey Associates Inc., Personal Correspondence With the Author, letter dated October 28, 1970.

between any two core O-types depends upon the user of the BC-TRY System.

When the decision has been reached as to the final core O-types, distance measures are computed between each individual's scores and the corresponding mean scores in the profile for each core O-type. All the subjects are now assigned and/or reassigned to those O-types with which they have the smallest distance. The mean score profile for each core O-type is recalculated. Distance measures are again calculated between each individual's scores and the mean score profile for each core O-type. Successive iterations like this are computed until all the core O-types neither gain nor lose membership. The core O-type is now designated simply as an O-type. Each O-type can now be described by its mean and standard deviation on each of the variables.

Once the final iterations are completed, a measure of "tightness" of the profiles of individuals that comprise a given O-type is performed. This "tightness" is the coefficient of homogeneity (H-value). "The H-value is a function of the within-variance of the group's cluster scores compared to the total variance of individuals in the full supply."[11]

---

11 Idem, Ibid., p. 161.

The formula for the H-value is:

$$H_{Tx} = \sqrt{1 - \frac{\text{Variance of cluster scores of N individuals in T}}{\text{Variance of cluster scores of TN individuals}}}$$

"When the members of an O-type are identical in their profiles, the within-group variance is zero and the homogeneity, H, is unity. If, however, the O-type is a random selection from the full supply, within-group variance equals the variance in the full supply and H becomes zero."[12]

The next basic step in the analysis of this data is to determine if the resulting O-types possess greater membership from one occupational group than from the others. The statistic used here is the chi square to determine the significance of membership of particular O-types.

Having discussed the sample, the tools, the experimental procedure and the analysis of the data, the writer now turns to the presentation and discussion of results.

---

12 Idem, Ibid., p. 161.

CHAPTER III

PRESENTATION AND DISCUSSION OF RESULTS

This chapter will present the results of the O-analysis and the chi squares on the various O-types.

1. The O-Analysis

Appendix 1 contains the first step in the O-analysis. This arbitrary breakdown into high and low sectors (above and below the mean on each variable where L means low and H means high) produced 181 actual score patterns from a theoretical possibility of 32,768. As mentioned previously, the theoretical number of score patterns depends upon the number of categories and the number of variables. In this case there were two categories and 15 variables ($S = 2^{15}$). In practice, the actual number of score patterns will also depend upon the number of individuals in the sample. Of the 181 score patterns, there were eight score patterns which contained two or more individuals. Five of the score patterns consisted of 2 individuals each who were similar as to their highs and lows on all 15 variables. Two score patterns contained three individuals each and one score pattern contained four individuals. Since there were many score patterns produced by this process and very few individuals in each pattern, the decision was made to keep this initial

sectioning and use the above mentioned 8 profiles as core O-types. Had there been more patterns with a greater frequency in them, then the 2% membership guide would have been followed.

Table IV presents the means on all 15 variables and number of people as per the eight core O-types. Core O-type 1 has a score pattern that is below the mean on all 15 variables with 9 variables at least one standard deviation below the mean. Core O-type 2 has all its variables below the mean with the exception of variable 12 (Production of Figural Effects - DFI) which is above the mean. In contrast, core O-type 8 has all its variables above the mean with the exception that variable 12 is well over one standard deviation below the mean. Core O-type 3 has thirteen variables below the mean with variable 10 (Make a Code - DSS) and variable 12 (Production of Figural Effects - DFI) above the mean. Core O-type 4 has all variables below the mean with variables 9 and 15 (Designs - DFS, Plot Titles - DMT) above the mean. Core O-type 5 also has almost all variables below the mean, with the exception of variables 5 and 13 (Name Grouping - DSC, and Limited Words - DSI). Core O-type 6 has three variables above the mean with the rest below. The three highs are variables 4, 12 and 14 (Figure Similarity - DFC, Production of Figural Effects - DFI, Match Problems - DFT). Core O-type 7 has all its variables above the mean with the exception of variable 3 (Thing Category - DSU).

TABLE IV.- Core O-Type Means for Fifteen Divergent-Production Tests

Core O-Types	N	Variables														
		1 DFU	2 DSU	3 DMU	4 DFC	5 DSC	6 DMC	7 DSR	8 DMR	9 DFS	10 DSS	11 DMS	12 DFI	13 DSI	14 DFT	15 DMT
O-Type 1	4	40.4	33.8	34.0	39.0	36.3	38.3	31.2	37.7	41.4	41.5	35.3	41.3	35.2	41.5	40.3
O-Type 2	3	34.0	36.5	42.9	41.3	37.5	36.5	34.2	36.1	34.1	37.4	38.9	54.3	39.4	42.9	40.0
O-Type 3	3	36.8	38.1	38.9	40.2	41.3	33.5	37.3	40.1	43.3	54.0	38.1	60.3	41.6	46.8	41.4
O-Type 4	2	36.3	46.1	38.1	37.4	41.9	42.3	44.9	44.3	56.4	34.1	41.1	39.1	36.1	42.1	54.5
O-Type 5	2	44.0	47.8	41.4	29.0	56.8	49.0	42.8	45.6	47.2	41.5	41.1	45.1	58.6	38.6	39.3
O-Type 6	2	46.8	35.2	38.1	55.9	40.0	37.2	36.0	35.7	35.6	34.1	41.1	50.3	36.1	58.4	37.1
O-Type 7	2	59.1	56.9	48.7	58.5	55.0	63.1	55.8	58.8	54.1	56.5	70.7	59.3	58.6	53.8	67.5
O-Type 8	2	61.6	68.9	58.1	60.2	55.0	64.2	57.2	54.2	56.4	61.4	73.3	33.1	62.7	57.3	63.1

From the analysis of Appendix 1 and Table IV, it is easily seen that very few individuals group together even when the arbitrary sectioning is done in terms of a dichotomy. This demonstrates that if you examine individuals under many aspects, there is bound to be very little pattern agreement on all variables. Of the 193 subjects, twenty were able to agree so as to make eight core O-types.

The next step in the O-analysis was the computation of the distance measures among the 8 core O-types. Table V presents the Euclidian Distances among the 8 core O-types. On inspection of this matrix, it is seen that some of the distance measures are less than one standard deviation as computed by the RMS. In order for an O-type to be at least one standard deviation away from another O-type, its distance measure must be 38.8 or greater. Of the 28 comparative distance measures, 12 are below this point. The Euclidean distance between core O-types 1 and 2 is 20.52 which is the least distance between any two of the core O-types. In terms of standard deviations as computed by the RMS, these two O-types are 0.529 standard deviations away.

To determine if the Euclidian distances could be enlarged, core O-type 1 and 2 were combined and distance measures were computed between this new O-type and the remaining O-types. When core O-types 1 and 2 were combined, they yielded the following distance measures from the

TABLE V.- Euclidian Distances Between Core O-Types

Core O-Types	Euclidian Distances							
	O-Type 1	O-Type 2	O-Type 3	O-Type 4	O-Type 5	O-Type 6	O-Type 7	O-Type 8
O-Type 1	---	20.52	27.30	31.36	41.66	29.80	82.95	91.25
O-Type 2	20.52	---	22.24	36.54	41.74	26.65	80.02	91.18
O-Type 3	27.30	22.24	---	38.39	39.92	33.83	72.38	85.38
O-Type 4	31.36	36.54	38.39	---	36.71	43.39	68.83	76.31
O-Type 5	41.66	41.74	39.92	36.71	---	50.96	64.49	71.56
O-Type 6	29.80	26.65	33.83	43.39	50.96	---	76.24	86.13
O-Type 7	82.95	80.02	72.38	68.83	64.49	76.24	---	32.22
O-Type 8	91.25	91.18	85.38	76.31	71.56	86.13	32.22	---

remaining core O-types. Core O-type 3, 23.12; core O-type 4, 32.11; core O-type 5, 40.44; core O-type 6, 26.62; core O-type 7, 81.08; core O-type 8, 90.65. These new calculations indicate virtually no improvements in increased distance between the core O-types so the decision was made to stay with the 8 core O-types.

