An examination of preference for complexity and its relation to creativity

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Abstract

At a theoretical level, preference for complexity was considered within the framework of creativity with the emphasis upon self-actualization as opposed to productivity. The experimental work can be divided into three main sections.

I. A developmental sample of 284 children, aged from 6 to 18, and 64 parents stated their preferences to three measures comprising stimuli varying in complexity: the Revised Art Scale (RA) of the Welsh Figure Preference Test, Berlyne's Figures, and the Random Polygons, the principal score on the latter measure being the Polygon $\bar{X}$ or the average of the number of points on the figures the subject liked. In general, there is consistency of simplicity—complexity preference. Therefore, it seems more reasonable to propose that such preference taps an underlying simplicity—complexity dimension of personality. Additional evidence relevant to the construct validity of complexity preference as an index of self-actualization was provided by the study with the 53 ESN children and the study with the 19 fifth-form art students.

Separating the sample into developmental subgroups, it was seen that the 6- to 7- year-olds and the adults tended to prefer less complexity on the RA and Berlyne's Figures; however, between the ages of 8 and 18, there was little change in complexity preference. The majority of subjects liked a moderate amount of complexity, that is, had scores falling within the medium range (10–14) on the Polygon $\bar{X}$. Furthermore, on the basis of cluster analyses, which aligned the RA, Berlyne's Figures, and the Polygon $\bar{X}$ in low, medium, and high terms, the largest number of subjects were placed in the medium scoring clusters.

II. Impression Formation Tests, one suitable for children and one for adults, were administered for the purpose of discovering whether complexity

preference indicates that an individual attempts to structure complexity. For the 231 children tested, no relation emerged between complexity preference and impression formation ability. For the 64 adults, positive correlations occurred between impression formation ability and complexity preference on the RA and Berlyne's Figures. Reasons for the disjunction between the children's and the adults' results were discussed.

III. Responses of parents in relation to those of their children were also examined. It was suggested that it might be important to take account of the effect of both parents, as a family entity, upon the child's complexity preference.

Throughout, the findings have been interpreted with a view to the lines which future research might profitably take.

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Statement of Purpose

The central concern of this research is to examine in depth a construct which has been related to creativity: preference for complexity. In order to accomplish this purpose, the necessary background literature in the two relevant areas of creativity and complexity will be reviewed.

A Review of the Creativity Literature

A striking feature of the literature on creativity is the diversity of definitions and approaches implemented. Yamamoto (1965c) refers to the "confused abundance" of the literature. As Day (1968a) has remarked: "Creativity is one example of a concept which has been proposed and described independently by so many theoreticians that there is no consistency in its definition, leading to obscure and ambiguous usage" (p.486). Specifically, he notes that this has resulted in a redundancy of conceptualization, where very different terms are used to designate roughly the same referent, while many theoretical formulations and measures of the same term have been created which bear little or no relationship to one another. One central contradiction stems from the view that in children creativity is universal. Anderson (1959) asks, "Why not take any generation of small children, already creative, and find out how to cultivate them?" (p.267). Yet it is found in few adults, many researchers restricting their investigations to those, judged on the basis of productivity by experts in their fields, to be creative (e.g., MacKinnon, 1962, 1965).

Creativity, as commonly defined, refers to behavior which occurs relatively infrequently, is uncommon under given conditions, and is relevant to these conditions. Criteria of relevance and uncommonness must be established for any given situation. The behavior is always relative, either in relation to the individual's past experience, or more important, to the norms of the population of which he is a member. Klein, Barr, and Wolitzky (1967) feel that this definition of creativity with its stress on novelty and originality in problem-solving, its context in action, is appropriate for science and invention. However, they maintain that the humanistic or artistic conception of creativity, which has as its context experience, with goals of meaning, and consciousness expansion, has been neglected. In their opinion, these two conceptions seem quite separate.

Fromm (1959) clarifies this dichotomy by his contention that there are two types of creativity: creativity in the sense of creating something new; and creativity as an attitude or character trait, the ability to see, to be aware, and to respond, which implies being sensitive to that of which one is aware. In May's (1959) words, "the encounter of the intensively conscious human being with his world" (p.68). Creativity in this latter sense does not refer to a quality which only gifted individuals can achieve, but to an attitude which every human being can develop. For the purposes of this research, the distinction will be made between great-talent or great-achievement creativity, which is manifest in productivity frequently at or near the boundaries of knowledge, and personal-living creativity which is characterized by self-actualization. The emphasis will be upon the personal-living type, and the meaning of self-actualization will now be explicated. Further consideration will later be given to the similarities and differences between these two views of creativity.

<u>Self-Actualization</u>

According to Goldstein (1939), self-actualization is the only motive which the organism possesses. What appear to be different drives such as hunger, power, achievement, and curiosity are rather concrete expressions of the sovereign purpose of life, to actualize oneself. When an individual is hungry, he actualizes himself by eating; when he desires to know, he actualizes himself by obtaining knowledge. The satisfaction of any particular need is in the foreground when it is a prerequisite for the self-actualization of the total organism. Self-actualization is the creative trend of human nature: it is the organic principle by which the individual becomes more fully developed and more complete. Although self-actualization is a universal phenomenon in nature, the specific ends towards which people strive vary from person to person. This is because people have different innate potentialities that shape their ends and direct the lines of their individual development and growth, as well as different environments and cultures to which they must adjust and from which they must secure the necessary materials for growth.

Maslow (1959, 1970), basing his definition of self-actualization upon Goldstein's, nevertheless uses it in a much more specific and limited manner. His theory of human motivation differentiates between basic needs and metaneeds. The basic needs are such as hunger, affection, security, and self-esteem. They may be considered external qualities that the organism lacks and therefore requires. Metaneeds include justice, goodness, beauty, order, and unity. The metaneeds are growth needs, whereas the basic needs are deficiency needs. The basic needs are prepotent over the metaneeds and are arranged in a hierarchical order. The metaneeds have no hierarchy, they are equally potent, and can be fairly easily substituted for one another. An individual who is realizing these metaneeds is self-actualizing.

Self-actualization refers to man's desire for self-fulfillment: it is the intrinsic growth of what is already in the organism, or more accurately of "what is" the organism itself. As a result, the specific form that it takes will vary greatly from person to person. Maslow also makes the distinction between this self-actualizing creativeness and what he calls special-talent creativeness. The former is a potentiality for all individuals and is released by basic satisfaction, the latter, he feels, may occur in spite of lack of basic satisfaction. Dow's (1959) view of creativity corresponds closely to Maslow's self-actualizing creativeness: Creativeness develops from man's natural endowment, his characteristic ability to think, and his distinctive talents. Ability to think, in this sense, does not mean capacity of the mind for thought, or IQ; it is a pure expression of the individualism of every mind. When this is combined with the person's particular talent, which is also idiosyncratic, a force exists which, if not diverted by a requirement for conformity, can be nothing but original.

Carl Rogers (1947, 1951, 1970) has also formulated a theory implementing the idea of self-actualization: "The organism has one basic tendency and striving — to actualize, maintain, and enhance, the experiencing organism" (1951, p.487). The central construct of his framework is the concept of self, or self as a perceived object in a phenomenal field. Based on the theoretical positions of Cooley (1909, 1922) and Mead (1934), he maintains that as a result of interaction with the environment, and particularly as a result of evaluational interaction with others, a portion of the total perceptual field gradually becomes differentiated as the self. He (1970) defines the self-structure as, "the organized, consistent conceptual gestalt composed of perceptions of the "I" or the "me" and the perceptions of the relationships of the "I" or the "me" to others and to various aspects of life, together with the values attached to these perceptions. It is a gestalt which is available to awareness though not necessarily in awareness. It is a fluid and changing gestalt, a process, but at any given moment it is a specific entity" (p.529).

Psychological adjustment exists when the concept of the self is such that all the sensory and visceral experiences of the organisms are, or may be, assimilated on a symbolic level into a consistent relationship with the concept of self. The values attached to experience and those which are a part of the self-structure are of two kinds: those experienced directly by the organism, and those values taken over or introjected from others, but perceived as if they had been experienced directly. As the individual moves toward psychological health, he perceives and accepts into his self-structure more of his organic experiences; he finds that he is replacing his present value system, based largely upon introjections which have been distortedly symbolized, with a continuing organismic valuing process. Valuing in the "mature individual" is fluid and flexible, based on the particular moment, and the degree to which the moment is experienced as enhancing and actualizing (Rogers, 1964). Values are not held rigidly but are continually changing; the self-concept becomes more congruent with the total experiences of the organism. If complete congruence is achieved, the individual is a "fully functioning person." The end-point of personality development is considered to be a basic congruence between the phenomenal world of experience and the conceptual structure of the self.

Rogers (1959) considers the motivation for all creativity to be man's tendency to actualize himself, to become his potentialities.

By this he means the directional trend which is evident in all organic and human life: the urge to expand, extend, develop, and mature; the tendency to express and activate all the tendencies of the organism, to the extent that such activation enhances the organism or the self. He defines the creative process as "the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people or circumstances of his life on the other" (p.71). However, he does not draw a line between great-talent or great-achievement creativity and personal-living creativity, and points out that his definition makes no distinction regarding the degree of creativity. A child inventing a game, an individual's continual process of developing his own value system, a theorist formulating a hypothesis are all creative in terms of his definition; there is no attempt to set them in some order of more or less creative.

The type of criticism which can be levied against the foregoing theories of self-actualization, particularly those of Maslow and Rogers, is that they are almost philosophical interpretations of intuitions derived from the therapeutic milieu. Next an experimental study which presents evidence of the distinction between creative productivity and creative attitudes, pertinent to the great-achievement, personal-living dichotomy, will be considered in some detail. Further evidence of the experimental basis of self-actualization will be presented later in this chapter, in the discussion of the motives posited to underlie creativity.

The Taft and Gilchrist (1970) study is based on Fromm's (1959) distinction between the creativity which refers to the production of something new which is tangible to others, and that which refers to a type of attitude which may exist even when no product results. This creative attitude is defined in terms of awareness of, and responsiveness to, experience. One hundred and twelve female and 81 male university students were tested to investigate the relationship between these two aspects of creativity. Specifically, measures of the two types of creativity were correlated with a self-checking list of traits and with measures of other personality and background variables. The correlation between scores on the Creative Interest Scale of the Zimmerman-Guilford Interest Inventory and ratings of level of productivity, assessed from self-reports of the creative activities of the subjects, was r= .28, significant beyond the .01 level for the sample size. Nevertheless, the experimenters point out that although this figure is significant, it indicates a relatively small degree of overlap between creative attitudes and creative productivity; they are largely independent dimensions.

High scorers on both dimensions saw themselves as unconventional, prepared to take risks, disorderly, impulsive, observant, imaginative, idealistic, concerned with beauty, and subject to emotional conflicts. Those with high scores on creative attitudes alone manifested traits associated with self-actualization, as well as the above. In addition, their responses to an Experience Questionnaire suggested intense emotional response to everyday occurrences, and changed states of consciousness indicative of controlled regressive experiences. However, in this study, self-actualizing creativeness was not related to creative productivity. On the other hand, MacKinnon (1965) comments with regard to his group of architects rated highly creative on the basis of productivity in their field: "... what is most impressive about Architects I is the degree to which they have actualized their potentialities; they have become in large measure the persons they were capable of becoming" (p.280).

High scores on creative productivity alone were more related to lack of self-control and neurotic symptoms. This corresponds to Maslow's (1959,1970) view that special-talent creativity can arise in spite of lack of basic satisfaction; whereas satisfaction is a necessary condition for self-actualizing creativeness. Yet, MacKinnon (1965) notes that on several of the measures of tension, conflict, and anxiety administered, the more creative Architects I and the less creative Architects II obtain very similar scores. He contends that what appears to give Architects I a greater capacity to handle the psychic turbulence which they also experience is higher ego-strength and self-assertiveness. In Barron's (1958) words, "they are both crazier and saner." Crutchfield (1963) also found that his more creative subjects were higher in ego-strength and in the ability to cope with stress. The less creative were more anxious, exhibiting more emotional constriction, lack of spontaneity, repression of impulse, and tendency toward indirect expression of hostility. The important conclusion to be drawn for the design of this research is that self-actualizing creativeness and creative productivity may or may not occur together. Therefore, it will be essential to determine a measure of creativity which relates to self-actualization.

Criteria of Creativity

Taylor (1964) maintains that creativity is complex rather than unitary. Taylor, Smith, and Ghiselin (1959) administered a large number of measures to a group of research scientists. The measures were refined to yield 56 scores for each subject, including, supervisor, peer, examiner, and self-evaluation; counts of reports and publications; official records; and membership in professional societies. Factor analysis yielded 27 factors. The finding that among the many correlations 4 out of any 5 variables were independent of a given criterion was presented as evidence of the "almost overwhelming complexity of the criterion problem." Jackson and Messick (1965) in their discussion of the criteria for creativity, point out that each view of creativity implies a position about the nature of the creator, which in turn helps to determine the types of variables emphasized in its assessment. Criteria of creativity will now be evaluated with regard to the requirements of this study:

1. that the measure be suitable for the self-actualization approach to creativity;
2. that the measure be suitable for use within a large age range;
3. that the measure be independent of intelligence.

The latter stipulation will be discussed later in this chapter and in the chapter on ESN (educationally subnormal) children.

The following examination of the research literature, which will revolve around the search for a measure adaptable to the self-actualization view of creativity, will also serve to further delineate the definition of self-actualizing creativity to be utilized as a basis for this study. There has not been a great deal of experimental work done on self-actualizing creativeness, and therefore to some extent, its meaning must be elucidated in comparison with the research on great-achievement creativity.

I. The Product

The advantages of the product as a criterion variable have been frequently cited, as products are the most "tangible" manifestations of creativity (Taylor, 1964). According to Jackson and Messick (1965), the essential requirements a product must fulfill before it can be designated creative are: unusualness, that is infrequency in relation to some population or group norm; appropriateness, the goodness of fit of the product in terms of its context; transformation, defined as the transcendance of conventional forms; and condensation, the summary power of the product, the degree to which it may be expanded and interpreted in a number of ways. Ghiselin (1963a) differentiates two levels of creativity. A higher, primary level introduces some new order of significance, while a lower, secondary level gives further development to an established body of meaning through initiating some advance in its use. He proposes that the measure of a creative product be the extent to which it restructures our universe of understanding. This is analogous to the earlier delineation of great-achievement creativity characterized by productivity at or near the boundaries of knowledge. Apart from the consideration that there would be little continuity in the population norms for comparison in a developmental study, with subjects ranging from 6 years to adulthood, the argument has already been presented that self-actualizing creativeness and creative productivity are distinguishable dimensions. A product-type criterion measure would therefore not be suitable for employment in the present context.