Once this decision was made, the distance measures were computed between the mean score patterns of these core O-types and the profiles of all the individuals in the sample. Those individuals whose distance measures were closest to a particular core O-type were then assigned to it. However, the distance measure between an individual profile and a core O-type had to be no more than one standard deviation away. With these calculations, new individuals were assigned to one of the 8 core O-types. The new mean of the core O-types was again calculated and new distance measures were computed between the core O-types and all the individuals. This iterative process reassigned some individuals and brought new individuals into one of the core O-types. There were nine iterations in all. The iterative process stopped once there was no longer any new members entering into any of the core O-types and when no individuals left one particular core O-type for another core O-type. This then was the final standing for the 8 core O-types which are now simply called O-types. Table VI lists the number of individuals as per

TABLE VI.- Number of Individuals Per Final O-Type

O-Types	N
O-Type 1	11
O-Type 2	8
O-Type 3	12
O-Type 4	30
O-Type 5	37
O-Type 6	12
O-Type 7	49
O-Type 8	6
Rejects	28

O-type. This table shows that 28 individuals could not be assigned because their D value was greater than one standard deviation away from any of the O-types. These subjects are considered unique, and had the sample been larger, they may have been the start of new O-types.

Table VII presents the means on all 15 variables for the final 8 O-types. O-types 1 and 2 have all their mean values below the standard score of 50. O-type 3 has variables 7, 10 and 12 above the mean (Number Rules - DSR, Make a Code - DSS, and Production of Figural Effects - DFI). O-type 4 has variables 2, 3, 6 and 15 above the mean (Word Beginnings - DSU, Thing Category - DMU, Utility Test - DMC, and Plot Titles - DMT). O-type 5 has variables 2, 4, 5, 7, 8, 13 and 14 all above the mean (Word Beginnings - DSU, Figure Similarity - DFC, Name Grouping - DSC, Number Rules - DSR, Associational Fluency - DMR, Limited Words - DSI, Match Problems - DFT). O-type 6 has variables 4 (Figure Similarity - DFC) and 14 (Match Problems - DFT) above the mean. O-type 7 is the contrast of O-type 1. The former has all its variables above the mean. O-type 8 has all its variables above the mean with the exception of 12 (Production of Figural Effects) which is two standard deviations below the mean.

Figures 1 to 4 present the 8 O-types. Two O-types are presented per figure so as to visually illustrate the differences between profiles. From these figures, it is seen

TABLE VII.- Means for the Final 8 O-Types

O-Types	Variables														
	1 DFU	2 DSU	3 DMU	4 DFC	5 DSC	6 DMC	7 DSR	8 DMR	9 DFS	10 DSS	11 DMS	12 DFI	13 DSI	14 DFT	15 DMT
O-Type 1	41.5	40.8	37.7	38.9	42.7	41.9	38.6	39.3	49.9	41.8	38.8	38.6	39.4	40.6	46.6
O-Type 2	36.3	41.1	39.6	43.1	36.8	37.2	31.7	42.8	36.2	40.3	39.1	48.8	39.6	41.2	37.1
O-Type 3	44.5	38.7	42.9	43.0	42.2	39.9	51.7	42.2	46.4	50.2	46.0	58.2	46.3	47.4	44.0
O-Type 4	46.8	51.3	51.4	49.7	44.6	50.8	46.0	46.4	49.5	47.5	49.1	47.6	45.3	45.0	57.4
O-Type 5	48.1	50.8	45.1	50.6	55.9	46.6	51.9	50.2	49.6	49.7	48.9	45.3	55.0	51.1	46.7
O-Type 6	47.1	42.7	44.5	55.1	45.0	44.8	45.8	39.7	47.6	42.4	41.3	48.7	41.3	52.0	40.7
O-Type 7	56.4	54.5	54.0	54.7	53.9	54.4	55.9	58.0	55.4	57.2	55.4	55.5	53.1	51.6	53.2
O-Type 8	55.1	60.5	56.3	55.1	56.2	63.3	57.0	54.8	54.9	56.5	67.7	30.6	61.4	55.7	56.6