According to Guilford (1950), creativity refers to the abilities that are most characteristic of creative people. He (1959b) has recommended a trait approach for the study of creativity and maintains that the most defensible way of discovering dependable primary traits is factor analysis. His factor analytic studies have led to the development of a three dimensional model of the structure of the intellect (Guilford,1959a,1967). Each dimension represents one of the modes of variation of the factors:

1. The type of material or content involved.

2. The operations or psychological processes performed upon the different varieties of content; this category includes convergent and divergent production.

3. The resultant products. In this system, each primary intellectual ability represents a kind of operation applied to a kind of material, yielding a kind of product.

The divergent-convergent production distinction has been most frequently implicated in the discussion of creativity. The unique feature of divergent production is that a variety of responses is produced; the product is not completely determined by given information. This type of ability has been related to creativity and is reflected in the measuring devices Guilford has designed or adapted: his tests require individuals to state defects or deficiencies in common implements or institutions; to produce words containing a specified letter or combination of letters; to produce in a limited time as many synonyms as they can for a stimulus word; to produce phrases or sentences; to specify objects with certain property requirements; or to give various uses for a common object. The tests can be scored for fluency, that is the number of responses; for flexibility, or the width of the range of ideas; and for originality, in terms of the infrequency of the occurrence of the response in the sample population. In contrast, convergent production occurs when the input information is sufficient to determine a unique answer. It is this type of ability which is emphasized in traditional intelligence tests.

The divergent production tests have some internal validity or factorial validity. However, the essential question to be considered is whether they are creativity tests. With respect to architects judged highly creative by experts in their own field, MacKinnon (1961) established that whether scored for quality or quantity of responses, the Guilford tests did not correlate well with the degree of creativity demonstrated in their creative production. Substantiating this, Gough (1961) presented evidence indicating that for research scientists, rated creativity correlated low or negligibly with various Guilford tests: Unusual Uses (quantity -.05, quality .27); Consequences (quantity -.27, quality -.12); Gestalt Transformations (.27). In a study of air force officers, Barron (1955) reported a positive multiple correlation of .55 between rated originality and a composite divergent production score including Guilford tests. The results therefore with emminent adults are not consistent.

In an investigation of sixth form school boys, Hudson (1966) found that scientists were better at convergent thinking, and arts specialists at divergent thinking, and that apart from this difference, either type of student can manifest creativity in his own way. He argued that the distinction between divergent and convergent thinking does not seem to be related to creativity; it is much more closely related to the differences between arts and science specialists. However, he also suggested that while scientists may be relatively low scorers on divergent thinking tests, those scoring high within the group range might prove more creative than low scorers. Thus, another possibility is that both divergent and convergent abilities may be implicated in creativity. Guilford (1950) does not regard creativity as a single variable: "Within the factorial frame of references there is much room for different types of creative abilities" (p.451). He (1967) asserts that although the divergent production factors and tests have relevance in connection with the measurement of creative potential, creative potential is very complex, and there is a notable possibility that almost any other ability, including some of the convergent production ones, may be involved. Butcher (1972) maintains that processes of thinking have been too rigidly classified as convergent or divergent. His suggestion is that it might be more profitable to treat the distinction between divergent and convergent production not as a dichotomy but as a continuum and to construct tests accordingly.

The argument for not utilizing the divergent production criterion does not stem from the inconsistencies of the research findings. To some extent, such discrepancies are found with respect to most of the criterion variables (Yamamoto 1965b). Rather, the divergent thinking approach, with its emphasis on productivity and product-oriented types of response, seems more relevant to the great-achievement view of creativity. In addition, the status of the relationship between divergent and convergent abilities, or in more generic terms between creativity and intelligence is not clear.

II. Creativity and Intelligence

Guilford (1950) has based his approach to creativity on his conception that creativity cannot be accounted for in terms of high intelligence or IQ alone: "If the correlations between intelligence-test scores and many types of creative performance are only moderate or low, and I predict that such correlations will be found, it is because the primary abilities represented in those tests are not all important for creative behavior. It is also because some of the primary abilities important for creative behavior are not represented in the test at all" (p.447). This conclusion has resulted in the delineation of the divergent production factors, and the question has arisen as to the degree of separation of these abilities from the convergent production ones. Thus much of the research on the creativity-intelligence distinction has been generated by the structure of intellect model, and the criterion measures of creativity employed have often been the divergent thinking tests.

One of the major studies in this area is that of Getzels and Jackson (1962, 1963) who, following Guilford, objected to the definition of the gifted child as one with a high IQ. Furthermore, they objected to the restriction of the term creative to the child with artistic talents. Their position was that measures of creativity as well as those of IQ should be considered appropriate defining characteristics of giftedness. Using an IQ measure (Stanford-Binet, Wechsler Scale for Children, or Henmon-Nelson) and 5 creativity measures (Word Association, Uses for Things, Hidden Shapes, Fables, and Make-up Problems), they found the correlation between IQ and these Guilford-derived creativity tests to be on the order of .3. Assuming that they had isolated a creativity dimension, they selected two experimental groups of highly gifted adolescents. One group was composed of children who placed in the top 20% on the creativity measures in comparison to age peers of the same sex, but below the top 20% in IQ. The second group consisted of students who placed in the top 20% in IQ, but below the top 20% on the creativity tests. Various personality and motivational differences were discovered between the two groups and attributed to the divergent-convergent dichotomy. A significant criticism of the study is that the school sample was atypical, having a mean IQ of 132. Even the supposedly low IQ, high creativity subjects were very intelligent with a mean IQ of 127.

After reviewing many of the studies which have reported a distinction between creativity and intelligence, Wallach and Kogan (1965) reached the conclusion that few of these studies demonstrated both convergent validity, in which intercorrelations of many different measures of creativity were high, and discriminant validity, in which intercorrelations of the creativity measures with intelligence were low. This is another criticism which applies to the Getzels and Jackson research: the intercorrelations among their creativity tests were no higher than those among creativity and intelligence tests. Wallach and Kogan hypothesized that a separate creativity dimension might manifest itself if the assessment situation was relaxed and nonevaluative, and time limits were dispensed with. Utilizing a Guilford-derived battery of creativity measures, designed to test Mednick's (1962) associative theory of creativity, 10- and 11-year-olds were seen in a playful and game-like atmosphere. Under these conditions, creativity was found to be independent of intelligence: the average correlation between the creativity measures was .41, between the intelligence measures was .51, but the average correlation between the two sets of measures was .09. Ward (1968), administering divergent thinking tests to 7- and 8- year-old boys in a permissive setting with no time restrictions, found individual differences to be reliable across the tests, and independent of IQ. Similarly, Nicholls (1971) reports intelligence and measures of divergent thinking to be unrelated under game-like conditions of divergent thinking assessment. Cropley (1968) presented the Wallach and Kogan battery of creativity tests in a nonevaluative context, and details similar results: the creativity tests manifested a high degree of internal consistency and were relatively independent of the intelligence tests. However, a principal component factor analysis also revealed a large general factor accounting for 28.8% of the variance with high loadings from both creativity and intelligence tests. There is thus some support for the contention that the relaxation of time limits and the reduction of anxiety induced by a test-like atmosphere are more conducive to the disclosure of a dimension of creativity independent of intelligence. But the issue remains unsettled. Another suggestion is that creativity is independent of intelligence above a certain "threshold level" of intelligence.

MacKinnon (1962) maintains that over the whole range of intelligence and creativity, there is a positive relationship between the two variables. Nevertheless, he states: "Above a certain required minimum of intelligence which varies from field to field and in some instances may be surprisingly low, being more intelligent does not guarantee a corresponding increase in creativeness. It is just not true that the more intelligent person is necessarily the more creative one" (p.488). Among his group of creative architects, rated creativity correlated -.08 with intelligence on the Terman Concept Mastery Test. Barron (1968) is in agreement with this theory and suggests that above an IQ of 120, measured intelligence appears to be an unimportant factor in creativity. Yamamoto's (1965a) data also support the threshold concept; he found a consistent decrease in the size of the correlation between creativity and intelligence as the IQ level of his subgroups became higher. McNemar (1964) argued that there should be a triangular scatter diagram between criterion measures of creativity and intelligence: "At high IQ levels there will be a very wide range of creativity whereas as we go down to average IQ, and on down to lower levels, the scatter for creativity will be less and less" (p.879). Analyzing correlational data from different sources, with different age and educational levels as well as different measures of intelligence represented, Guilford (1967) produced a similar triangular scatter plot. He suggests that the pattern of the distribution indicates that although high IQ is not a sufficient condition for high creative ability, it is almost a necessary condition.

The threshold hypothesis appears to be a more tenable position with regard to the creativity-intelligence distinction; however, there is some conflicting evidence. Ginsburg and Whittemoore (1968) using Mednick's (1962) Remote Associates Test (RAT) as their criterion of creativity, found a positive linear relationship between IQ and creativity throughout the IQ range. The criticism of this study is that the RAT is more a test of intelligence, or convergent thinking: the association required as a response is remote, but it is the one "correct" association. Lovell (1968) in a study of 8- to 12- year-olds, all of whom had obtained a WISC verbal score of 140 or more, found a large general component running through the intellectual tasks and a series of Guilford-derived creativity tests. Even within this highly selective sample, it accounted for almost one-half of the identified variance.

The strongest conclusion warranted on the basis of all the findings is that creativity is relatively independent of IQ above a threshold level in the region of 120. Thus it appears that intelligence is an essential, although not sufficient, prerequisite for great-achievement creativity. With regard to personal-living or self-actualizing creativeness, Rogers (1947, 1951) notes that in the course of therapy, as the person approaches psychological health and the self-concept becomes more congruent with all the experiences of the organism, a common insight arrived at is that the self has a capacity for reorganization and development. The assumption of this research is that "the self can be an architect of the self" (Rogers, 1947), regardless of the level of intelligence. If an individual has a high IQ, this is part of his potential to be actualized; its realization may result in great-achievement creativity. If an individual has a low IQ, great-achievement creativity may be very unlikely; however, he is capable of developing his potentialities.

III. The Process

Gruber, Terrell, and Wertheimer (1963) maintain that creativity varies in degree and in kind and therefore the essential continuity is to be found not in the product but in the creative process. Ghiselin (1952) defines the creative process as "the process of change, of development, of evolution, in the organization of subjective life" (p.12). As applied to self-actualizing creativeness, this refers to the subjective life of the individual; with regard to great-achievement creativity, it refers to the subjective life of both the individual and society. Wallas (1926) described the stages involved in the creative process in the following manner: preparation, incubation, illumination, and verification. While the four stages are distinguishable from one another, Wallas points out that they do not necessarily occur in an uninterrupted problem and solution sequence. Thomson (1959) notes that the four stages may overlap or they may take place in a slightly different order.

Preparation refers to the individual's familiarizing himself with his situation and the materials and circumstances at his disposal.

In the case of great-achievement creativity, this implies an acquisition of knowledge in the field of endeavour. However, this working within the boundaries of the organism-environment interaction constraints can be regarded as a condition of all thinking oriented towards reality. Ghiselin (1952, 1963b) contends that the phases which are most characteristic of creative thinking are incubation, which involves unconscious processes, and illumination or inspiration, in which the solution is grasped or intuited. Drawing mainly upon anecdotal descriptions by men of genius of their creative processes, Ghiselin (1952) elaborates: "Creation begins typically with a vague, even a confused excitement, some sort of yearning, hunch, or other preverbal intimation of approaching or potential resolution" (p.14). Sometimes there is awareness of a state even more primitive, one of complete indecision. Therefore, he emphasizes that the first impulse towards a new order is, as it must be, a move away from the clearly determined, from the conscious activity already in motion. Creation is characterized by an impulse towards unconsciousness, or "a consciousness partly unfocused."

Neisser (1963), considering theories of thinking, remarks that they frequently distinguish between two types of mental processes, variously labelled as, primary and secondary, tacit and explicit, creative and constrained, intuitive and rational, and productive or insightful and rote. He feels these dichotomies share a common core of meaning and suggests they can be explained by the use of a computer analogy involving the difference between multiple and sequential processing. Specifically, in the computer, multiple processing is better adapted to deal with novel or irregular input. He therefore hypothesizes that creative, intuitive, and productive thinking depend on the use of multiple sequences of mental activity. While sequential processing, which is less wasteful and better adapted to fully predictable situations, corresponds to the more reality-oriented types of thinking.

Neisser's theory is that human thinking is a multiple activity in which a number of more or less independent trains of thought usually co-exist. In the normal course of events, however, there is a "main sequence" in progress, dealing with some particular material in a step by step manner; he regards this as a necessary adaptive mechanism. The main sequence, which corresponds to the ordinary train of consciousness, may or may not be influenced by other processes going on simultaneously. Because consciousness is intrinsically single, these concurrent operations are not conscious. They, in turn, can combine and influence one another in many ways. He notes that people differ greatly in the degree to which they are capable of using the multiplicity of their own thoughts. By means of experiments on visual scanning behavior or "visual search," Neisser (1964) has obtained evidence that people are able to carry out a multiplicity of processes together. He found that with practiced searchers, the time-per-letter is no longer in a search for ten letters than it is in a search for one or two. In addition, this finding generalizes to the search for particular kinds of words. His conclusion is that it is likely to apply to other searches as well.

With regard to creativity, Neisser (1963) contends that its defining characteristic is not so much the quality of the product, nor its uniqueness in history, but rather a certain freedom from constraint in the process itself. It is generally attested that this process is not conscious (Ghiselin, 1952). However, as Taft (1971) has pointed out, creativity requires both primary and secondary activity. Or as Blatt, Allison, and Fernstein (1969) express it, "Creative functioning, however, requires both capacities: the ability to suspend logical considerations temporarily and to think in novel and possibly nonlogical and unconventional ways, and the capacity voluntarily to stop this more regressive mode of functioning and to return to more secondary modes of functioning where novel thoughts are placed in appropriate and realistic contexts" (p.286). A study by Hersh (1962) based on the hypothesis that creativity requires mobility in terms of regression and progression, that is in the ability to utilize processes at both the mature and primitive levels, offers experimental support for this view. Analyzing Rorschach protocols of emminent artists, normals, and schizophrenics, his findings were: Compared to noncreative normals, the artists produced on the "mature" level more human movement and more form-dominant responses of an articulated nature, and on the "primitive" level, more primitive thought processes. The normals produced more of the mature types of response than the schizophrenics, and few primitive responses of any sort. The schizophrenics lacked the mature levels shown by the other two groups. The data support the thesis that the creative individual can make use of primitive operations by imposing more mature processes on them, while the schizophrenic is overwhelmed by his primitive functioning, and the noncreative individual is restricted in his ability to function primitively. It is to be noted that one of the distinguishing traits of the self-actualizing creative in the Taft and Gilchrist (1970) study was the use of controlled regressive experiences, which in turn corresponds to Rogers (1951, 1959) characterizing the self-actualizing individual as one who is open to all his experiences.

As Bolton (1972) has indicated, once access has been gained to the primary mode of thought, the question still remains as to how it is integrated with the analytic mode within focal awareness. Neisser (1963) seems to advocate an explanation in terms of association: if analyses are occurring simultaneously along related sequences, there may come a moment when a "higher order operation" can combine them adaptively. Higher order operations, resulting in novel syntheses, can ensue at both the unconscious and the conscious levels. This view is congruent with Mednick's (1962) definition of the creative process as "the forming of associative elements into new combinations which either meet specified requirements or are in some way useful" (p.221). However, for the purposes of this research, the important point to be drawn from the above delineation of the creative process is that it appears to be a common feature of both self-actualizing and great-achievement creativeness. The problem which arises is that the creative process cannot be studied directly but only by inference, and as Dellas and Gaier (1970) point out, a test of creativity is not "creativity," just as a test of intelligence is not "intelligence."

IV. The Person.

Guilford (1950), at an early stage in his research on creativity, expressed the opinion that noncognitive elements can also be instrumental for an understanding of the subject: "Creative productivity in every-day life is undoubtedly dependent upon primary traits other than abilities. Motivational factors (interests and attitudes) as well as temperamental factors must be significant contributors" (p.454). In 1967, he again stressed that if a satisfactory view of the behavior in creativity is to be obtained, motivational aspects must be considered. MacKinnon (1962) contends that if an individual has the minimum of intelligence required for the mastery of a field of knowledge, whether his performance in that field is creative or mundane is largely a function of personality factors. Or in Thomson's (1959) words, "It is not so much the capacities as the manner in which they are applied which counts" (p.200). In self-descriptions, MacKinnon's (1962) group of creative architects emphasized their inventiveness, independence, and individuality. The results from scores on the California Psychological Inventory depict the creative individual as self-assured, autonomous and flexible, and strongly motivated to achieve primarily in those situations where independent thought and action, rather than conformity, are required. Although socially poised and confident, he is not particularly interested in the impression he makes on others, and is not of an especially sociable or participative temperament. He is relatively free from conventional restraints and inhibitions, and ready to recognize and admit self-views that are unusual and unconventional. Through analysis of profiles on the Minnesota Multiphasic Personality Inventory (MMPI), and life history interviews, the basic quality which is revealed is an openness to experience, and especially to experiences of one's inner life. On the Strong Vocational Interest Blank, the architects emerge as intellectually curious, and relatively disinterested in policing either their own impulses and images or those of others.

Implementing the Sixteen Personality Factor Test, Cattell (1963a) found that the characteristic personality profiles of creative individuals in both the arts and sciences are very similar. In addition, creative artists and research scientists differ significantly on the whole personality factor profile from those who are of equal ability and academic training but who are not creative (Cattell, 1963b, 1963c). Thus the difference between the creative and the noncreative person seems to lie more in the area of personality than in the area of special ability tests.

In most general terms, Cattell describes the creative person as a self-sufficient introvert as indicated by his significantly higher scores on Factor A- (reserve), Factor F- (desurgency), which loads on such qualities as reticence and introspection, and Factor Q2+ (self-sufficiency). However, Factor H+ (venturesomeness) is high in creative individuals in the opposite direction from that which would be expected from the introversion trend: The person who scores high on Factor H tends to be ready to try new things, spontaneous and abundant in emotional response. He is able to face wear and tear in dealing with people and gruelling emotional situations without fatigue. The overall picture reinforces the one presented by MacKinnon.

Barron (1966) formulates a cogent argument for the examination of personality in relation to creativity: "There is reason to believe that originality is almost habitual with individuals who produce a really singular idea. What this implies is that a highly organized mode of responding to experience is a precondition for consistent creativity. And from what we know about the relationship between thinking and behavior, we certainly should expect that some aspects of an individual's personality will play an important role in his capacity to think and act creatively" (p.6). He (1955, 1958, 1968) reports that, compared with noncreative individuals, those rated creative or who score high on creativity measures are marked by independence of judgment, confidence, flexibility, rebelliousness, and nonconformity. They display wider interests, prefer complexity, and are more accepting of apparent disorder. On the basis of psychiatric interviews, they emerge as having more complex personality structures and greater potential for ego-syntheses. They reject suppression as a mechanism for the control of impulse, which implies that they forbid themselves fewer thoughts and are disposed to entertain impulses and commonly unacceptable ideas. Considered altogether, the findings of the various researchers suggest that there is a distinguishing pattern of personality traits among creative persons, and that this pattern, rather than a configuration of cognitive abilities, is common to creativity independent of field.

In a review of the creativity research carried out with children, Arasteh (1968) points out that noncognitive factors concerned with motivation and personality are being recognized as important for the understanding of creativity in children as well as in adults. Even at the preschool level, there appear to be wide individual differences in such factors as nonconformity, freedom of expression, playfulness, and curiosity. Creative children, in general, are characterized as being highly sensitive to their environment, and at the same time, independent and nonconforming in thought and behavior.

The results of a study by Ward (1969) emphasize the influence of noncognitive elements. He administered three ideational fluency measures to 34 7- and 8- year-old boys, and designated as creative those having high response fluency. He found that response rate decreased and average uncommonness of responses increased over time. The creative children who produced more ideas gave them at a higher rate; however, they did not differ from the uncreative children either in their proportion of uncommon responses throughout the task, or in the rate at which their successive responses became less stereotyped. Therefore, Ward argues that personality and motivational variables, by affecting the amount of effort invested in the task, seem more salient than any differences in cognitive abilities, that is in the number and richness of potential responses which the child has stored. Hudson (1966, 1970), after failing to find a clear-cut relationship between creativity and divergent thinking in arts and science students, similarly suggested that the roots of creativity do not seem to lie in cognitive abilities, but rather in personality and motivational variables.

Schaefer and Anastasi (1968) developed and cross-validated biographical inventory keys with American public high school boys, subdivided into creative and matched control groups in the arts and the sciences. Creative students were selected on the basis of teachers' nominations supported by creative products. Implementing the same biographical inventory, Anastasi and Schaefer (1969) also developed and cross-validated a creative arts and a creative writing key with high school girls. In the two studies, the final keys, composed of items that differentiated in both initial and cross-validation samples, were used to describe biographical correlates of creativity. Considering the results of both studies together, there are certain common characteristics of creative adolescents cutting across both sex and field: continuity and pervasiveness of interest in their chosen fields; educational superiority of their families; and prevalence of unusual, novel, and diverse experiences in their backgrounds. With regard to the latter difference, Anastasi and Schaefer suggest it may indicate greater readiness to acknowledge unusual experiences and less reluctance to report them.

Summarizing the findings of various research efforts designed to determine the personality traits of creative children, Dellas and Gaier (1970) report that the characteristics consistently identified are independence, dominance, autonomy, unconventionality, broad interests, and openness to feelings. These characteristics are in accord with those delineated by Arasteh (1968) and Anastasi and Schaefer (1968, 1969). In addition, they bear similarities to the traits which distinguish creative adults. Dellas and Gaier concluded that the traits appear to develop quite early, and that their demonstration at a young age suggests that they may be determinants of creative behavior, rather than evolving in response to recognition of creative behavior.

Maslow (1959) contends that self-actualizing creativity, which may result in great and obvious products, as well as manifesting itself widely in the ordinary affairs of life, springs much more from the personality than from any particular abilities. He has found self-actualizing individuals to demonstrate openness to experience, to be more independent, more spontaneous and less controlled and inhibited in their behavior, and less self-critical. Another quality which distinguishes these persons is that they are relatively unfrightened by the unknown, the mysterious and the puzzling, and are often positively attracted by it. The conditions within the individual which Rogers (1959) identifies as being associated with a potentially creative act are very similar. Like Maslow, he emphasizes the importance of openness to experience, defined in terms of a lack of rigidity, a permeability of boundaries in concepts, beliefs, perceptions, and hypotheses; and a tolerance of ambiguity where ambiguity exists. In addition, he mentions an internal locus of evaluation which involves such qualities as independence of judgment, self-reliance, and self-confidence.

Thus, it appears that personality traits play a significant role in the determination of both great-achievement and personal-living creativity. The characteristics consistently implicated in both views are openness to experience and independence of judgment. For the purposes of this study, it has been assumed that the creative process is a common feature of both self-actualizing and great-achievement creativeness. A tenable argument can be made for the importance of each of these qualities in relation to the creative process: openness to experience implies the capacity to regress and to be aware of the multiplicity of one's own thoughts; independence of judgment implies the willingness to admit and to utilize one's unusual, unconventional, or unacceptable impulses and ideas. It has been suggested (Allen and Levine, 1968; Crutchfield, 1963) that conformity, which involves an acceptance of group norms, tends to inhibit creativity by alienating the individual both from reliance on his own thought processes, and from contact with basic reality.

Complexity as Related to Creativity

One of the forms in which openness to internal and external experience manifests itself is in a predisposition to allow into the perceptual system complexity, disorder, ambiguity and inbalance for the satisfaction and challenge of achieving an idiosyncratic new order. Consistent with the emphasis on an ordering principle, Barron (1966) postulates that the human act of creation involves a reshaping of given material whether physical or mental. The "something new" then is a form made by the reconstitution of, or generation from, something old. With regard to self-actualizing creativeness, an added stipulation will be that the form may be new to the person or new in the sense of unique, which corresponds to Taylor's (1964) distinction between individual and social creativity.

Implementing a test of perceptual preference, the Revised Art Scale (RA) of the Welsh Figure Preference Test (WFPT), which consists of line drawings varying along the dimension of simplicity—complexity, Barron (1958, 1966, 1968) discovered that creative persons, regardless of field, tend to prefer complexity. He (1958, 1963) explains this preference in terms of the motive, "need for disorder": the creative response to "apparent" disorder is to attempt to find an elegant new order more satisfying than any that could be evoked by a simpler configuration. Pointing out that the ego is associated with order, the unconscious with disorder, Barron posits that creative persons, in their generalized preference for disorder and complexity, turn much more than do most people to the dimly realized life of the unconscious. They are confident that the irrational in themselves will generate some ordering principle if it is permitted expression and admitted to conscious scrutiny. In other words, the creative individual courts the irrational as a source of novelty in his own thoughts. As it appears that the Revised Art Scale is a measure of openness to experience, and is related to the underlying creative process, it will be employed as the criterion of creativity in this research.

Dellas and Gaier (1970), surveying the inconclusiveness of the data generated by a product-oriented approach to creativity, maintain that "until the personological context in which the cognitive variables are embedded is determined, real measures of the dimension of creativity remain elusive" (p.59). Similarly, Golann (1963) does not feel that the product approach will provide a comprehensive understanding of creativity. Again emphasizing the importance of personality, his suggestion is that the attempt be made to isolate the contribution of a single criterion, a personality or stylistic mode variable which has been repeatedly linked to creativity. Within such a framework, some of the important questions for consideration would be: How does this personality trait, stylistic or motivational mode of interacting with the environment develop? What are the environmental, interpersonal, and intrapersonal conditions that favour or discourage its manifestation? How in turn are these factors related at different age levels to behavior judged to be creative? The beginnings of the effort to answer the questions posed will be made with preference for complexity, particularly the RA scale, as the criterion variable.

Creativity as Self-Actualization

Mooney (1963) proposes that a comprehensive understanding of creativity will entail the study of the person, his environment, the transaction between the two, and the consequent adaptation. In agreement with this view, Stein (1959) regards creative behavior to be a function of the transactional relationship between the individual and his environment. Rogers (1959) contends that the self-actualizing individual attempts to experience his environment in new ways, and to deal actively with his environment in such a way as to express himself, to experience "the me in action." With the locus of creativity in the relationship between the individual and his environment, the following definition is in accord with the personal-living approach: Creativity is present when the interaction between the uniqueness of the individual, and the materials, events, people, or circumstances of his life results in the emergence of a thought or action which is new to the individual concerned and has value for him.

The primary feature of motivation is the tendency to deal with the environment. The question arises as to why some persons strive to experience their environments in new ways and others do not. This is the question of the motivation for creativity. An early view of motivation was that certain drives or physiological states, such as hunger and thirst, impelled the organism to action. The drive was reinforced by drive- or tension-reduction. On the other hand, Maddi (1965) contends that one of the requirements of creativity motivation is that it lead the person in the direction of increasing, rather than decreasing, stimulation and tension. Harlow (1953) moved the focus of attention from drive state and drive-state reduction to certain incentive characteristics of external stimuli; he posited a curiosity-manipulative drive. His research has shown that monkeys both learn to solve mechanical puzzles (Harlow, 1950; Harlow, Harlow, and Meyer, 1950) and learn discrimination problems (Harlow and McClearn, 1954), when no motivation other than the manipulation of the materials involved, is provided. Such behavior can be most readily conceptualized by postulating that under certain circumstances reinforcement is correlated with an increase in arousal or excitement rather than a decrease.

However, the framework within which creativity motivation will be considered is that of Bindra (1968), who advances a central, incentive view of motivation in contrast to the earlier peripheral, drive view. In addition, he places the emphasis on the organism in transaction with its environment: neither the organismic drive state nor the presence of an incentive stimulus is in itself sufficient to account for behavior. A Central Motive State (CMS) results from the interaction of conditions in the individual and in the environment. A CMS has both a selective-attention and a response-bias function. That is, it creates a general readiness for sensory input and motor output; the exact objects attended to and the exact responses made depend on the characteristics of the situation. A CMS can be quite specific, for example in the case of hunger, or it can be more pervasive, such as preference for simplicity or complexity, which is a sort of generalized "set" towards the environment. Consistent with this approach is Barron's (1968) interpretation of the liking for either simplicity or complexity: The types of perceptual preference observed are related basically to a choice of what to attend to in the complex of phenomena that makes up the world we experience; for the world is both stable and unstable, predictable and unpredictable, ordered and chaotic. To see it predominantly as one or the other is a sort of perceptual decision. One may attend to its ordered aspect, to regular sequences of events, to a stable corner of the universe, or one may attend primarily to the eccentric, the relative, and the arbitrary aspect of the world (p.198).

Preference for complexity would appear to involve an increase in stimulation. Bindra (1959) contends that increased stimulation can be reinforcing. Leuba (1955) has advanced the concept of optimal stimulation, which is subject to variation at different times; learning is associated with movement toward this optimal level, upward when the stimulation is too low, and downward when it is too high. In a similar line, Fiske and Maddi (1961) have formulated a comprehensive theory of activation: Activation refers to the degree of excitation of a postulated centre in the brain, in the "conceptual nervous system" (Hebb, 1955). Each organism has a characteristic or typical level of activation which it attempts to maintain because doing so is conducive to maximum comfort. The property of a stimulus which can affect activation level is termed impact; its sources are variation, intensity, and meaningfulness, generically referred to as "varied experience."

Whenever the actual level of activation is lower than that which is characteristic, a condition resulting from an insufficient amount of impact, a need for increased stimulation exists. Furthermore, Fiske and Maddi maintain that characteristic level of activation differs from person to person.