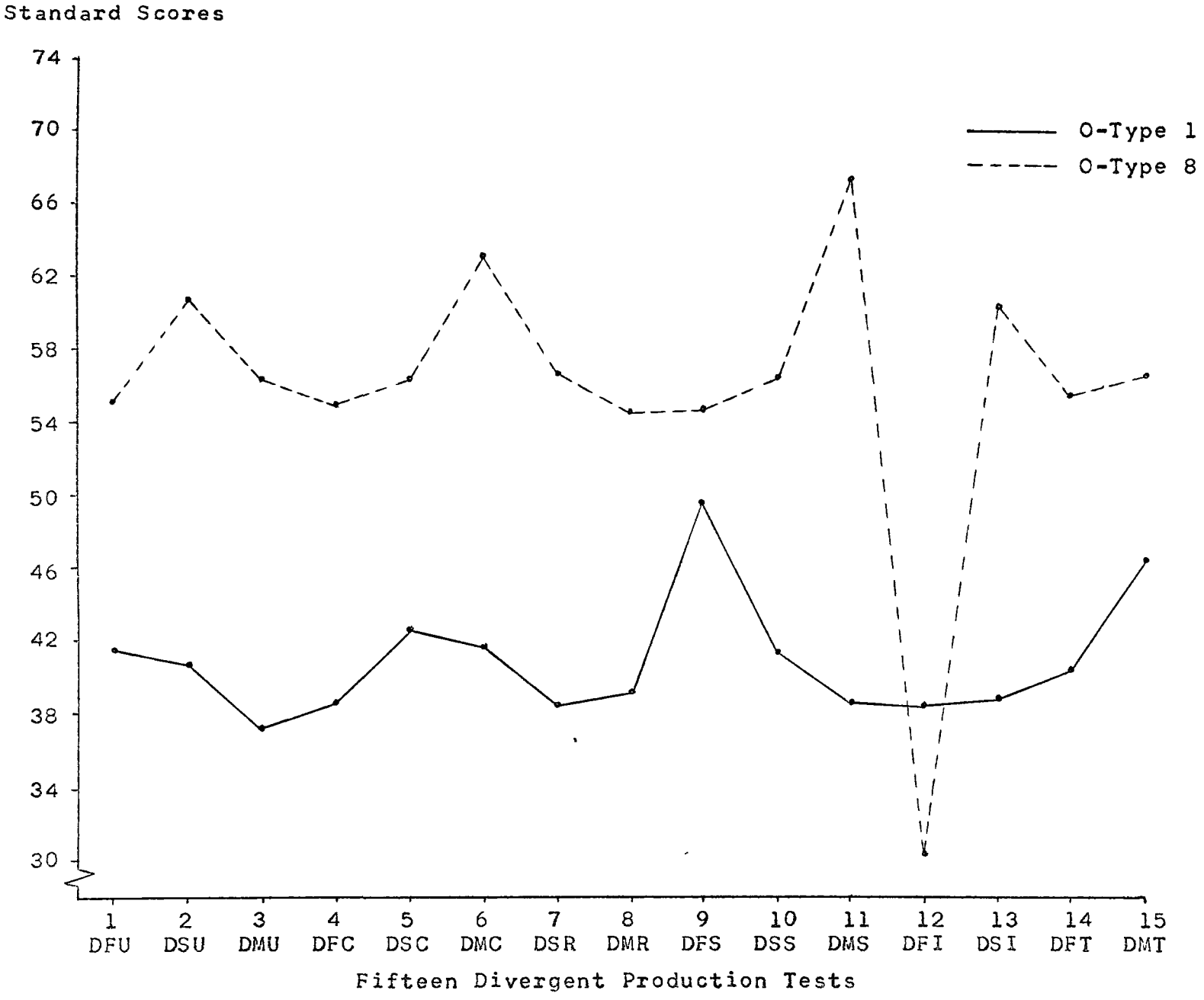


FIGURE 1.- Divergent-Production Profiles for O-Types 1 and 8

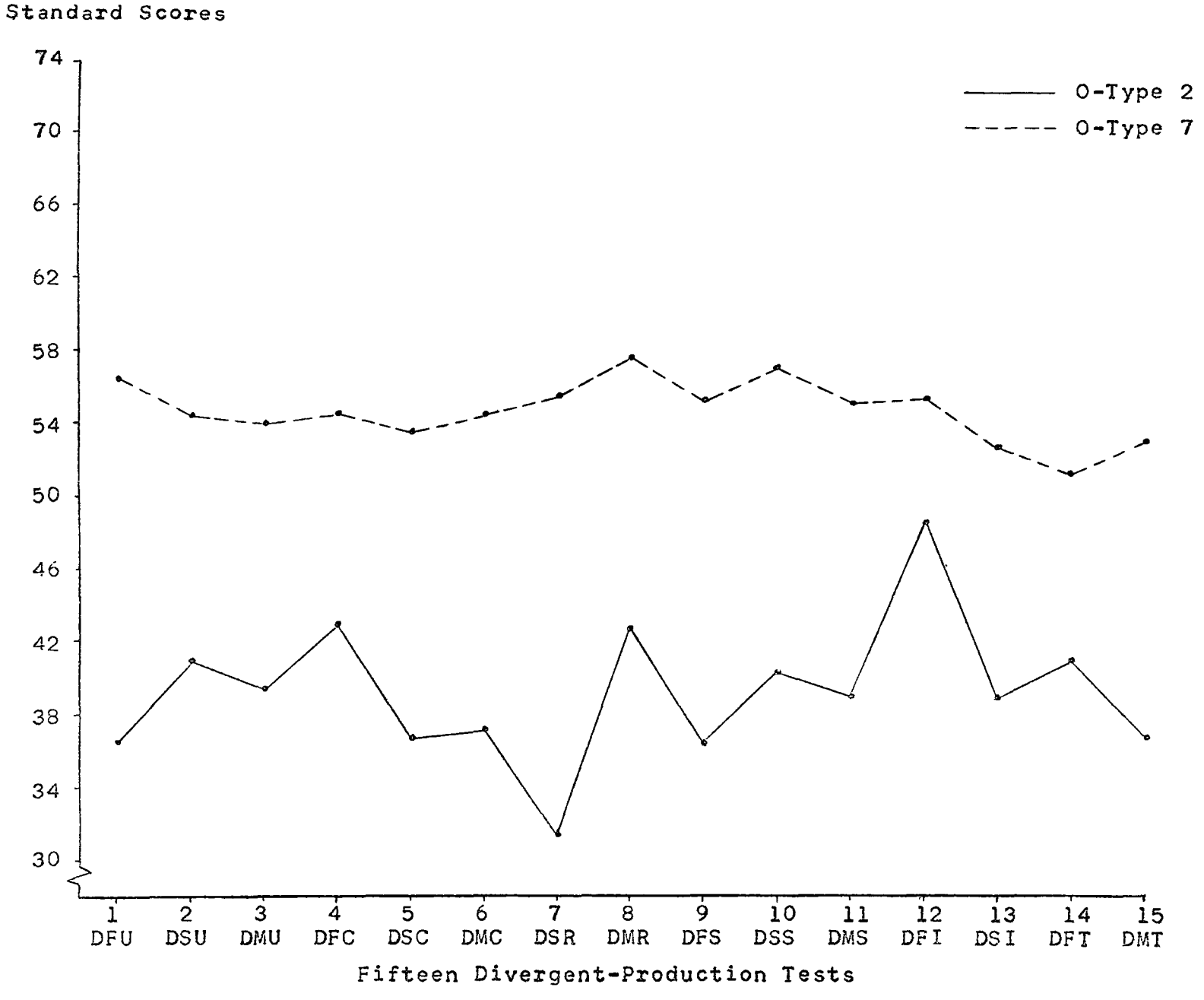


FIGURE 2.- Divergent-Production Profiles for O-Types 2 and 7

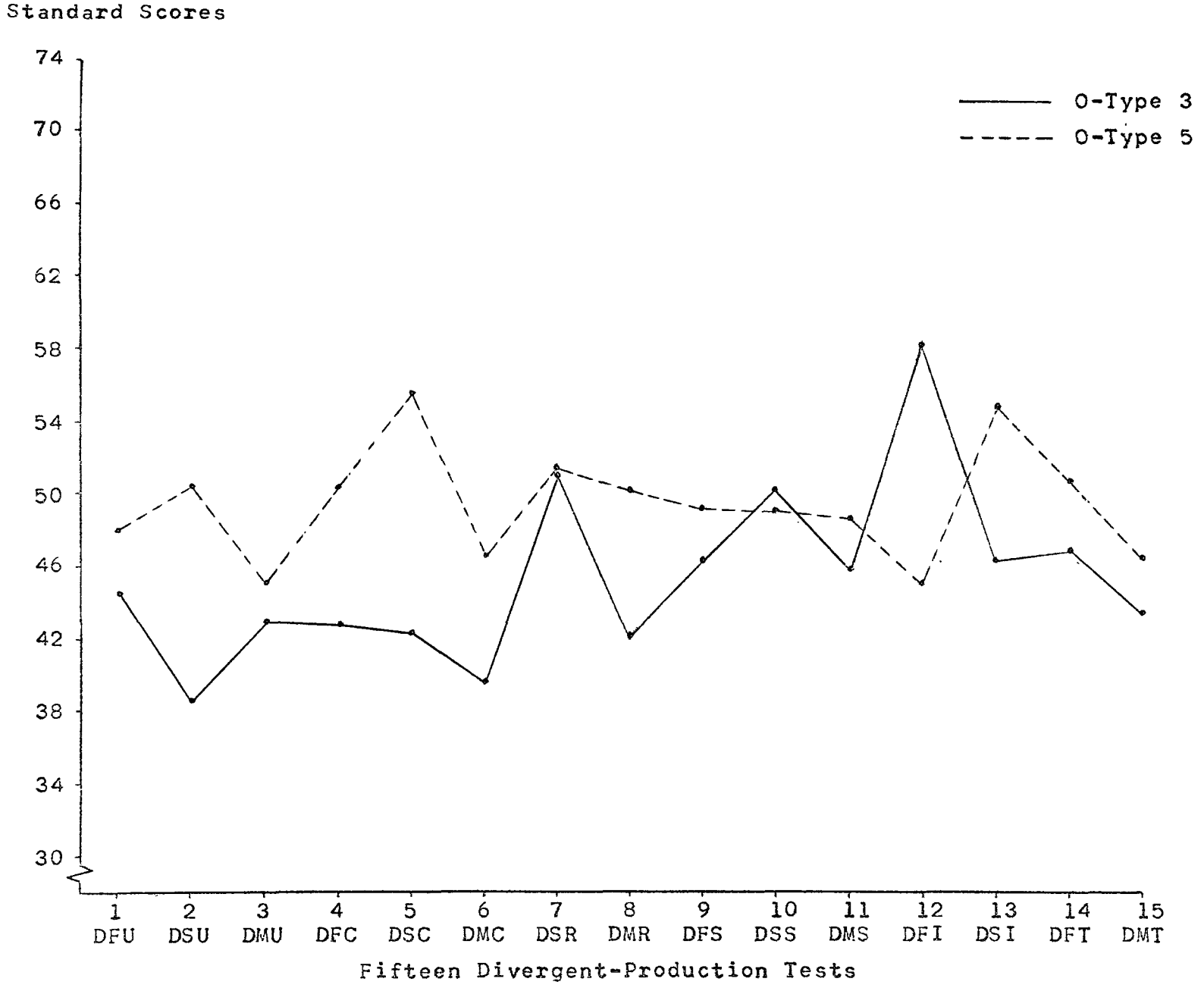


FIGURE 3.- Divergent-Production Profiles for O-Types 3 and 5

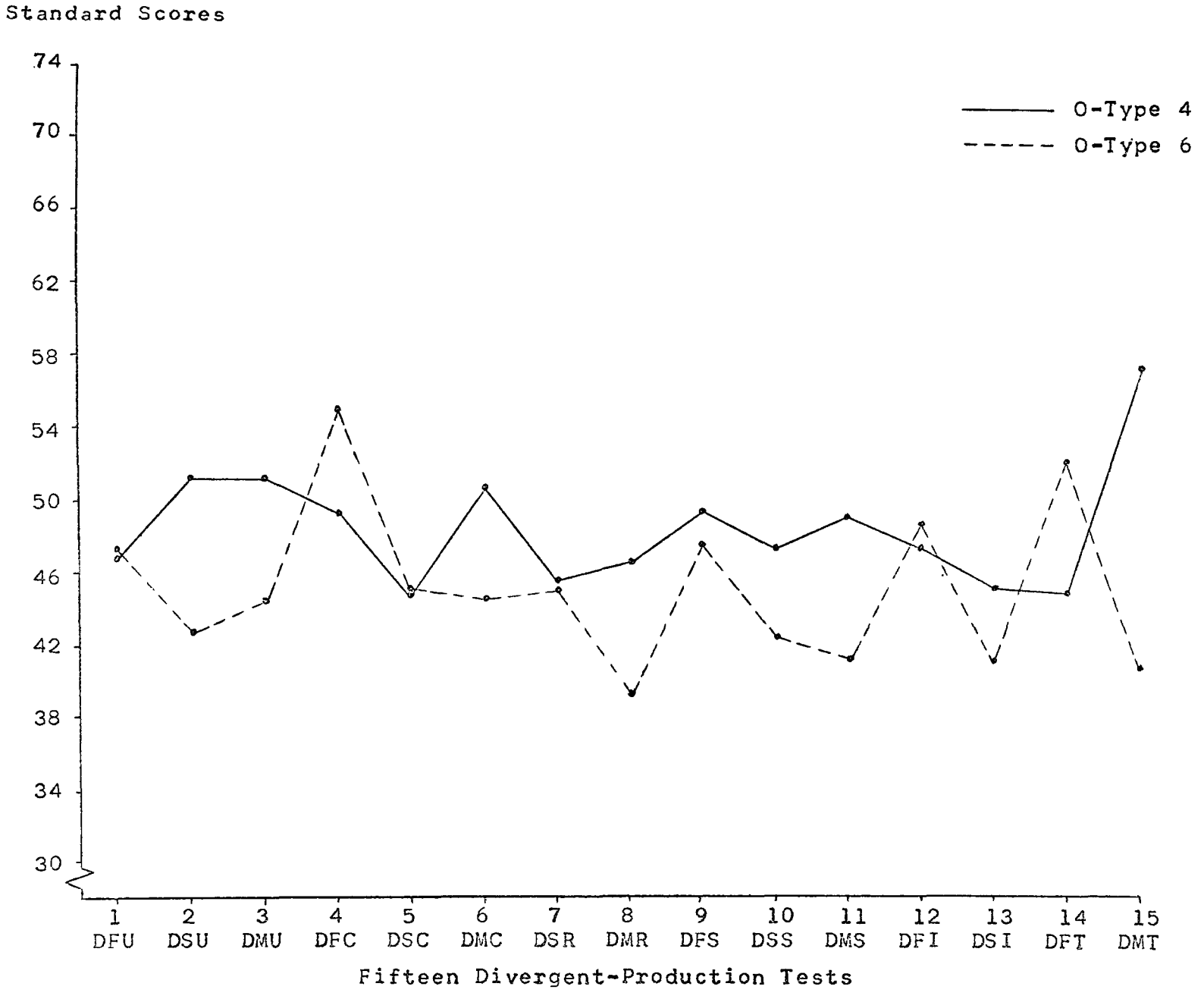


FIGURE 4.- Divergent-Production Profiles for O-Types 4 and 6

that O-types 2 and 8 are the most different types with O-types 1 and 8 being the second least alike. O-types 3 and 6 are the most alike.

There is one last calculation within the BC-TRY System and that is the homogeneity coefficient (H). This H-value tells how "tight" the individuals comprising each profile are. Table VIII presents the H-value for each variable within the O-types and also an overall H-value index. The individual variable homogeneity varies from -0.71 (on variable 4, O-type 1) to 0.96 (variable 7, O-type 8). The overall homogeneity varies from 0.60 (O-type 7) to 0.77 (O-type 2). The average overall homogeneity is 0.70. This compares favorably with Keat's[1] study where his mean H for a 14-dimensional analysis was 0.72. The overall homogeneities are somewhat lower than those found by Tryon[2] in his four variable study where the H-value varied from 0.88 to 0.90.

The results of the above analysis indicated that despite the spread of individual differences, as measured by these divergent-production tests, certain subjects can be grouped together due to the similarity of their profiles.

---

1 D.B. Keat, II, "Cluster Analyses of Inventory Items and Persons' Profiles by Means of the BC-TRY System", reprinted from the Proceedings, 76th Annual Convention, APA, 1968, p. 202.

2 R.C. Tryon, "Person-Clusters on Intellectual Abilities and on MMPI Attributes", Multivariate Behavioral Research, Vol. 2, No. 1, 1967, p. 19.