What kinds of motivation are consistent with the desire for increased stimulation or varied experience? White (1961) has proposed the "concept of competence" which refers to the individual's capacity to interact effectively with his environment. This involves discovering the effects he can have on the environment and the effects the environment can have on him. The general idea is very similar to Piaget's (Flavell, 1965) concept of the functional invariants, that is organization, and adaptation, including assimilation and accommodation. These functional characteristics remain essentially constant through life and make possible the emergence of cognitive structures from the organism-environment interaction: "It is by adapting to things that thought organizes itself and it is by organizing itself that it structures things" (p.48). To account for this type of interaction with the environment, White has postulated an "effectance motivation." He feels that a drive which has no consummatory climax seems to require the formulation that an increase in arousal can function as a reinforcement; it is difficult to associate reinforcement with a transition from alertness to boredom, or with an abatement of interest in the environment. Effectance motivation involves satisfaction, in the form of a "feeling of efficacy," in transactions in which behavior has an exploratory, varying, experimental character and produces changes in the stimulus field. Having this character, the behavior leads the organism to find out how the environment can be changed and what consequences result from these changes. Therefore the satisfaction lies in a trend of behavior, rather than in a specific goal that is achieved. Effectance motivation, with regard to a particular situation, subsides when that situation has been explored to the point that it no longer offers new possibilities. However, there will be individual differences in the degree to which people are willing to admit and to consider possibilities.

Frenkel-Brunswik (1949) formulated the concept of "intolerance of ambiguity" to account for the finding that some individuals tend to insist on definiteness and lack of shading in their worlds, with the consequence that certain aspects of experience have to be kept out of awareness. Cohen, Stotland, and Wolfe (1955) have carried out an experimental study of need for cognition, defined as the need to structure situations in meaningful, integrated ways. The experimental stimuli were two forms of the same story, one ambiguous, the other structured. They found that persons with a high need for cognition expressed significantly more negative affect in the ambiguity condition than in the structure condition; persons with low need for cognition did not differ from condition to condition. In addition, high need individuals perceived the structured situation as significantly more anbiguous than did the low need individuals. A tenable hypothesis seems to be that all individuals desire to understand and make reasonable the experiential world. However, they vary in the extent to which they endeavour to assimilate ambiguity, complexity, and disorder into their integrations. Relevant to this tolerance of disorder, Barron (1968) regards preference for complexity and simplicity as generalized experiential dispositions: "... the preference for complexity is associated with a perceptual attitude that seeks to allow into the perceptual system the greatest possible richness of experience, even though discord and disorder result, while the preference for simplicity is associated with a perceptual attitude that allows into the system only as much as can be integrated without great discomfort and disorder, even though this means excluding some aspects of reality" (pp. 207-208).

Kagan (1972) suggests that there is a primary "motive for mastery" based on three related themes: the desire to match behavior to a standard, to predict events, and to define the self. Uncertainty is an underlying condition of this motive. The performances and experiences of the self are a fundamental source of uncertainty: each individual wants to determine the quality and uniqueness of his own self. As a result, the motive for mastery can be gratified in most behavioral contexts, from those of intellectual achievement to those of everyday living. In other words, there are secondary, more particular motives, which vary from individual to individual, implemented to realize the primary motive of mastery. An additional stipulation is that a person seeks uncertainty when he feels that he can handle it; he avoids uncertainty when he believes that he cannot. Thus there will be individual differences in the tolerance of uncertainty.

As previously discussed, Rogers (1959) regards the motive for creativity to be self-actualization, that is man's tendency to actualize himself, to become his potentialities. It is proposed that self-actualization is a more specific form of White's effectance motivation or Kagan's motive for mastery. Maddi (1965) contends that two factors involved in consistent creativity are the need for quality and the need for novelty, which are relatively concrete expressions of the more general tendency toward self-actualization. The individual motivated toward quality does not merely want evidence that he has an effect on the environment or that he is competent; these things are relevant but not enough. Rather, he desires to exercise his capacities in such a way that he sees himself doing things that are special and valuable in his own terms. This idea is embodied in Roger's concept of an internal locus of evaluation which he considers to be an essential condition of creativity. The person motivated toward novelty finds the unusual, the rare, the unlikely, and the unexpected rewarding. It is not that the novelty is instrumental and therefore useful, but instead that its occurrence produces the pleasant emotional response of surprise, while its absence brings the unpleasant emotional response of boredom. Another important difference between self-actualization and effectance or mastery is the degree of openness to experience, involving tolerance of ambiguity, complexity, and disorder. Openness to experience is a fundamental characteristic of self-actualization; however, it appears to be variable within the other two theories. Maddi concludes that the creative individual will have intense needs for both quality and novelty: need for quality implying persistence and independence; liking for novelty implying openness to experience.

Golann (1962) has carried out research which offers support for the conception that preference for complexity, as measured by the RA of the WFPT, is related to self-actualization. He proposed a creativity motive, referring to the tendency for people to differ in the extent to which they will endeavour to experience their fullest perceptual, cognitive, and expressive potentials in their interaction with their environments. He felt that a person's attempt to realize his potential more fully would often lead to behavior which was creative in terms of his previous repertory, and perhaps to behavior judged by others to be creative in a larger sense. More specifically, such an individual would prefer objects and situations which permitted personal or idiosyncratic ways of dealing with them. In the first experiment, the entire WFPT was administered to 150 undergraduates. The usual response to each item is like or dislike; however, the subjects were instead instructed to write down what each figure reminded them of, or what they thought it might represent. From this information, an ambiguity score for each item was determined. Ambiguity in this context, did not refer to haziness or lack of structure in the figure itself; rather, it was defined in terms of the number of different associations from a group of subjects. With respect to the RA scale, it was found that the 30 figures generally liked by creative individuals were significantly more ambiguous or evocative than those they disliked ($p<.001$). In contrast, there was no significant difference in ambiguity between the items most and least liked by people in general. A second experiment, comparing scores of 6th- and 8th- grade students on the RA with scores on a forced-choice questionnaire, indicated that individuals who tended to prefer the ambiguous, complex figures also expressed preference for activities and situations which permitted more self-expression and utilization of creative capacity. On the other hand, low RA subjects preferred more routine, structured, and assigned activities. Thus, it appears that preference for complexity is one manifestation of a type of interaction with and attitude toward the environment which is characteristic of self-actualization.

Summary

In this chapter, a view of self-actualizing creativity, distinct from creative productivity, was presented. The research literature was examined in the attempt to determine a criterion variable which would relate to self-actualizing creativeness. It was concluded that the creative process is implicated in this type of creativity; however, the process cannot be studied directly, only by inference. Two personality characteristics which appear to distinguish self-actualizing individuals are openness to experience and independence of judgment. It was suggested that these qualities also are involved in the creative process. Preference for complexity, particularly as measured by the RA of the WFPT, appears to be a manifestation of openness to experience. In addition, Golann (1962) presents evidence which indicates that the RA scale is related to self-actualization. Therefore, it was chosen as the criterion of self-actualizing creativity for this research. In the next chapter, the RA scale, as well as the other measures of visual complexity implemented in this study, will be considered in detail.

CHAPTER II.

Complexity and Its Measurement

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Preference for complexity is a construct implicated in the creativity literature. The theoretical basis for the posited relationship between creativity and complexity has been examined. The development of the RA scale and its experimental correlates will now be considered. However, complexity is also embedded in other research traditions. There has been a great deal of interest in the relation of age to preference level. In addition, complexity has been implemented as a measure of curiosity, for example, in Berlyne's work. In this study the correlations of the RA scale with other measures of complexity will be an important concern, and so the supplementary measures to be utilized will be discussed in the context of their research backgrounds. The examination of the pattern of correlations should serve two purposes: 1. at an experimental level, it will help to determine whether preference for complexity is consistent within the individual; 2. at a theoretical level, it may make it possible to clarify preference for complexity in the creative individual by integrating other explanations of this type of preference with the one advanced in connection with creativity.

The Development of the RA Scale

The Welsh Figure Preference Test (Welsh, 1959a, 1959b) consists of 400 black-and-white ruled or freehand line drawings, to each of which the subject is asked to respond "Like" or "Don't Like" by entering a mark on a standard answer sheet. A factor analysis indicated that most of the variance in this choice task was accounted for by two factors: 1. a general acceptance—rejection factor, that is the tendency of the subjects to either like or dislike a figure; 2. a second bipolar factor, interpreted as simplicity-symmetry and complexity-asymmetry. In other words, there are some drawings about which people agree. If one person likes them almost everyone will like them, and if one person dislikes almost everyone will dislike them. However, there are other drawings about which people disagree. These drawings define the bipolar factor and divide people into two groups. When the drawings which arouse this strong disagreement are examined, it is seen that some people are especially fond of figures drawn according to an easily recognized geometric principle and usually described by subjects as clean, regular, neat, and well-ordered; these are the simple-symmetrical figures. On the other hand, some people prefer drawings which resemble childish scrawls or unarranged scribbles and are described as dynamic, irregular, whimsical, complicated, messy, or even chaotic. These drawings delineate the complex-asymmetrical end of the bipolar dimension.

In the attempt to determine the relationship of aesthetic choice to personality, Barron and Welsh (1952) administered the Welsh Figure Preference Test (WFPT) to 37 artists and 150 "people in general." On the basis of an item analysis, they developed a new scale, the Barron-Welsh Art Scale (BW), consisting of the 40 items disliked at the .01 level of significance more frequently by artists than nonartists, and the 25 items liked at the .05 level of significance more by artists than nonartists. The 40 figures disliked by the artists were all simple-symmetrical drawings, while most of the 25 figures liked more by the artists were complex-asymmetrical; a high score on the BW scale is in the direction of high complexity preference. The overall scores on this scale separated the original group of artists and nonartists at the .0001 level of significance. When cross-validated with an additional sample of 30 artists and 30 nonartists, the scale significantly separated ($p < .001$) these new samples. With a group of 250 people in general, Welsh (1959b) derived the Revised Art Scale (RA) by contrasting the choices of individuals who placed at the extremes in terms of their scores on the BW. Again, a high score on the RA indicates high preference for complexity. A correlation of .85 has been reported between the BW and the RA (Welsh, 1959b) and the item overlap is extensive. The advantage of the RA over the BW is that it is composed of 60 items, 30 of which are scored in the "Like" and 30 in the "Don't Like" direction, thus eliminating most effects of response sets. Administering the RA to two groups of university students, Welsh (1959b) has found great consistency, with test-retest reliabilities of .94 and .90. Furthermore, in a study of 368 gifted high school students, Welsh (1966) found that although the correlation between the two intelligence measures implemented, the Terman Concept Mastery Test (CMT) and the nonverbal D-48, was significant, the correlations of both tests with the RA scale were essentially zero, .03 with the CMT and .07 with the D-48.

<u>Personality Correlates of the Art Scales</u>

With the development of the BW, Barron and Welsh (1952) had a scale which distinguished between artists and nonartists, but the question remained as to whether preferences were more related to differences in aesthetic judgment or to differences in underlying personality characteristics. In a comprehensive study of 40 graduate students, Barron (1952) inferred the values of the subjects from fine art preferences. The students were asked to classify 105 postcard-size, colour reproductions of paintings including a wide range of content, style, and period. He found that the paintings liked "best of all" by the high BW scorers were those liked "least of all" by the low BW scorers. Specifically, he reports that high BW subjects approved of the modern, experimental, the primitive, and the sensual; they disliked the aristocratic, traditional, and emotionally controlled. Whereas, the low BW subjects approved of good breeding, formality, religion, and authority, and rejected the daring, the esoteric, or sensual. Thus, there appear to be aesthetic differences. In addition on the Gough Adjective Check List, the high scorers tended to describe themselves as gloomy, loud, unstable, bitter, cool, dissatisfied, pessimistic, emotional, irritable, and pleasure-seeking, while the low scorers more frequently checked contented, gentle, conservative, unaffected, patient, and peaceable. Similarly, Welsh (1959b) reports self-descriptions on the Adjective Check List such as adventurous, aggressive, argumentative, artistic, impulsive, individualistic, rebellious, and unconventional for high RA scorers, in contrast to conservative, contented, conventional, easygoing, industrious, pleasant, and sentimental for low RA scorers.

In studies designed to extend the research on personality differences with respect to the BW, Barron (1953a, 1953b, 1958) has found: artistic preference, that is preference for complexity-asymmetry is positively related to rapid personal tempo, impulsiveness, and expansiveness; it is negatively related to rigidity, control of impulse by repression, social conformity, ethnocentrism, and political-economic conservatism; it is positively related to independence of judgment, originality, and breadth of interest. On the basis of these findings, Barron (1966, 1968) has conceptualized a personality dimension of simplicity—complexity and remarks that the persons investigated have themselves proved as groups to be as different from one another as the figures they prefer and in rather analogous ways. Those who prefer the simple-symmetrical drawings are described by other people as conservative, organized, conventional, occasionally even rigid. Those who prefer the complex-asymmetrical drawings are described as unconventional, original, dynamic, and sometimes as radical and rebellious.

Frenkel-Brunswik (1949) has argued that formal style elements or structural aspects of the personality, such as exaggeration, easy generalization, intolerance of ambiguity, and so on, are more pervasive, persistent, and general within the personality than such content elements as the Oedipus complex, sibling rivalry, specific erotic and aggressive impulses, and the like. She contends that "the formal elements of personality style are not in the same manner subject to censorship — in the psychoanalytic sense of the term — as is the more concrete content of wishes and instinctual tendencies" (p.140). Furthermore, this view has led to the suggestion that perceptual styles or preferences may be indications of deeper personality organizations. For example, Frenkel-Brunswik (1951) postulates that "a certain inability, in the perceptual and cognitive approach of an individual to tolerate more complex, conflicting or open structures might, it seemed, occur also to a certain extent in the emotional and social areas" (p.393). Or as Linton (1955) suggests, perceptual tasks may tap a deeper, more enduring layer of the person: "As an expression of the person's characteristic ways of responding to stimuli, perception is primary, since it must precede any cognitive or social behavior" (p.506). With the development of the BW and the RA, Barron and Welsh appear to have derived testing instruments which measure both simple—complex perceptual preferences and also a relevant underlying personality dimension.

A General Criticism of the Presented Viewpoint

One of the criticisms levied against the Art Scales is that there is a disjunction between the verbal level of theoretical interpretation and the experimental level of observation and measurement. More specifically, the question arises: Is there a general factor of preference for complexity? It seems essential to clear up this issue before assuming that simplicity or complexity preferences reflect simplicity or complexity within individuals. The simplicity—complexity dimension was not inherent in the construction of the figures in the Welsh Figure Preference Test, rather it was an interpretation applied to the drawings as the result of a factor analysis. Deciding to investigate the unidimensional nature of the BW, Eysenck and Castle (1970) factor analyzed it and found a simplicity factor (Factor 1) and three independent complexity factors: complexity may arise because geometrical figures can be complicated in various ways (Factor 2), because irregular freehand drawings of a nonrepresentational kind can be made (Factor 3), or through the use of representational drawings (Factor 4). Two higher order factors were extracted and interpreted as simplicity (Factor 1) and complexity (Factors 2, 3, and 4 combined); however, the correlation between these two factors, $r = .09$, suggested independence rather than polarity. Finally, a third-order extraction revealed a single factor, which corresponded quite closely with the Barron-Welsh hypothesis, predicting all but two of the "Like," "Don't Like" marking on the scoring key. Eysenck and Castle conclude, "In this very limited sense, therefore, the Barron-Welsh intuitive marking system is upheld" (p.525).

An associated issue was examined by Moyles, Tuddenham, and Block (1965); they were interested in the relation between simplicity—complexity and symmetry—asymmetry with respect to the BW and RA scales. As they were able to derive a set of items from the WFPT in which simplicity—complexity and symmetry—asymmetry were uncorrelated, they suggest that the two dimensions can be distinguished. However, the correlation between the two dimensions for the entire 400 items of the

WFPT was .74, for the BW it was .82, and for the RA it was .89. Thus, it appears that the original formulation of the fused stimulus dimension, simplicity-symmetry versus complexity-asymmetry, is accurate in terms of both Art Scales. Nevertheless, the question of the relationship between symmetry—asymmetry and complexity preferences remains unsettled and will be further considered in this chapter.

Bieri (1961) maintains that in the development of art preference scales, it would seem important to determine the various stimulus characteristics which can enter into the overall designation of a drawing as either simple or complex: "What is needed, then, in the studies of preference for complex stimulation is a more rigorous definition of what constitutes a complex stimulus" (p.377). He feels this would be advantageous in that it would make it easier to determine the consistency of preference across a range of stimuli varying considerably in kind. In turn, this would be instrumental in the attempt to discover whether preference for complex stimulation in a variety of situations is associated with an underlying personality disposition.

<u>The Definition of Complexity</u>

Attneave and Arnoult (1956) define form as "a somewhat vague set of properties invariant under transformations of colour and brightness, size, place and orientation" (p.463). They have emphasized the need for an adequate psychophysics of shape or form for two related reasons: 1. If a random sample of a stimulus-domain defined by a set of rules could be constructed, it would be feasible to generalize from findings with these experimental stimuli to the entire stimulus-domain, or parent population. 2. If the psychologically important parameters of natural forms could be determined, experimental stimuli could be constructed to possess the same parameters. That is, the stimuli would have "ecological validity" and findings could more reasonably be extended to "real" situations. With regard to the first concern, Attneave and Arnoult have described seven methods for generating "random" shapes. The common property of these methods is that certain physical characteristics of the stimuli are systematically varied, and the remainder are randomly determined.

Implementing 72 shapes constructed according to various methods, Attneave (1957) had 168 subjects rate them on a 7-point complexity scale. He found that the major portion of the variance in the complexity judgments was accounted for by the number of distinguishable angles or turns involved in the construction of the shapes. Thus, it appears that the amount of physical variation in a stimulus may be a primary determinant of its judged complexity. However, he also suggests that a better approximation would require some adjustment for repetitions sequences of elements. This implies the predictability of the component parts of the stimulus, or in information theory terms, its "redundancy." Houston, Garskof, and Silber (1965) present evidence which indicates that both amount of change, and amount of relative uncertainty, that is 1 minus redundancy (Attneave, 1954), significantly ($p<.01$) influence judged complexity.

Fiske and Maddi (1961) elucidate the definition of complexity within their framework of variation or "varied experience": a complex stimulus is postulated to have greater potential for variation than a less complex stimulus. Maddi (1961a) explicates, "A stimulus is considered to have variation if it is different from the immediately preceding one, if it has relative novelty, or if it is either temporally or spatially unexpected" (p.271). The complexity of a stimulus is determined by the number of distinct elements is contains, and its irregularity, implying relative uncertainty within the stimulus. Thus, a complex stimulus provides greater opportunity for variation concomitant with scanning the visual field.

<u>The Theoretical Argument for an Optimal Level of Complexity Preference</u>

Hebb (1949) has suggested that small discrepancies between expectation and experience are pleasurable, while large discrepancies are unpleasant. In 1955, he proposed that situations which are extremely novel, complex, or ambiguous, that is situations which lead to high levels of uncertainty, generate a state of heightened neurophysiological arousal and negative affect which he labelled anxiety. Similarly, low neurophysiological arousal induces negative affect, that is boredom. Therefore, he contends that moderate levels of arousal induced by stimulus uncertainty lead to positive affect and increased interest: "... at low levels an increase of drive intensity may be rewarding, whereas at high levels it is a decrease that rewards" (p.251). In his theory, arousal is equated with general drive state; drive, in this sense, is an "energizer," but not a "guide."

Dember and Earl (1957) have also emphasized the motivational significance of stimulus complexity, involving discrepancy between expectation and stimulation. They postulate that stimulus complexity is a major determinant of attention and as such, they argue that it is an important independent variable in the control of exploratory, manipulatory, and curiosity behavior. In addition, they suggest that each individual has a preferred or optimal amount of stimulus complexity. This preferred amount, which they designate the "pacer" stimulus, is determined both by the complexity of the individual, and by the complexity of the stimulus itself. They maintain that the individual will attend most frequently to the pacer stimulus as compared to stimuli with lesser or greater complexity values.

Fiske and Maddi (1961) regard their concept of activation to be equivalent to Hebb's (1955) concept of arousal, or level of "arousal function." In other words, activation refers to the state of the energizing mechanism in the central nervous system. Within their framework, arousal refers to the manifestations of activation in various parts of the organism, for example as implicated in EEG or GSR measures. At any point in time, it is total impact which determines activation level; in turn, total impact is a function of varied experience. Maddi (1961b) proposes that a person's affective state is related to the amount of stimulus unexpectedness in the perceptual field. As discussed above, complexity is defined in terms of variation and unexpectedness. He further argues that as stimulus unexpectedness changes from low to high, the associated affective state changes from negative to positive and then back to negative again, in a nonmonotonic fashion. Thus, there is a preferred or optimal amount of unexpectedness with either too little or too much resulting in negative affect and avoidance. He concludes: "Holding other factors constant, minimal, moderate, and maximal unexpectedness are most likely to contribute to levels of activation that are, respectively, lower than normal, normal, and higher than normal" (p.396). One relevant stipulation which should be mentioned in this context is that characteristic "normal" activation level is considered to vary from individual to individual.

Research with Random Shapes

A large number of experimenters have adopted the Attneave and Arnoult (1956) methods, particularly Method 1, to generate shapes which differ in complexity. Essentially, Method 1 involves plotting random points on a grid, usually 100x100. However, Attneave (1957) has found that the grain of the matrix (8x8, 16x16, 32x32, or 64x64) from which critical points are selected to construct shapes is insignificant with respect to judged complexity. Then the points are connected according to the following rules: 1. the most peripheral points are first joined to form a convex polygon; 2. the remaining interior points are next assigned letters randomly and joined, one at a time, to sides which are also labelled and chosen randomly. The results of this procedure are random asymmetrical polygons which contain a specified number of independent discriminable angles or turns.

Adult Preferences

Munsinger and Kessen (1964) have assumed a positive monotonic relationship between number of independent turns or number of sides of the stimulus, which are equivalent in the case of asymmetrical polygons, and the amount of information in the stimulus. Citing Miller (1956), they postulated that there would be a limit on the capacity of adult human beings to process environmental variation. Furthermore, they contended that human beings would prefer an amount of uncertainty near the limit of their processing ability. Implementing three sets of asymmetrical polygons varying in 12 approximately equal logarithmic steps from 3 to 40 turns, a complete paired-comparison procedure was followed so that every possible combination of figures was displayed. Forty-four female and 92 male university students were asked to state their preferences. The hypothesized nonmonotonic function between variability and preference was found: subjects manifested an increasing preference for figures of greater variability until a maximum was reached at 10-turn figures; thereafter, subjects showed a decreasing preference for figures of greater variability. Therefore, Munsinger and Kessen conclude that people are sensitive to variation of stimulation, and that there is an intermediate amount of uncertainty which is generally preferred. However, they also note that there are significant and consistent individual differences among subjects in their preference for variability.

Vitz (1966a), in two studies designed to test the hypothesis that humans have a preference or optimal amount of stimulus complexity, presented sets of complex stimuli to male and female college students. The first set of 8 stimuli consisted of "connected walks" of random extensions or steps, 8 steps, 16, 32, 64, 168, 384, 512, and 1024 steps respectively; these stimuli have the overall appearance of scribbles. No attempt was made to measure bits of information, the stimuli were merely considered to represent 8 increasing degrees of complexity ordered on an ordinal scale. However, as a check on the operational definition of complexity, 6 subjects were requested to rank the 8 stimuli in terms of complexity: all rankings were in agreement with the operational definition. The entire sample of 56 subjects was then asked to rank the stimuli in order of preference, to state preference in a complete paired-comparison design, and finally to rank the stimuli a second time. Group curves derived from both rank-ordering and paired-comparison data indicated that preference increased up to an intermediate degree of complexity and then decreased. Furthermore, in an examination of individual preference curves, although Vitz found substantial variation from person to person in optimum preference level, 60% of the subjects had curves which declined regularly from the preferred or "peak" point. Similarly, with regard to random polygons, Eisenman and Rappaport (1967) present data consistent with the view that positive affect is associated with the individual's optimal complexity level: University students with the lowest complexity preference scores also rated the lowest complexity polygons favourably on the three semantic differential scales, beautiful-ugly, fast-slow, strong-weak, and rated the moderate and high complexity shapes negatively. Whereas, the subjects preferring the most complexity rated high and moderate complexity favourably, and tended to rate low complexity negatively, although their rating of low complexity was not significant.

The purpose of Vitz's second study was to determine if his findings would generalize to another set of complex stimuli. The set of 6 stimuli implemented was composed of different numbers of random lines, 4, 8, 16, 32, 64, and 128 lines respectively, intersecting within a square. Once again, 5 subjects' rankings of the complexity of the 6 stimuli agreed without exception with the operational definition of complexity. Forty-eight male and female students were tested in a procedure very like that utilized in the first study, and the results also corresponded. Specifically, group curves manifested an increase to an intermediate level of complexity preference and then a decrease; there were individual differences in the degree of complexity preferred, but approximately 75% of the subjects had curves which regularly declined from their most preferred stimulus. On the basis of both studies, Vitz concludes that humans have optimal or preferred amounts of visual complexity; and that in general, they tend to prefer an intermediate level of stimulus complexity. In addition, Vitz (1966b) has carried out similar research with sequences of tones. Overall, the findings are congruent with those on visual complexity. That is, subjective ratings of the variation of tonal sequences agree with the objective construction; and the mean pleasantness ratings increase up to a moderate amount of stimulus variation and then decline. However, he again stresses the large individual differences underlying the group curve. The results of this series of experiments reinforce those of Munsinger and Kessen (1964) on random polygons. In line with the emphasis on individual differences in preferred or optimal level, Munsinger and Kessen (1966b) also report that subjects, who prefer high variability in strings of letters and words, recall high variability better than subjects not showing such a preference.

Wohlwill (1968) designed an experiment to investigate both the shape of the function relating stimulus complexity to affective ratings on a 7-point preference scale, and that relating stimulus complexity to exploratory behavior, in terms of the number of times a subject chose to expose each stimulus for a brief period of time. A subsidiary aim was to attempt to discover whether results with random shapes and series of tones would generalize to less artificial stimuli. Therefore, defining complexity as amount of variation in a stimulus, Wohlwill first had two groups of judges, composed mainly of graduate students in psychology, rate two series of slides: one made up of scenes from the geographic environment; the other comprised of nonrepresentational works of modern art. The two sets of means showed a rank-order correlation of .96 for the environment slides and .97 for the art slides, indicating the stability of the complexity values. The experimental stimuli, 14 slides defining a 7-point scale of complexity for each series, were next presented to 28 undergraduates in a number-of-exposures (NE) phase and then in a ratings (R) phase. For both the environment slides and the art slides, the trend is for the NE data to increase monotonically as a function of stimulus complexity; while the R data follow a curvilinear trend, reaching a maximum at an intermediate point of the complexity scale. Thus, the preference results are in accord with those reported for random shapes and tones.

In related research with random shapes, Day (1967b) presented polygons, varying in approximately even logarithmic steps from 4 to 160 sides, in a complete paired-comparison design to groups of college students: one-third of whom were instructed to mark the "more complex," one-third the "more interesting," and one-third the "more pleasing" alternative of each pair of slides. In most general terms, he found that subjective complexity increases monotonically with the number of sides. Interest appears to increase with complexity to a peak at the 28-sided level and to remain fairly high with additional complexity. While the distribution of pleasingness evaluations is bimodal, peaking once at the 6-sided level and again at the 28-sided level, and then declining with increasing complexity. These data correspond to Wohlwill's report of the increase of number of exposures with complexity, and of the inverted U-shaped function described by preference ratings over complexity. Similarly, Eisenman (1966a) displaying random polygons varying from 4 to 24 sides to university students for rank ordering, found that the more complex shapes were significantly more often ($p < .01$) selected as more interesting. In addition, 21 of the 28 subjects chose the three 4-point polygons as the three least interesting shapes, suggesting that low complexity is definitely associated with lack of interestingness. However, there were no significant relationships between complexity and pleasingness, which may indicate larger individual differences in the pleasingness response. An arguable hypothesis is that interest responses reflect internal processes closely related to arousal-raising stimulus properties; whereas, pleasingness responses reflect optimal or preferred amounts of arousal generated by stimulus complexity. The results of a study by Bryson and Driver (1969) provide further support for this view: with male university-student subjects, they found that arousal, measured by GSR deflections, significantly increases ($p < .01$) as the complexity of random polygons increases. Grove and Eisenman (1970) asked undergraduates to rate 4- to 24-sided random shapes on a 7-point hostility scale. Their data indicate that for both males and females, increasing complexity is associated ($p < .01$) with higher hostility ratings. Thus, it would seem that arousal increases with interest, and that interest is distinct from preference.

One question which arises concerning Day's (1967b) findings is why the pleasingness curve peaked at the 6-sided and the 28-sided levels in contrast to Munsinger and Kessen's (1964) disclosure of a peak at the 10-sided level. Terwilliger (1963) presents evidence which suggests that ratings of the pleasantness of stimuli, varying along the complexity dimension, are dependent not only on the absolute complexity values of the stimuli, but also on the complexity adaptation level for all the stimuli being judged. With respect to the latter, pleasantness is posited to increase and then decrease as complexity becomes increasingly different from the adaptation level for all the figures involved. Munsinger and Kessen's shapes ranged in complexity from 3 to 40 sides; Day's ranged from 4 to 160 sides. Therefore, a higher adaptation level might explain the peak at the 28-sided figure. Nevertheless, there was also a peak at the 6-sided figure. Another possible interpretation is that this tendency in the direction of bimodality may reflect the type of simplicity or complexity preferences implicated in the Art Scales developed by Barron and Welsh.