TABLE VIII.- Homogeneities on the Fifteen Divergent-Production Tests for the Final Eight O-Types

O-Types	Variables															Overall Homogeneity
	1 DFU	2 DSU	3 DMU	4 DFC	5 DSC	6 DMC	7 DSR	8 DMR	9 DFS	10 DSS	11 DMS	12 DFI	13 DSI	14 DFT	15 DMT	
O-Type 1	.86	.69	.78	-.71	.56	.90	.81	.84	.82	.56	.76	.75	.65	.87	.75	.71
O-Type 2	.87	.65	.89	.57	.80	.94	.68	.62	.78	.80	.87	.67	.60	.75	.90	.77
O-Type 3	.77	.90	.87	-.40	.77	.82	.50	.77	.82	.46	.62	.66	.49	.58	.89	.69
O-Type 4	.82	.42	.77	.60	.59	.69	.55	.76	.28	.73	.76	.77	.73	.40	.68	.66
O-Type 5	.53	.52	.77	.55	.67	.68	.73	.78	.58	.62	.75	.69	.60	.52	.71	.65
O-Type 6	.66	.88	.88	.93	.56	.91	.72	.93	-.34	.84	.81	.76	.81	.82	.83	.78
O-Type 7	.53	.68	.60	.57	.40	.64	.72	.62	.59	.65	.55	.69	.70	.53	.43	.60
O-Type 8	.82	.59	.95	.87	.94	.91	.97	.85	.58	.53	.83	.68	.63	.46	.62	.77

These results show that some individuals have all their variable scores above the mean, whereas others are below the mean.

In general, the results of this research would seem to indicate that individuals who obtain a low score on one divergent-production test would also obtain low scores on other divergent-production tests. The same also holds true for those who obtain a high score on a divergent-production test. Thorndike has stated that:

> If tests of different "creativity" sub-abilities show very low correlations, then which children will be identified as creative will depend very heavily upon the particular collection of subtests that is used. One assortment, with one type of content or process emphasized, will be likely to pick out quite a different group of "creative" pupils than will a different assortment with a different emphasis.[3]

The results of this research does not support this contention. On examining the eight different profiles, there is no way that the profiles can be labeled according to overall type of content or process. There is no profile which has all of its variables high (above a score of 60) or low (below a score of 40) in terms of content or process.

The conclusions drawn from these results are that no real clear cut modes of expression of creativity have emerged. There are three profiles (O-types 1, 2, 3) which could be

---

3 R.L. Thorndike, "The Measurement of Creativity", Teachers College Record, Vol. 64, No. 5, 1963, p. 423.

labeled as "general low creative profiles", but the reasons why they are low differ. Three profiles emerged as average (O-types 4, 5, 6), but they also are average for different reasons. One profile could be labeled as above average (O-type 7) and O-type 8 could be labeled as high average.

2. Occupational Membership in the O-Types

This section will examine the individuals who make up the various O-types. The subjects for this research represented six logically different occupational groups: language translators, draftsmen, statisticians, patent officers, junior administrators and second language teachers. As mentioned previously, the total number of individuals in all the O-types was 165 with 28 subjects not being assigned to any O-type. Table IX presents the number of subjects according to their occupational group and the profile into which they fell. To test the null hypothesis, i.e., when divergent-production test scores from six heterogeneous occupational groups are analyzed into dissimilar profiles by the BC-TRY method, then there areno significant differences among occupational groups within each divergent-production profile, chi squares where performed on the membership within each O-type. Table X presents the observed and expected frequencies for each occupational group within all the O-types. The expected frequency was arrived at by taking the proportion

TABLE IX.- Differential Membership of the Six Occupational Groups as per the Eight O-Types

O-Types	Occupational Groups					
	Language Teachers	Trans-lators	Adminis-trators	Statis-ticians	Patent Officers	Draftsmen
O-Type 1	0	1	0	0	1	9
O-Type 2	0	2	0	0	4	2
O-Type 3	0	2	0	1	2	7
O-Type 4	6	7	0	4	4	9
O-Type 5	0	8	8	5	11	5
O-Type 6	0	2	2	0	1	7
O-Type 7	5	1	10	10	19	4
O-Type 8	1	1	1	2	1	0

TABLE X.- Observed and Expected Frequencies and Chi Squares for the Six Occupational Groups Within Each O-Type

O-Types		Occupational Groups						Chi Squares
		Language Teachers	Trans-lators	Adminis-trators	Statis-ticians	Patent Officers	Draftsmen	
O-Type 1	fo	0	1	0	0	1	9	
	fe	0.80	1.60	1.40	1.466	2.866	2.866	
O-Type 2	fo	0	2	0	0	4	2	
	fe	0.581	1.163	1.018	1.066	2.084	2.084	
O-Type 3	fo	0	2	0	1	2	7	
	fe	0.872	1.745	1.527	1.6	3.127	3.127	
O-Type 4	fo	6	7	0	4	4	9	14.262*
	fe	2.181	4.363	3.818	4	6	6	
O-Type 5	fo	0	8	8	5	11	5	8.687
	fe	2.69	5.381	4.709	4.933	9.642	9.642	
O-Type 6	fo	0	2	2	0	1	7	
	fe	0.872	1.745	1.527	1.6	3.127	3.127	
O-Type 7	fo	5	1	10	10	19	4	18.88**
	fe	3.563	7.127	6.236	6.533	12.769	12.769	
O-Type 8	fo	1	1	1	2	1	0	
	fe	0.436	0.872	0.763	0.8	1.563	1.563	

** $p < .01$

* $p < .02$

of the occupational group in the total sample and then multiplying the actual number of subjects found within a particular O-type by this proportion. As Table X indicates, many of the expected frequencies are below 10, but since the degrees of freedom are greater than one, the Yates'[4] correction could not be used in the computation of the chi square. There is some disagreement amongst statisticians as to the minimum number of expected frequencies required for each cell. The author of this thesis is following the guideline as set down by Ferguson:

> With 2 or more degrees of freedom, the error introduced by small expected frequencies is of less consequence than with 1 degree of freedom. An expectation of not less than 2 in each cell will permit the estimation of roughly approximate probabilities.[5]

O-types 4, 5 and 7 met this criterion. O-type 7 was significant beyond the .01 level, and O-type 4 was significant beyond the .05 level. O-type 5 did not reach these levels of significance. For two of the three O-types which met the minimum expected frequencies in each cell, it can be stated that the differences between the observed and expected frequencies are significant and cannot be explained by sampling fluctuations.

---

4 J.P. Guilford, Fundamental Statistics in Psychology and Education, New York, McGraw-Hill, fourth edition, 1965, p. 237.

5 G.A. Ferguson, Statistical Analyses in Psychology and Education, New York, McGraw-Hill, 1966, p. 207.

Guilford has stated that differing occupations may express their creativity in one form rather than in another. He has also stated that differing occupations may have differing profiles of creativity. The data presented here support in part Guilford's theory. Of the three profiles that met the assumption regarding the use of the chi square statistic, two support Guilford's contention that differing occupations have differing profiles of creativity. At this point, however, it cannot be concluded that there are differing modes of creative expression according to occupational groups.

SUMMARY AND CONCLUSIONS

Six logically defined occupational groups were administered a battery of 15 divergent-production tests. These groups were empirically grouped into 8 dissimilar O-types through the method of the BC-TRY System. Each O-type was examined to see if the observed frequency of occupational groups within each O-type corresponded to the expected frequency. Two O-types proved to be significant and could not be explained by sampling fluctuations. Guilford's theory that there are differing profiles and that these profiles differ according to occupational groups is supported in part. It could not be concluded that the differing divergent-production profiles are related to a particular mode of expression.

More empirical research is needed in this area. Individuals who have concentrated their efforts in studying creativity state "that multiple types of creative talent exist"[1] and that 'dead-wood' predictors need to be identified so that the validity of the surviving characteristics and the best weighted combination of these for each field could be discovered[2].