Meaningfulness

Meaningfulness is a factor which has been postulated to influence preference judgments of figures varying in complexity (Munsinger and

Kessen, 1964; Terwilliger, 1963). Vanderplas and Garvin (1959), in a study designed to determine the associative value of random shapes, utilized 30 polygons at each of 6 levels of complexity, 4, 6, 8, 12, 16, or 24 sides respectively. The experimental task for 50 male and female university students was to write down for each shape, the object or situation, if any, of which it reminded them; if the shape evoked something which could not be described in a word or two, the instruction was simply to mark down "yes;" finally, if the shape generated no associations, a "no" was written. The association value of each shape was the percentage of subjects making "yes" or content responses to the shape. An inverse relation between complexity and association value emerged; that is, subjects made the most associations to simple figures. However, Vanderplas and Garvin also note that the figures of greater complexity seemed to evoke responses of greater variety of content, perhaps because these responses did not reflect clear resemblances to objects. In a similar procedure, Eisenman (1966b) asked 22 university students to associate to each of 3 examples of the 4-, 12-, and 24-sided levels of complexity. He found that the students gave the most associations to the shapes of moderate complexity: two of the 12-sided shapes had association values over 90%.

Fiske and Maddi (1961) regard meaningfulness as a form of varied experience and maintain that it influences activation level. It would seem that the more meanings suggested by a stimulus, the greater the variation it provides, and therefore, the greater the increment in activation associated with it. Consistent with this interpretation is Munsinger and Kessen's (1965) proposal that these are two meanings of meaningfulness. Specifically, they hypothesized that when an individual is instructed to process or structure an entire shape, that is, when he is asked to give a single response which describes it, he will find the task easier with shapes of low variability than with those of high variability. This is the form of the association task implemented in the two studies already described. On the whole, the results are in accordance with Munsinger and Kessen's prediction. Yet, when an individual is asked to report the number of different things a shape reminds him of, they expected the task to be easier with shapes of high variability. Random polygons, ranging from 5 to 40 turns, were shown in a complete paired-comparison design to 104 undergraduates under two different instruction conditions: in one case, the students were told to pick the figure from each pair which reminded them more of "one thing;" in the other case, they were told to pick the figure which reminded them more of "many things." The set of instructions to select on the basis of a "primary" association produced an inverse relation between the number of turns in the shapes and their judged meaningfulness; although meaningfulness, in this sense, was also very high for figures in the mid-range, that is the 10- and 13-sided figures. However, the set of instructions to judge on the total number of configurations produced the opposite relationship: meaningfulness increased with complexity. These data imply that there are two ways of liking a shape in terms of meaningfulness. So an individual who prefers shapes of high complexity is perhaps also attracted by the greater number of associations they evoke. Golann's (1962) finding that the complex RA figures, liked by creative persons, are significantly more ambiguous, in that they are suggestive of a greater number of meanings, than the simple RA items disliked by creative persons, offers support for this interpretation. Thus, there do seem to be certain properties which are more characteristic of complex figures, and it can be argued, therefore, that there should be some uniformity in an individual's complexity preference.

Developmental Findings

Munsinger and Kessen were interested in the relationship between age and preference for variability. In a number of studies with 5- to 40-sided polygons, both a paired-comparison technique (Munsinger, Kessen, and Kessen, 1964) and a multidimensional scaling analysis (Munsinger, 1966) have been implemented to examine the preferences of individuals of both sexes, ranging in age from 6 to 22 years. The results have consistently demonstrated an age-invariant area of inflection of the preference-for-complexity function at the 10-sided level: for all ages, there is great similarity in the preference curve within the 5- to 10-turn complexity range. However, no comparable developmental invariance exists in expressed preference for figures of higher complexity; children like these figures far more than adults do. When broad age divisions are considered, the relation between preference and complexity for the youngest group, 6- to 8- year-olds, is positive and monotonic; for the intermediate group, aged approximately 10 and 11, a nonmonotonic function is found; the adult preference function is strongly nonmonotonic. Furthermore, there is a systematic decrease in preference for high complexity shapes with age: 7- year-olds state lower preference for such figures than do 6- year-olds; 8- year-olds like them less than do the 7- year-olds, and so on. Munsinger, Kessen, and Kessen (1964) have formulated two possible explanations of the changes with age in response to high complexity. It is conceivable that the positive reaction of young children to the more complex figures is gradually undermined by the "inhibiting influence of training in school and the wider culture." The alternative suggestion is that young children and adults deal with high complexity in different ways. Young children may sample a complex shape until they find a part of it which pleases them. As many-sided figures are more variable, they provide more opportunity for this process of selection than do the simpler figures, and so tend to be preferred. On the other hand, adults are more likely to judge on the basis of the entire shape.

Several studies have been carried out, the findings of which tend to support the second hypothesis. Children at 3 age levels, 7, 8, and 9, 10 and 11, and 13 and 14, were told they would see 4 kinds of figures, composed of either 5, 10, 20, or 40 sides (Munsinger and Kessen, 1966a). They were instructed to use only these 4 divisions in responding, and for each figure displayed to estimate or "guess" the number of sides it contained. Estimation accuracy was inversely related to level of complexity: subjects were better able to estimate figures which contained little variability, particularly 5-sided figures. Munsinger and Kessen contend that this indicates that when individuals are first exposed to random shapes, they are not able to code them into meaningful units. An analysis of variance revealed a significant age effect ($p < .001$); that is, in comparison with older children, younger children were not as capable of estimating complexity. In addition, there was a significant age X variability effect ($p < .001$). There were no differences in estimation accuracy at each complexity level between the two older groups; however, the younger group was relatively less able to estimate the complexity of 10-, 20-, and 40-sided figures. As the younger children experience no differential difficulty with the 5-turn figures, their inability to handle more complex shapes may stem from sampling behavior.

When subjects ranging in age from 6 years to adulthood are required to categorize figures of 5, 10, 20, and 40 sides, either by learning a nonsense syllable, or in a related study by sorting the shapes into 4 groups which "go together," the results are in agreement with those reported for estimation accuracy (Munsinger and Kessen, 1966c). Specifically, the younger the individual, the more difficulty he has in correctly categorizing figures of many turns. Furthermore, almost all the variance in the interaction between age and stimulus complexity is contributed by age variation in the categorization of 20- and 40-sided figures. In general, these findings are congruent with the view that young children do not attend to all the variability implicit in high complexity shapes. Nevertheless, Munsinger and Kessen (1966c) conclude: "... neither our argument nor the data in support of it are conclusive; the preference of children for high variability figures remains somewhat puzzling" (p.171). Within their framework, the ability of an adult to differentiate a high complexity shape does not necessarily imply that he can "make sense of it," in terms of structuring or organizing it.

Rock, Halper, and Clayton (1972) suggest that adults also sample more complex shapes, or as they phrase it, "certain nuances of more complex figures do not seem to establish adequate traces" (p.655). The label nuance applies to such things as a configuration inside an outer closed contour or minor fluctuations in the outer contour itself. These researchers carried out experiments which demonstrated that the features of a figure which are unimportant to its overall, global appearance are typically not recognized even immediately afterwards. On the other hand, the same features presented in isolation under the same circumstances and for the same duration of time, are recognized. Therefore, they postulate that these features, when embedded in complex configurations, are not perceived, at least in the sense that they are not "cognitively apprehended." This bears on Munsinger and Kessen's contention that an individual's preference for, or discrimination of a shape is not inherently an indication that he can process it. The processing of a figure entails structuring it, that is, organizing it into a meaningful unit. The problems which arise with regard to structuring are that, as a term, it is difficult to define with any precision; and it is particularly difficult to investigate. The concept of structuring will be discussed again at various points in this research.

In the attempt to delineate the developmental course of preference, the responses of human infants to differing amounts of complexity have also been investigated. Fantz has proposed that the activity of an infant's eyes themselves can be implemented to determine his visual ability; he argues that if an infant consistently regards some forms more than others, he must be able to perceive form. In this manner, he has demonstrated that infants are capable of discriminating forms, such as circles and squares (Fantz, 1961) and patterns, such as stripes and schematic representations of human faces, as well as human faces (Fantz, 1961, 1963). Furthermore, he consider number of fixations to be a measure of interest or preference, and although he has found great variability in the individual responses of infants from 1 to 15 weeks, one overall trend emerges: infants tend to look longer at the more complex of a pair of stimuli.

Hershenson, Munsinger, and Kessen (1965) presented 3 random shapes, one example from each of the 5-, 10-, and 20-sided complexity levels, in all possible pair combinations, to newborn infants. Their evidence suggested that preference described on inverted U-shaped function over complexity: 10-turn figures were preferred over both 5- and 20-turn figures; however, the only significant difference ($p < .001$) was between the 5- and 10-turn figures. Once again defining preference in terms of amount of looking time, Munsinger and Weir (1967) exposed pairs of stimuli, varying from 5 to 40 sides, to children aged from 9 to 41 months. The results indicated a strong preference on the part of very young children for increasing levels of complexity. This monotonic function is in agreement with that reported by Munsinger, Kessen, and Kessen (1964) and Munsinger (1966) as characteristic of 6-, 7-, and 8- year-olds. Munsinger and Weir conclude that it seems more reasonable to assume that the Hershenson, Munsinger, and Kessen data did not reflect a truly curvilinear relationship. Rather, they maintain that the more probable developmental progression is from a monotonic function to an inverted U-shaped one.

A criticism formulated by Hutt and McGrew (1969) is applicable to this type of research. Pointing out the empirical distinction which has been established between "interestingness" and "pleasingness," they emphasize that amount of fixation has been found to be more an index of interest than of preference. They argue that to be satisfactory, a preference measure should involve a choice on the part of the subject, either to view one particular stimulus of a pair again or to categorize preferentially. Neither of these alternatives is viable in the case of infants, and so at the moment, it does not seem to be feasible to assess their preferences. Therefore, the strongest conclusion warranted on the basis of the studies described is that, in general, infants manifest more interest in the more complex stimuli. This is consistent with the findings reported for adults' interest with respect to complexity as well.

Effects of Experience on Preference

In order to investigate the effects of long-term experience with forms on preference, Munsinger and Kessen (1964) presented random shapes, varying from 3 to 40 sides, to 23 advanced art students. They reasoned that the artists' experience with geometric figures would have led to the evolvement of rules for structuring high stimulus complexity, and this would result in a tendency to prefer complex shapes. The findings confirmed their expectation: the preference function for the art students was positive and monotonic in contrast to the nonmonotonic function characteristic of untrained university subjects. Furthermore, the art students referred to the figures of few turns as "dull," "plain," and "uninteresting." In the case of relatively short-term experience, male undergraduates were asked to state their preferences for the same figures during two hours of paired-comparison judgments. An analysis of the first and last set of choices shows a shift in the curve towards reduced preference for the shapes of few turns, little change in the middle range, and a substantial increase in preference for the complex figures. However, this short-term exposure to complexity did not lead to the emergence of the monotonic pattern of preference found for the artists. On the basis of these two studies, Munsinger and Kessen conclude that experience is one of the factors which influences complexity preference.

In a relevant developmental experiment, Siegel (1968) investigated the effects of training or ability to process complexity, in terms of estimating the number of sides in random polygons. The subjects, 54 males and females at 3 age levels, 9- year-olds, 11- year-olds, and university students, were presented shapes varying from 5 to 40 turns in 8 stages. Both the pre- and post-test consisted of circling one of the 8 options, corresponding to the different amounts of complexity, for each figure. Repeated judgments of different examples of the 8 complexity levels constituted the training procedure, which did not involve correction. An analysis of variance of the pre-test data revealed a significant age effect ($p < .001$), indicating that the ability to process the information in random shapes increases with age. This finding is consistent with the reports of Munsinger and Kessen of age-related improvements in both estimation accuracy (1966a) and categorization (1966c). A comparison of the pre- and post-test results showed that the adults' performance was significantly better ($p < .01$) after training; however, short-term experience had little effect on children's estimation accuracy. Nevertheless, this does not imply that long-term experience with complexity would not have important consequences for a child's processing ability.

Barron (1963) contends that creative persons learn to prefer ambiguity, complexity, and apparent disorder by having had early practice in dealing with such phenomena. Fiske and Maddi (1961) advance an explanation which could account for the effects of early exposure to complexity on later preference for it. They suggest that the conditions of a child's environment, in terms of amount of "varied experience," influence the development of his characteristic level of activation. As already discussed, varied experience is considered to have activation-raising properties. Therefore, if an individual's early environment has been rich in variation and complexity of stimulation, this may result, through the process of habituation, in his having at maturity a relatively high preferred amount of activation. Such an individual would tend to seek experiences which maintained activation at the high optimal level, and so in turn, would probably manifest a preference for complexity. With respect to the diversity of complexity preference, Munsinger and Kessen (1964) and Munsinger, Kessen, and Kessen (1964) note that at all age levels, there are consistent individual differences which underlie the group curves. Although these researchers emphasize the ability to process or structure complexity, persons who put a positive value on complexity, even if they are not able to structure it completely, are those who have more potential to come to be able to structure it: a positive valence generally precedes approach behavior (Lewin, 1935, 1951). It would seem reasonable to argue that openness to complexity must precede learning to organize it meaningfully.

One question which arises concerning processing ability, even defined in the rather narrow sense of indicating the number of sides in random shapes, is: if this ability improves with age (Munsinger and Kessen, 1966a, 1966c; Siegel, 1968), why doesn't preference increase with age as well? The explanation formulated by Munsinger and Kessen (1964) for the artists' high complexity preference implicated their more developed processing rules. However, Munsinger, Kessen, and Kessen (1964) report on age-invariant preference for 10-sided figures, and a decreasing preference for greater amounts of complexity with increasing age. Thomas (1966) criticized Munsinger, Kessen, and Kessen for providing only 2 examples at each stimulus level, suggesting that they had thus failed to randomize variables other than the one of interest, stimulus complexity. He felt that this failure had perhaps resulted in level-specific idiosyncracies, particularly in the case of the 10-sided figures. Therefore, in his series of experiments, he implemented 4 examples of each level of complexity. Presenting these shapes, varying from 3 to 40 sides, in a complete paired-comparison design to male and female subjects, aged 7 to 19, he did not find evidence of an age-invariant preference for the 10-sided figures. The functions for ages 7 through 16 were very similar and showed an increasing preference for complexity. On the other hand, the preference functions of the 17-, 18-, and 19- year-olds were nonmonotonic. In addition, these subjects manifested a decreasing preference for complexity with age, offering some support for the Munsinger, Kessen, and Kessen data. Following Thomas, Baltes and Wender (1971) employed 5 examples of each level of complexity for polygons ranging from 3 to 63 sides. The mixed sample of subjects aged 9, 11, 13, and 15 were instructed to rate each shape on a 9-point preference scale. For all age groups, a monotonically increasing relation between degree of complexity and rated pleasantness was reported. There was also a significant age X variability interaction ($p < .01$) due primarily to the 13- and 15- year-old subjects liking the low complexity shapes, that is the 3- to 16-sided ones, less than did the two younger groups. Thus essentially, there are two matters which remain somewhat unsettled: the relationship of complexity choice to age differences; and the question of whether there is an age-invariant mid-range of complexity preference.

Symmetry

Attneave (1955) defines symmetry as a form of redundancy which reduces the informational display. A pattern is considered to be symmetrical about an axis if one half of the figure is congruent with the other half when rotated about that axis. Munsinger and Kessen (1964) constructed symmetrical polygons by reflecting asymmetrical polygons about a vertical axis passed through the centre of the 100x100 matrix. In this fashion, symmetrical figures were generated which contained the same number of sides as the original figures, but only half the number of independent turns; complexity is thus assumed to be reduced by 50%. Presenting symmetrical shapes, varying from 8 to 46 sides, to 48 male and female university students, Munsinger and Kessen found the preference function to be generally monotonic, suggesting that symmetry does reduce the complexity of shapes. Day (1968c), implementing a series of asymmetrical polygons, and 4 symmetrical polygons, 2 horizontal and 2 vertical derived from each of the asymmetrical ones, reports that the symmetrical figures were rated as significantly less complex ($p < .001$), but much more pleasing ($p < .001$) than their corresponding asymmetrical figure. This is consistent with the Munsinger and Kessen finding.

Again investigating what effect symmetry would have on complexity preference, Eisenman and Schussel (1970) instructed 450 male and female undergraduates to select their 3 most preferred and 3 least preferred shapes from among 12 symmetrical polygons, ranging in degree of complexity from 4 to 24 sides. A complexity score was calculated for each individual by subtracting the total number of points on his 3 least preferred polygons from the total number of points on his 3 most preferred polygons: a plus score signified that the person liked more complexity than he rejected; whereas, a minus score was associated with simplicity preference. Making use of this analysis procedure with asymmetrical shapes representing the same 4- to 24-sided complexity range, Eisenman has generally found that university students either tend to prefer simplicity (Eisenman, 1967b; Eisenman and Rappaport, 1967); or to divide fairly evenly, with about half expressing preference for simplicity and half for complexity (Eisenman, 1968a; Eisenman and Schussel, 1970). In contrast, with the symmetrical shapes, significantly more subjects ($p < .001$) preferred complexity, 310 obtaining plus scores, and 140 obtaining minus scores. Thus subjects do seem to respond to symmetrical shapes as if they were less complex.

However, Munsinger and Kessen (1966a) also present evidence which suggests that symmetry cannot be understood merely as a reduction of information. The results of a study of estimation accuracy with 3 age groups, 7- and 8- year-olds, 10- and 11- year-olds, and university students, show that older children and adults are better able to estimate the variability of asymmetrical shapes than of symmetrical shapes with approximately the same number of sides; while younger children seem to ignore symmetry in that they respond to both types of figures in much the same way. In an analogous study of categorization, younger children were again found to be insensitive to symmetry. Older children and adults categorized symmetrical shapes more easily at the low complexity levels; asymmetrical shapes were handled more easily at the high complexity levels. Munsinger and Kessen conclude: "This indicates the complications an active organism can place on a simple information-theoretic approach to the comprehension of environmental variability" (pp.47-48).

In the research on preference described, the figures utilized have been either all symmetrical or all asymmetrical. Eisenman (1967b) asked 58 university students to select their 3 most preferred and 3 least preferred shapes from an array composed of 9 asymmetrical polygons, 3 examples of each of the 4-, 12-, and 24-sided complexity levels; and of 3 symmetrical polygons of 4, 8, and 10 sides respectively, taken from a set designed by Birkhoff (1933). A significant preference for symmetry was manifested: 28 subjects chose 2 or more of the symmetrical polygons as their most preferred shapes ($p<.001$). Eisenman and Rappaport (1967) report that all their subjects, even those whose high complexity scores indicated that they preferred complexity to simplicity, rated the 3 Birkhoff symmetrical polygons favourably on 3 semantic differential scales, beautiful-ugly, fast-slow, and strong-weak. On the other hand, having found a correlation of -.73 between preference for complexity and preference for simplicity, which offers some support for the view that complexity and simplicity define the ends of a dimension, Grove and Eisenman (1970) also draw attention to the negative correlation of -.79 between preference for complexity and preference for symmetry, and the positive correlation of .71 between preference for simplicity and preference for symmetry. These data suggest that there is some overlap between simplicity—complexity and symmetry—asymmetry; however, it appears that an individual can prefer complexity and asymmetry, and yet still like symmetry, although it has been shown to have an attenuation effect on complexity.

Symmetry has often been implicated as an element in aesthetic appreciation (Birkhoff, 1933; Platt, 1961). For example Platt (1961), emphasizing the symmetries in biological forms and the importance of equidistance in man's visual organization of space, postulates that there may be within man, a physiological basis for considering symmetrical relations beautiful. In addition, he notes: "In all our languages the technical terms that indicate geometrical or physical regularities are also the terms of artistic praise. Ever since the Greeks, the words balance, symmetry, and harmony have had both meanings" (p.421). It has already been mentioned that the correlation between simplicity—complexity and symmetry—asymmetry is .82 for the Barron-Welsh Art Scale, and .89 for the Revised Art Scale (Moyles, Tuddenham, and Block, 1965). Nevertheless, as Grove and Eisenman (1970) contend: "... for most purposes it might be best to keep the complexity-simplicity and symmetry-asymmetry constructs separate" (p.391).

Random Shapes as Measures of Creativity

Eisenman (1964; Taylor and Eisenman, 1964) was interested in the relation of complexity preference to creativity. An art department faculty member rated 20 of her students, judging 12 to be creative and 8 to be less creative: the creative students were considered to show originality and independence of thought in their work; whereas the work of the less creative students was described as unoriginal and repetitious. These subjects were requested to select their 3 most preferred and 3 least preferred shapes from 9 asymmetrical polygons, 3 examples of each of the 4-, 12-, and 24-sided complexity levels, and 3 Birkhoff symmetrical polygons of 4, 8, and 10 sides respectively; a score was obtained for each choice category by summing the number of sides. For the most preferred category, the difference between the two groups was significant ($p < .01$), the more creative subjects tending to prefer the more complex figures. Comparing least preferred choices, the creative individuals disliked the simple figures more ($p < .025$) than did the less creative individuals. In an experiment with 302 university undergraduates, Eisenman (1969) examined complexity preferences on two measures: his polygon-choice test, for which a composite score was derived by subtracting the total number of points on the 3 least preferred shapes from the total number of points on the 3 most preferred shapes; and the Barron-Welsh Art Scale. A correlation of .55 ($p < .001$) was found between preference for complexity in polygons and BW score. This suggests that with an adult sample, there is some consistency in complexity preference; and that preference for complex polygons may be a measure of self-actualizing creativity, as well as relating to the product-oriented definition of creativity (Taylor and Eisenman, 1964).

Certain criteria have been advanced as characteristic of tests of self-actualizing creativeness. Specifically, IQ should not be implicated in such a measure; and there should be some indication that the measure is associated with two personality variables, independence of judgment and openness to experience. With respect to the first requirement, Eisenman (1968c) did not find a significant correlation between the polygon preferences of university students and their IQ scores on the Scholastic Aptitude Test. Similarly, for high school students aged 15 to 18, Eisenman and Robinson (1967) report that there is no relation between polygon preference and IQ as measured by the Stanford-Binet. It has been argued that preference for complexity is one manifestation of openness to experience; however, the second requirement will be further considered in the course of the discussion of Eisenman's research.

Postulating that personality variables interact with stimulus variables to determine preference, Eisenman has been particularly interested in the personality correlates of liking for simplicity or complexity. Eisenman and Jones (1965) designed an experiment to determine if order of presentation of shapes influenced choice behavior. A photograph was taken of each of two arrangements, one non-random and the other random, of the 9 asymmetrical and 3 symmetrical shapes typically implemented by Eisenman. The non-random array was composed of 4 polygons per row: the 4-sided shapes in the top row; the 12-sided shapes in the middle row; the 24-sided shapes in the bottom row; the symmetrical figures were all placed in the last column. The results of testing university students individually, with one or the other of the photographs, show that there are no differences in complexity preference based on order of arrangement. Therefore, Eisenman and Jones suggest that subjects respond "personally," which supports the view of an interaction between subject variables and stimulus properties.

Birth order and sex differences are two subject characteristics found to have important effects on preference for complexity. In a study of 224 male and female university undergraduates divided into first-born and later-born groups, Eisenman (1967c) requested each student to select his 3 most preferred and 3 least preferred shapes; a composite complexity score was derived by subtracting the total number of points on the least preferred figures from the total number of points on the most preferred ones. An analysis of variance revealed that sex was significantly related ($p<.01$) to simplicity—complexity choice: females preferred more complexity than males. With other mixed samples, Eisenman (1968a) and Taylor and Eisenman (1968) report analogous sex differences in preferential behavior. On the other hand, Hare (1972) did not find that sex affected choice on the polygon preference measure. Eisenman (1967c) also found a significant sex X birth order interaction ($p<.05$), indicating that later-born females preferred more complexity than first-born females, while first-born males preferred more complexity than did later-born males. Eisenman (1967a) and Taylor and Eisenman (1968) present evidence of a corresponding interaction effect.

However, Taylor and Eisenman (1968) not only examined sex and birth order differences in relation to simplicity—complexity choice, but also in relation to independence of judgment. Independence was defined in terms of the adjectives on the Gough Adjective Check List which have been shown to discriminate at the .05 and .01 levels between subjects who remain independent and those who yield in their judgments in an Asch-type (Asch, 1952) conformity situation (Barron, 1953b, 1968). There was a significant sex X birth order effect ($p<.05$) for the Adjective Check List data, congruent with the interaction effect ($p<.05$) on complexity preference. That is, the self-descriptions of the first-born males and later-born females were in agreement with those of the independent subjects. Therefore, these individuals appear both to prefer more complexity and to manifest personality traits associated with independence.

In line with the emphasis on personality, Eisenman and Cherry (1970) have investigated birth order and sex differences in authoritarianism as measured by a 30-item, true-false version of the California F Scale. The authoritarian individual has been characterized as lacking in openness to experience, and as conservative and resistant to change (Adorno, Frenkel-Brunswik, Levinson, and Sanford, 1950; Brown, 1965). Such traits are in opposition to those which distinguish self-actualizing persons. Eisenman and Cherry found that first-born males were significantly less likely ($p<.01$) than later-born males to score in the authoritarian direction; however, there were no birth order differences in authoritarianism for female subjects. Concerning sex differences, Grove and Eisenman (1970) report that for female subjects, who tend to prefer more complexity than males, authoritarianism was significantly correlated with liking simplicity ($p<.01$) and disliking complexity ($p<.01$).

Overall, the personality data suggest that independence of judgment and openness to experience are implicated in preference for complex polygons. Thus, there is some basis for regarding such preference as an index of self-actualizing creativeness. The question arises as to whether, over a large age range, polygon preference would relate to Revised Art Scale scores in a consistent manner. In addition, it appears that birth order and sex differences may affect simplicity—complexity choice, and therefore should be taken into account in a study of preferential behavior.

Birth Order and Sex Differences

Adler (1928, 1930; Ansbacher and Ansbacher, 1956) described the "dethronement" of the first-born child by the later-born, and postulated that the first-born's effort to regain the central position in the affection and attention of his parents would have a marked effect on his development. That is, the child would look back to the time when he had played a more important role in the family, and such concern with the past would result in a strong inclination towards conservatism. Following this line of reasoning, McArthur (1956) presents evidence that first-born children are more "adult-oriented" which involves being more dependent on their parents, and conforming more to parental expectations. Maslow (1956) contends that there are two forces inherent in all individuals: he distinguishes between "safety" or defensiveness, which is a tendency to regress and to hold on to the past, and the opposite set of forces, or "growth" which impels the individual towards greater independence and towards taking chances. Growth forces predominate in self-actualizing persons (Maslow, 1959, 1970).

The above consideration of birth order suggests that insofar as they are more conservative and dependent, first-born individuals, generally speaking, should prefer less complexity. However, again with regard to birth order, Singer (1971) points out that different researchers have concentrated on different measures of adult-orientation, for example, similarity of values or dependency. In contrast, with a sample of 4440 15- and 16- year-old students, she investigated the relationship of ordinal position to adult-orientation on an index combining 15 intercorrelated measures of sentiment, interaction, and similarity between parents and children, and of children's conformity to parental expectancies. As a summary definition, adult-orientation means that students who like their parents and value their approval tend to talk to them frequently about a variety of topics; they view themselves as similar in values to their parents; and they tend to conform to their parents' expectations. In turn, their parents are seen as reciprocating the affection and esteem in which they are held. Singer maintains that "parent-orientation" in this sense, is the precursor of a more general orientation towards adults. The results show that girls are much more likely ($p<.001$) to score high on the index of adult-orientation than boys. Furthermore, first-born girls are consistently more adult-oriented than later-born girls, although in families of more than 3 children the differences are very small and unreliable. On the other hand, first-born boys are not more adult-oriented than later-born boys. Therefore, it seems reasonable to conclude that birth order effects vary as a function of sex differences.

Concerning Eisenman's findings, the question arises as to why an interaction should emerge such that first-born males, but later-born females express greater liking for complex shapes. Johnson and Knapp (1963), having found significant sex differences in aesthetic preferences for verbal imagery, visual art, tartan design, and music, attribute these differences to "the social and cultural incentives and pressures which train men and women for their respective sex roles within the family and society" (p.297). Eisenman (1967a; Taylor and Eisenman, 1968) also implicates sex roles, arguing that males are usually permitted greater independence; whereas more conformity and dependence is expected of females. In addition, it has frequently been proposed that the consequences of birth order have their origins in interaction patterns that vary for children according to ordinal position within the same family (Altus, 1966; Bradley, 1968; McArthur, 1956; Warren, 1966). As Munroe (1955) states the argument: "Adler's point was not that order of birth is in itself important but that the place of the child in the family introduces fairly definable problems which ... tend to call forth certain characteristic kinds of solution (p.357). The attitude of the parents, particularly the mother, towards the child becomes more relaxed, less anxious with later-born than with first-born children (Lasko, 1954; Sears, 1950). Thus, it may be that independence is emphasized for the first-born male, which would be conducive to his becoming reliant on his own judgments. Preference for complexity seems to be associated with such a behavior pattern. In contrast, dependence would be demanded of the first-born female; while the later-born female, subjected to less intensive socialization pressures, would more likely be allowed independence.

On the basis of the discussion of birth order and sex differences, a tenable hypothesis is that the child's environment, with the focus on the parent-child interaction, has salient consequences for his later ability to deal with complexity. Birth order and sex differences may be regarded as important, both as subject variables relevant to personality, and also as possible indicators of variation in parental environment; and therefore, they may be instrumental in the attempt to understand complexity preference. The potential influence of the home environment on liking for simplicity—complexity will be considered again in the chapter dealing with integration and its measurement.