---

1 C.W. Taylor, Creativity: Progress and Potential, New York, McGraw-Hill, 1964, p. 25.

2 Idem, Ibid., p. 29.

Creative types have been found in occupational fields. Helson and Crutchfield[3] applied the BC-TRY cluster analysis to a set of personality variables obtained from a group of creative mathematicians. Their criteria for determining creativity differed from this study. The important point, however, is that there were a number of creative types within this one occupation. In a series of studies carried out at the Institute of Personality Assessment and Research, MacKinnon and his associates[4] investigated the areas of creative writing, architecture, mathematics, industrial research, physical science, and engineering. They made the distinction between artistic and scientific creativity where artistic creativity is the externalization of something of the individual into the public field and scientific creativity is when the creative product is unrelated to the creator as a person. A number of univariate analysis have shown that these groups differ significantly on a number of variables, for example, it was found that the creative research scientist was highest on theoretical values as measured by the

---

3 R. Helson and R.S. Crutchfield, "Creative Types in Mathematics", Journal of Personality, Vol. 38, No. 2, June 1970, p. 177-197.

4 D.W. MacKinnon, Proceedings, The Creative Person, a Conference Presented at the Tahae Alumni Centre, October 13-17, 1961, Institute of Personality Assessment and Research, University of California, Berkeley, California, IX Chapters.

Allport-Vernon-Lindzey Study of Values[5] while the creative architect was highest on the esthetic value.

The above two studies indicate that there are different creative types within occupations and between occupations. The variables they used were mainly motivational, temperament and personality. This thesis tried to determine whether occupational groups differed according to aptitudes. Although the findings in this thesis were not overwhelming, this type of research shows some promise.

The lack of more significant results from this research may be due to a number of limitations particularly with regards to the sample. A more stringent criterion for selecting occupational groups is needed. A large enough sample for each occupational group is needed to ensure that sufficient numbers are present within each O-type. Variations of this study are needed. Instead of using all of Guilford's divergent-production tests, only certain ones dealing with specific content controlled for products should be utilized. Although Guilford has not directly stated that certain products are important in specific occupations, one can logically conclude this from the following quote which deals with a discussion on the non-significant results of a training program. Guilford stated that

---

5 G.W. Allport, P.E. Vernon, and G. Lindzey, Study of Values: Manual of Directions (Rev. Ed.), Boston, Houghton Mifflin, 1951.

> Although he had wisely selected abilities in the semantic content area, he had chosen to use tests for products of units and systems, where an examination of the kinds of problems used in the training program would suggest that he might have done better to use tests for the products of transformations and implications.[6]

If, however, one were to use all of the available divergent-production tests, then a cluster analysis (V-analysis) or a factor analysis could proceed the O-analysis.

---

6 J.P. Guilford, "Creativity: Retrospect and Prospect", Journal of Creative Behavior, Vol. 4, No. 3, 1970, p. 160-161.

BIBLIOGRAPHY

Golann, S.E., "Psychological Study of Creativity", Psychological Bulletin, Vol. 60, No. 6, 1963, p. 548-565.
This article reviews creativity from four different emphasis: process, measurement, products and personality. It also presents research data on the relationship between creativity and these four aspects.

Guilford, J.P., "Creativity", The American Psychologist, Vol. 5, No. 9, 1950, p. 444-454.
This is one of the first articles by Guilford on the topic of creativity. It deals with a number of basic hypothesis concerning the nature of creativity. It is in this article that the author states that "there is much room for different types of creative abilities".

Guilford, J.P., "Three Faces of Intellect", The American Psychologist, Vol. 14, No. 8, 1959, p. 469-479.
This article summarizes the theoretical formulations underlying the Structure of Intellect Model. It is this article that stresses the possible relationship between the type of creative expression and different occupations.

Guilford, J.P., and Ralph Hoepfner, "Structure-of-Intellect Factors and Their Tests, 1966", Reports from the Psychological Laboratory, University of Southern California, No. 36, June 1966, 16 p.
This manuscript is of particular importance because it gave an up-to-date analysis of the SI model as well as a description of the tests available for each of the factors. The tests for this study were chosen from this manuscript.

Guilford, J.P., "Creativity: Yesterday, Today, and Tomorrow", Journal of Creative Behavior, Vol. 1, No. 1, 1967, p. 3-14.
The author presents an historical overview of the area of creativity, summarizes his research and proposes areas where future research should concern itself.

Guilford, J.P., The Nature of Human Intelligence, New York, McGraw-Hill, 1967, vii-538 p.
This text is the author's first major publication in which he fully discusses his Structure-of-Intellect theory. The text contains his Model, the representative tests and a summary of his research results. This was a major source for the background literature for this research project.

Mackler, B., and Franklin C. Shontz, "Creativity: Theoretical and Methodological Considerations", The Psychological Record, Vol. 15, No. 2, 1965, p. 217-238.

This article covers all the major theoretical formulations of creativity and presents research and methodological problems inherent in the study of creativity. Guilford's theory along with several others are emphasized.

Parnes, S.J., and Harold F. Harding, Eds., A Source Book for Creative Thinking, New York, Charles Scribner's Sons, 1962, v-393 p.

This book is a compendium of research reports dealing with creativity from many points of view. It contains data on creativity as it is related to education, development, philosophy, problem-solving, and measurement.

Tryon, R.C., and D.E. Bailey, Cluster Analysis, New York, McGraw-Hill, 1970, v-347 p.

This book contains a description of the theory and application of cluster analysis as developed by the authors. It discusses cluster analysis of variables, objects and differential predictive analysis based on clusters. The major statistical method used in this thesis was drawn from this book.

APPENDIX 1

181 Score Patterns for 193 Individuals on Fifteen Divergent-Production Tests Dichotomized as High (Above Z Score of 50) and Low (Below Z Score of 50)

N	Score Pattern														
	Variables														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
3	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L
1	L	L	L	L	L	L	L	L	L	L	H	H	L	L	H
3	L	L	L	L	L	L	L	L	L	H	L	H	L	L	L
2	L	L	L	L	L	L	L	L	H	L	L	L	L	L	H
1	L	L	L	L	L	L	L	L	H	H	L	L	L	L	L
1	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L
1	L	L	L	L	L	L	H	L	H	H	L	L	L	L	L
1	L	L	L	L	L	H	H	L	H	L	H	H	H	H	L
2	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L
1	L	L	L	L	H	L	L	L	L	L	H	H	L	L	H
1	L	L	L	L	H	L	L	L	L	L	H	H	H	H	L
1	L	L	L	L	H	L	H	L	L	H	L	H	H	L	L
1	L	L	L	L	H	H	L	L	L	L	H	H	H	L	H
1	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L
1	L	L	L	H	L	L	L	L	L	L	L	L	L	H	L
1	L	L	L	H	L	L	L	L	L	L	L	L	L	H	H
2	L	L	L	H	L	L	L	L	L	L	L	H	L	H	L
1	L	L	L	H	L	L	L	L	L	H	L	L	L	L	H
1	L	L	L	H	L	L	L	L	H	L	L	L	L	L	L
1	L	L	L	H	L	L	L	L	H	L	L	L	L	H	L
1	L	L	L	H	L	L	L	H	L	L	H	L	H	L	L
1	L	L	L	H	L	L	L	H	L	L	H	H	H	L	H
1	L	L	L	H	L	L	H	L	L	L	L	L	H	L	H
1	L	L	L	H	L	H	H	L	L	L	H	H	L	H	L
1	L	L	L	H	H	L	L	L	L	L	L	L	L	L	H
1	L	L	L	H	H	L	L	L	L	H	H	L	H	H	L
1	L	L	L	H	H	L	L	H	L	L	L	L	H	L	L
1	L	L	L	H	H	L	L	H	H	L	H	H	L	L	H
1	L	L	L	H	H	L	H	L	L	L	L	L	L	H	L
1	L	L	L	H	H	L	H	H	L	H	H	L	H	H	L
1	L	L	L	H	H	H	L	L	L	L	L	L	L	H	H
1	L	L	L	H	H	H	L	H	H	L	H	L	H	H	H
1	L	L	H	L	L	L	L	L	L	L	H	L	H	H	H

181 Score Patterns for 193 Individuals on Fifteen Divergent-Production Tests Dichotomized as High (Above Z Score of 50) and Low (Below Z Score of 50)

N	Score Pattern														
	Variables														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L
1	L	L	H	L	L	L	L	H	H	H	L	H	L	H	H
1	L	L	H	L	L	L	H	L	L	L	L	L	L	H	L
1	L	L	H	L	L	L	H	L	L	L	H	H	L	L	H
1	L	L	H	L	L	L	H	H	L	L	L	L	L	L	L
1	L	L	H	L	L	H	H	L	L	H	L	L	H	H	L
1	L	L	H	L	L	H	H	H	L	L	H	L	L	L	L
1	L	L	H	L	H	L	H	L	L	H	L	L	H	H	H
1	L	L	H	L	H	H	H	L	H	H	L	H	L	H	H
1	L	L	H	L	H	H	H	H	L	H	L	H	L	L	H
1	L	L	H	H	L	L	L	L	H	L	L	L	L	L	H
1	L	L	H	H	L	L	H	H	L	H	H	H	L	H	L
1	L	L	H	H	L	H	L	H	L	H	H	L	L	L	L
1	L	L	H	H	H	H	H	L	H	H	H	L	H	H	H
1	L	L	H	H	H	H	H	H	L	L	H	L	H	L	H
1	L	L	H	H	H	H	H	H	L	H	L	L	H	H	L
1	L	H	L	L	L	L	L	L	L	L	L	H	L	L	L
1	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L
1	L	H	L	L	L	L	H	L	L	H	L	H	L	H	H
1	L	H	L	L	L	L	H	H	H	L	H	L	H	L	L
1	L	H	L	L	L	H	H	L	H	L	H	L	H	L	H
1	L	H	L	L	L	H	H	H	H	H	H	L	L	L	L
1	L	H	L	L	H	L	H	H	H	L	L	H	H	H	H
1	L	H	L	L	H	L	H	H	H	L	H	H	L	H	H
1	L	H	L	L	H	H	H	L	L	L	L	L	L	L	L
1	L	H	L	L	H	H	H	L	L	H	H	H	H	H	L
1	L	H	L	H	L	L	L	H	H	H	H	H	L	L	H
1	L	H	L	H	L	L	H	L	H	L	L	H	H	L	H
1	L	H	L	H	L	L	H	H	L	L	H	L	L	H	H
1	L	H	L	H	L	L	H	H	H	L	H	H	H	L	H
1	L	H	L	H	H	L	L	L	L	L	L	H	L	L	L
1	L	H	L	H	H	L	L	H	L	L	H	H	L	L	L
1	L	H	L	H	H	L	L	H	L	H	H	L	H	L	H
1	L	H	L	H	H	L	H	L	H	L	H	H	H	L	L
1	L	H	L	H	H	H	L	L	H	L	L	H	L	L	H
1	L	H	L	H	H	H	H	L	L	H	H	H	H	H	H
1	L	H	H	L	L	L	H	H	H	L	H	L	H	H	H

181 Score Patterns for 193 Individuals on Fifteen Divergent-Production Tests Dichotomized as High (Above Z Score of 50) and Low (Below Z Score of 50)

N	Score Pattern														
	Variables														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	L	H	H	L	L	H	L	L	H	H	L	H	L	L	H
1	L	H	H	L	L	H	H	L	L	L	H	L	L	H	H
1	L	H	H	L	L	H	H	H	L	H	L	L	L	L	H
1	L	H	H	L	L	H	H	H	L	H	H	L	L	L	H
1	L	H	H	L	L	H	H	H	H	H	H	H	H	L	H
1	L	H	H	L	H	L	L	L	L	L	H	H	H	H	H
1	L	H	H	L	H	H	L	H	L	L	H	L	H	H	H
1	L	H	H	L	H	H	H	H	L	H	L	L	L	H	L
1	L	H	H	L	H	H	H	H	L	H	H	L	H	L	H
1	L	H	H	H	L	L	L	L	L	H	L	H	H	L	H
1	L	H	H	H	L	L	L	L	H	L	L	H	L	L	H
1	L	H	H	H	L	H	H	L	L	L	H	L	L	H	H
1	L	H	H	H	L	H	H	H	L	L	H	H	H	L	H
1	L	H	H	H	L	H	H	H	H	H	L	L	L	H	L
1	L	H	H	H	H	L	L	H	L	L	H	H	L	H	H
1	L	H	H	H	H	L	L	H	H	L	L	L	L	H	H
1	L	H	H	H	H	L	H	L	H	H	L	L	H	H	H
1	L	H	H	H	H	L	H	H	L	L	H	H	H	H	H
1	L	H	H	H	H	L	H	H	H	H	H	H	L	H	H
1	L	H	H	H	H	H	L	L	L	L	H	L	L	L	H
1	L	H	H	H	H	H	H	H	H	L	L	L	H	H	H
1	L	H	H	H	H	H	H	H	H	L	H	L	H	L	H
1	L	H	H	H	H	H	H	H	L	L	H	H	H	H	L
1	L	H	H	H	H	H	H	H	L	L	H	L	H	L	H
1	L	H	H	H	H	H	H	H	L	H	L	L	L	H	L
1	L	H	H	H	H	H	H	H	L	H	H	L	H	L	H
1	L	H	H	H	H	H	H	H	H	L	L	L	H	L	H
1	L	H	H	H	H	H	H	H	H	L	H	L	H	H	H
1	L	H	H	H	H	H	H	H	H	L	H	H	L	H	H
1	L	H	H	H	H	H	H	H	H	H	L	L	L	H	L
1	L	H	H	H	H	H	L	L	L	L	H	L	L	L	H
1	L	H	H	H	H	H	H	H	H	L	L	L	H	H	H
1	L	H	H	H	H	H	H	H	H	L	H	L	H	L	H
1	L	H	H	H	H	H	H	H	H	L	H	H	H	L	H
1	L	H	H	H	H	H	H	H	H	L	H	L	H	H	L
1	H	L	L	L	L	L	L	L	L	L	H	L	L	H	H
1	H	L	L	L	L	L	L	H	H	L	H	H	L	L	H
1	H	L	L	L	L	H	L	H	L	L	L	L	H	L	H
1	H	L	L	L	H	L	H	L	L	L	L	L	H	H	H
1	H	L	L	L	H	L	H	L	H	H	L	H	H	H	H
1	H	L	L	H	L	L	L	L	L	L	H	H	L	L	L
1	H	L	L	H	L	L	L	H	H	L	H	L	H	L	H
1	H	L	L	H	L	L	L	H	H	L	H	H	H	L	H
1	H	L	L	H	L	L	H	L	L	L	L	H	L	L	H
1	H	L	L	H	L	L	H	L	L	L	L	H	L	H	L
1	H	L	L	H	L	H	L	L	L	L	L	L	L	L	L
1	H	L	L	H	L	H	L	L	H	L	L	L	L	L	H
1	H	L	L	H	L	H	L	L	H	L	L	H	L	H	L

181 Score Patterns for 193 Individuals on Fifteen Divergent-Production Tests Dichotomized as High (Above Z Score of 50) and Low (Below Z Score of 50)

N	Score Pattern														
	Variables														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	H	L	L	H	L	H	L	H	L	H	L	H	L	H	H
1	H	L	L	H	H	L	L	L	L	L	L	L	L	L	L
1	H	L	L	H	H	L	L	L	L	H	L	L	H	H	L
1	H	L	L	H	H	L	L	L	H	L	H	L	H	H	H
1	H	L	L	H	H	L	L	H	H	L	H	L	L	H	L
1	H	L	L	H	H	L	H	H	L	H	H	L	H	H	L
1	H	L	L	H	H	H	L	H	L	H	H	H	H	L	L
1	H	L	L	H	H	H	H	L	H	H	L	L	H	H	L
1	H	L	H	L	L	L	L	L	L	L	H	L	L	L	H
1	H	L	H	L	L	H	L	L	L	L	L	L	L	L	H
1	H	L	H	L	L	H	H	H	H	H	H	H	L	H	H
1	H	L	H	L	H	L	H	H	L	H	L	L	L	L	L
1	H	L	H	L	H	L	H	H	L	H	H	L	H	H	L
1	H	L	H	L	H	H	H	H	L	L	L	H	H	L	H
1	H	L	H	H	L	L	L	L	H	L	L	L	L	L	H
1	H	L	H	H	L	L	H	L	H	L	H	H	H	H	H
1	H	L	H	H	L	L	H	H	L	L	L	L	L	H	L
1	H	L	H	H	L	H	L	L	H	L	L	L	L	H	L
1	H	L	H	H	L	H	L	H	H	H	H	H	L	H	H
1	H	L	H	H	L	H	H	H	H	H	L	H	H	L	L
1	H	L	H	H	H	L	L	L	L	L	L	L	L	H	H
1	H	L	H	H	H	L	H	H	L	H	L	H	H	H	H
1	H	L	H	H	H	L	H	H	L	H	H	H	H	H	L
1	H	L	H	H	H	L	H	H	H	H	H	L	H	L	H
1	H	L	H	H	H	H	L	H	H	H	H	L	H	L	H
1	H	L	H	H	H	H	H	L	H	H	H	H	H	H	H
1	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H
1	H	L	H	H	H	H	H	H	H	L	H	L	H	L	L
1	H	H	L	L	L	L	L	H	L	L	L	H	H	L	H
1	H	H	L	L	H	L	H	H	L	L	H	L	H	H	H
1	H	H	L	L	H	H	H	H	H	H	H	H	H	H	H
1	H	H	L	H	L	L	L	L	L	H	H	H	H	L	L
1	H	H	L	H	L	H	L	H	L	H	H	H	L	L	H
1	H	H	L	H	L	H	H	H	L	H	H	H	L	L	L
1	H	H	L	H	L	H	H	H	H	L	L	L	L	H	L
1	H	H	L	H	H	L	L	H	L	H	L	H	H	L	L
1	H	H	L	H	H	H	L	L	L	H	H	L	H	L	L

181 Score Patterns for 193 Individuals on Fifteen Divergent-Production Tests Dichotomized as High (Above Z Score of 50) and Low (Below Z Score of 50)

N	Score Pattern														
	Variables														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	H	H	L	H	H	H	H	L	L	L	L	H	L	L	H
1	H	H	L	H	H	H	H	H	H	H	L	H	L	H	H
1	H	H	L	H	H	H	H	H	H	H	H	L	H	L	H
1	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
1	H	H	H	L	L	L	L	L	L	L	L	L	H	L	H
1	H	H	H	L	L	L	L	L	L	H	L	H	L	L	L
1	H	H	H	L	L	L	H	H	L	H	L	H	H	H	H
1	H	H	H	L	L	H	L	H	H	L	H	H	L	L	H
1	H	H	H	L	L	H	L	H	H	H	H	H	H	H	H
1	H	H	H	L	H	L	H	H	H	H	H	H	H	L	H
1	H	H	H	L	H	H	L	L	L	L	H	H	L	L	H
1	H	H	H	L	H	H	L	H	H	H	H	L	H	L	H
1	H	H	H	L	H	H	L	H	H	H	H	H	L	L	H
1	H	H	H	L	H	H	H	L	L	H	L	H	L	H	H
1	H	H	H	L	H	H	H	L	L	H	H	H	H	L	H
1	H	H	H	L	H	H	H	H	L	L	H	L	H	H	H
1	H	H	H	H	L	H	H	H	H	H	H	L	L	H	H
1	H	H	H	H	L	H	H	H	H	H	H	H	H	H	L
1	H	H	H	H	H	L	L	H	L	H	L	L	H	L	H
1	H	H	H	H	H	L	H	L	L	L	H	L	H	L	H
1	H	H	H	H	H	L	H	L	L	H	L	L	H	H	H
1	H	H	H	H	H	L	H	H	L	H	H	L	H	H	L
1	H	H	H	H	H	L	H	H	H	H	H	H	H	L	L
1	H	H	H	H	H	H	L	L	H	H	L	H	H	H	H
1	H	H	H	H	H	H	L	H	H	L	H	H	H	L	H
1	H	H	H	H	H	H	H	L	H	L	L	H	H	L	L
1	H	H	H	H	H	H	H	L	L	H	H	L	L	L	H
1	H	H	H	H	H	H	H	H	L	H	H	L	H	H	L
1	H	H	H	H	H	H	H	H	L	H	H	H	L	L	H
1	H	H	H	H	H	H	H	H	H	L	H	H	L	L	H
1	H	H	H	H	H	H	H	H	H	L	H	H	L	L	H
2	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
1	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L
1	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L
1	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

APPENDIX 2

ABSTRACT OF

Divergent Production Profiles and Occupational Membership[1]

The present investigation is a research study having as its primary focus the investigation of one aspect of Guilford's Structure-of-Intellect Model. It was designed to assess whether one can empirically establish "creativity" profiles based upon a particular type of communication (semantic, symbolic, and figural) and test whether a particular profile is linked with a specific occupation.

The experiment consisted of testing six occupational groups with fifteen of Guilford's divergent-production tests. The test results were subjected to an empirical O-type clustering as devised by the BC-TRY System. Membership within each profile was tabulated and a chi square statistic was then employed.

The null hypothesis stated that when divergent-production test scores from six heterogeneous occupational groups are analyzed into dissimilar profiles by the BC-TRY method, then there is no significant differences between occupational groups within each divergent-production profile.

---

1 L.W. Slivinski, master's thesis presented to the Faculty of Psychology of the University of Ottawa, Ontario, 1971, vi-78 p.

Eight dissimilar profiles were found. However, none of them could be labeled as being of a particular creative type in terms of creative expression. In the first chi square analysis, significant differences were found for occupational membership within three profiles. When some of the groups were collapsed, a significant difference was found for occupational membership within one profile. On this basis, the writer concluded that his results in part support one aspect of Guilford's Structure-of-Intellect Model. However, due to certain limitations in sample size, the results are interpreted with caution. Further areas of research and methodological considerations are advanced.