An aspect of Eisenman's data (Eisenman, 1967c, 1968a; Taylor and Eisenman, 1968) which deserves some comment is the finding that females in general prefer more complexity than males do. Taylor and Eisenman (1968) interpret the evidence to signify that females are more open to their experiences. With sufficient intelligence as a necessary condition, self-actualizing creativity may lead to great-achievement creativity; however, in comparison to males, females have not accomplished much in this respect (e.g. Barron, 1966). Eisenman's finding is not an isolated one. With reference to creativity defined in terms of divergent thinking, Maccoby (1967) similarly observes that girls appear to do better than boys on tests reflecting this ability. Guilford (1967) has indicated that females score higher on 3 divergent production factors, divergent symbolic units, divergent semantic units, and divergent semantic systems. Olive (1972), testing 434 male and female high school students on 7 of Guilford's verbal divergent production measures, reports that there were no sex differences on the 2 measures relevant to the factors of divergent semantic classes and divergent semantic transformations. On the other hand, the girls performed significantly better ($p<.01$) than the boys on the remaining 5 measures which tapped 4 divergent production factors: divergent symbolic units, divergent semantic units, divergent semantic relations, and divergent semantic systems. In conclusion, Olive notes that it is therefore surprising that females are "mediocre" in their creative endeavours, at least as these are evaluated by productivity and emminence; she contends that "dependent female role behavior" may be involved.

The results of a study by Helson (1967) of 109 men and women mathematicians, some judged highly creative by other mathematicians and some comparison subjects, are consistent with Olive's emphasis on female role behavior. Regarding what she calls the "social status hypothesis," Helson found that creative men showed more self-assurance and professional participativeness, traits assumed to be associated with high social status, than all other subjects. Specifically, although both creative men and women were less constricted than comparison subjects, the creative women were less self-acceptant and less sociable than comparison women; whereas, the creative men were more self-acceptant and sociable than comparison men. Furthermore, creative women expressed much less desire to make a mark in mathematics, were, in fact, less productive than the creative men, and suffered from inner conflict. Thus, it is arguable that expected female behavior, with its accent on dependency, may inhibit creative output.

Curiosity and Exploration

Berlyne (1962) defines exploratory behavior as "behavior whose principal function is to change the stimulus field and introduce stimulus elements that were not previously accessible" (p.152). He (1962, 1963b) points out that all behavior that acts on the environment changes the stimulus field; however, the stimulus-introducing function may be secondary to other biological consequences. The stimuli introduced by exploration are distinctive in that they do not have any important effects on other tissues besides the sense organs and nervous system; they offer no immediate adaptive value and are sought for "their own sake" (Berlyne, 1966).

Collative Variables

Berlyne (1963b, 1966) maintains that the probability, vigor, and direction of exploratory responses are dependent on both organismic factors, such as personality and motivational variables, and stimulus factors. There is one group of stimulus properties which seem to be particularly influential in eliciting exploratory behavior. These he designates "collative" properties because they depend on collation or comparison of stimulus elements appearing simultaneously in different sectors of a stimulus field, or elements that have been perceived at different times. Collative properties include properties covered by terms like novelty, variability, and complexity. They are quantitative variables and have close connections with information theory: information theory concepts, for example, number of elements and redundancy, are useful in specifying and measuring them; however, these concepts are not adequate for a complete description and explanation of the collative variables. It may be argued that the common attribute of the collative variables is that they all involve unexpectedness, that is, discrepancy between expectation and stimulation. With reference to complexity, it seems that complex patterns evoke a number of disparate classifying or predictive responses. Berlyne (1963b) emphasizes that the connotations of the collative terms are distinct. Nevertheless, there is a great deal of overlap among the collative variables both in "real" and in experimental situations: for instance, the more complex and surprising a stimulus is, the more likely it is to be novel.

Much of Berlyne's research has been focussed on the collative variable of complexity. He (1960) contends that the word complexity, in its everyday usage, includes several different properties; and therefore figures have been generated to sample the various kinds of complexity. Specifically, two complexity series have been constructed: A non-X series, or lower complexity series, composed of 6 stimulus categories, A. irregularity of arrangement, B. amount of material, C. heterogeneity of elements, D. irregularity of shape, E. incongruity, and F. incongruous juxtaposition (Berlyne, 1958a). And an X series, estimated to be a higher complexity series in that it involves more information, comprising 3 categories, XA. number of independent units, XB. asymmetry, and XC. random rearrangement (Berlyne, Craw, Salapatek, and Lewis, 1963). Within each category there are a number of pairs; each pair includes a less irregular or less complex (LC) pattern and a more irregular or more complex (MC) pattern. In a 1965 thesis, the findings of which are described by Day (1966) and by Berlyne and Peckham (1966), Day indicates that the LC patterns from the non-X categories, the MC patterns from the non-X categories, the LC patterns from the X categories, and the MC patterns from the X categories form an ascending sequence of significantly different levels of complexity. Thus, "subjective" or judged complexity seems to follow the objective criteria relevant to information (Berlyne, Ogilvie, and Parham, 1968).

Day's finding supports Berlyne's postulation that the common property underlying the various stimulus categories is complexity. Similarly, Berlyne, Ogilvie, and Parham (1968) had 20 undergraduates rate some of the patterns from both the non-X and the X series on a 9-point complexity scale and subjected the ratings to a multidimensional scaling analysis. They present additional evidence of a general factor of complexity: one dimension accounted for the greater part of the variance, 67.4%, in the complexity ratings; and two dimensions covered 91% of the variance. Furthermore, the principal complexity dimension reflected the number of independent component elements contained in the figures. Thus, both amount of material and amount of relative uncertainty (one minus redundancy), considered to be major determinants of complexity (Attneave, 1957; Houston, Garskof, and Silber, 1965), are inherent in this dimension.

Dember and Earl (1957) define attention as "any behavior, motor or perceptual, which has as its end-state contact between the organism and selected portions of its environment" (p.91). In addition, any behavior that indicates interest in, or particular attention to, one portion, as opposed to the rest, of the environment can be considered exploratory (Maddi, 1961a). Berlyne (1958a) designed an experiment to ascertain if complexity would affect duration of attention in terms of an "orienting response," that is, an observing response involving receptor-orienting movements. Ten male and 10 female undergraduates were shown the non-X series of patterns: each pair of figures was visible on a screen for 10 seconds; and amount of fixation was recorded for each figure of the pair. For every category of complexity, there was a significant tendency ($p<.01$) for the subjects to spend more time looking at the more complex figures. Berlyne (1957b) also reports that complexity influenced the number of times adult subjects pressed a key to expose themselves for .14 seconds to tachistoscopically presented stimuli: number of exposures increased with the same complexity variables. Nevertheless, in these two experiments, it is possible that the more complex stimuli were looked at longer merely because they took longer to identify, and not because they were more interesting. Therefore, Berlyne (1958b) repeated the first experiment, lengthening the time each pair of figures was visible on the screen to 2 minutes. The results of this experiment were similar to those of the original one, offering support for his view that the greater attention to more complex patterns does not implicate identification alone, but also implicates "specific" exploration or curiosity. Within Berlyne's framework, specific exploration has the function of providing stimulation from a definite source; it is primarily aimed at securing information about one particular object or event.

Pointing out that there seems to be a high positive correlation between subjective judgments of complexity and objective measures of complexity based on information theory, Leckart and Bakan (1965) have investigated the effects of the complexity of "real" stimuli on duration of attention. Fifty-six colour photographs of landscapes, single objects, and arrays of objects were rated by 39 subjects on a 7-point complexity scale. The mean ratings for all photographs were calculated, and 10 stimuli representing each of the low-, middle-, and high-complexity levels were selected for experimental use. These were presented to 30 male and female university students who were tested individually: a subject was provided with a button which changed the stimuli, and looking time was recorded for each photograph. The mean looking times for the low-, middle-, and high-complexity levels were 7 seconds, 11 seconds, and 13.3 seconds respectively, indicating that the judged complexity of the photographs was positively related to attention. Comparisons between the high- and medium-levels and between the medium- and low-levels showed both differences to be significant ($p=.01$). Thus, the influence of complexity on exploratory behavior appears to generalize to more realistic stimuli. Furthermore, the between subjects variance was significant ($p=.01$), reflecting diversity in individual looking times.

A novel stimulus is either one which is unprecedented in the organism's history, or one which is different from recently experienced stimuli (Berlyne, 1960, 1962, 1963b). Berlyne (1958a) was also interested in the effects of stimulus change or relative novelty on the orienting response. The 10 male and 10 female university subjects were shown pairs of stimuli, consisting of pictures of animals, for 10 seconds on a screen; duration of attention was recorded for each figure. On 10 consecutive exposures either the stimulus in the left or right position was "recurring" or familiar, while the other stimulus was "varying" or novel. An analysis of the time spent looking at the familiar and novel stimuli indicated that the fixation time for the varying stimuli progressively increased at the expense of the fixation time for the recurring stimulus. Therefore, complexity and novelty seem to have a corresponding influence in terms of eliciting exploratory behavior.

Leckart (1966) has extended this research by implementing 30 realistic photographs, comprising 10 examples of each of the low-, medium-, and high-complexity levels. During a 10-minute familiarization period, 3 separate groups, composed of 30 male and 30 female university students, received either 0, 10, or 20 seconds of familiarization with each of the photographs. Visual exploration was then measured in a free looking task; that is, the subject controlled the duration of exposure of the stimuli. Consistent with Berlyne's results, free looking time was directly related to the complexity of the photographs, and inversely related to their familiarity. Again with reference to the connection between novelty and complexity, Eisenman (1968d) had 28 male and female university undergraduates rank order asymmetrical polygons, 3 each of the 4-, 12-, and 24-sided complexity categories, according to their novelty. Novelty tended to be a linear function of complexity: the most complex shapes were rated as most novel, the middle complexity shapes as intermediate in novelty, and the low complexity shapes as least novel. So although novelty and complexity do not have identical meanings, they do appear to have certain common influences on behavior. This supports Berlyne's emphasis on the importance of the collative stimulus properties.

Comparable results with the collative variables have been demonstrated in experiments with children. Friedman (1972b) presented 3 groups, each composed of 40 newborn infants ranging in age from 17 to 96 hours, with a recurring visual target, either a 2x2 or 12x12 checkerboard pattern, or with a series of varying patterns. There was no difference in viewing time between the 2 groups of infants exposed to the repetitions of the checkerboard targets; in contrast, the group receiving the novel patterns had a significantly greater ($p < .025$) mean fixation time. In a related study with a sample of $3\frac{1}{2}$-month-old infants, Caron and Caron (1968) displayed a continuously varying series of stimuli, followed by a sequence of repetitions of either a 2x2 or a 12x12 checkerboard pattern, followed by another series of varying stimuli. Within both the group receiving the 2x2 or the 12x12 recurring target, repeated exposure produced significant decrements ($p<.01$) in observing behavior. However, the magnitude of the decrement was influenced by the complexity of the familiar pattern: the decline was significantly steeper ($p<.001$) in the group viewing the 2x2 checkerboard target than in the group seeing the 12x12 target. Furthermore, both groups manifested a significant rise ($p<.01$) in amount of fixation during the second series of novel stimuli, suggesting that the preceding decrement was not a function of either general or sensory fatigue. Friedman (1972a) has found that newborn infants show a similar recovery effect: there is a significant increase ($p<.001$) in fixation time when a novel stimulus is introduced after habituation has occurred to a repeated pattern. Using realistic photographs cut from magazines, Fantz (1964) reports that infants 2 to 6 months old looked at a recurring pattern, presented for 10 successive 1-minute exposure periods, progressively less than at the corresponding varying patterns paired with it. For the familiar photograph, there was a significant decrease ($p<.01$) in amount of fixation from the first 5 to the last 5 exposure intervals; the novel photograph was viewed longer by 18 of the 22 infants during the last 5 intervals. As previously noted, Fantz (1961, 1963) has also remarked that when 2 equally novel patterns are displayed simultaneously, the more complex figure is generally fixated longer. Thus, it seems reasonable to argue that collative properties have salient effects on attention even in very young children.

Implementing 21 pictures of animals and children, Leckart, Briggs, and Kirk (1968) "played a game" with each of 39 4- and 5- year-old preschool subjects. By selecting one of 2 windows, the child was able to observe the picture behind it for 5 seconds: the stimulus behind one window was always the same, whereas the stimulus behind the other window changed on each trial. A comparison of the first and last block of 10 trials indicated that the mean number of novel choices significantly increased ($p<.01$) as the familiarity of the alternate picture increased. Cantor and Cantor, with both a selection of black-and-white figures from the Welsh Figure Preference Test (1964a, 1966) and of colour cartoon pictures (1964b), have found that 3- to 5- year-old children, given the opportunity to project familiarized and nonfamiliarized stimuli, tend to expose the novel material for longer periods of time. These data are consistent with the general finding that adults spend a greater amount of time viewing novel stimuli relative to familiar ones.

In an experiment dealing with complexity, Cantor, Cantor, and Ditricks (1963) presented 6 stimulus triads, one at a time, to 31 male and 29 female preschool children, ranging in age from 3 to 5. Each stimulus triad, composed of patterns considered to represent low-, medium-, and high-complexity levels, was displayed for a 60-second interval; the amount of time the child fixated every pattern was recorded. The mean viewing time for the high complexity stimuli was significantly greater than that for both the low complexity stimuli ($p<.005$), and for the medium complexity stimuli ($p<.025$); there was no significant difference between the low and medium means. Faw and Nunnally (1968) report corresponding results for a sample of 19 males, aged 7 to 13, presented with polygons varying in degree of complexity. All possible pairs of stimuli, comprising 2 examples of each of the 4-, 12-, and 24-sided levels, were shown for 10-second periods. Recorded looking time data indicated that the 24-sided figures were observed significantly longer than both the 12-sided ($p<.01$), and the 4-sided figures ($p<.002$).

There was no significant difference in the time spent viewing the 4- or the 12-sided figures; however, the researchers point out that a less complex polygon never "dominated" a more complex polygon. Therefore, it seems that children, as well as adults, tend to pay more attention to more complex material. With reference to both novelty and complexity, the results from studies with children in general replicate the findings for adults, suggesting that these variables have consistent effects on "specific" exploratory behavior.

Specific and Diversive Exploration

Patterns selected from both the non-X and the X complexity series were presented, one by one, to 64 university students (Berlyne and Lewis, 1963). From free looking time data, duration of attention was calculated for each pattern. The mean amount of exploration per figure was higher for the more complex (MC) than for the less complex (LC) figures in all categories, with the exception of XC, random rearrangement. In this category, the mean LC duration was higher, but not significantly so. Berlyne and Lawrence (1964) similarly report that MC alternatives tend to be inspected longer. However, Berlyne (1963a) was also interested in the relation of exploration to verbal rating behavior. He instructed one group of 16 undergraduates to rate some of the non-X and X patterns on a 7-point scale of interestingness; another group of 16 students rated the stimuli on a 7-point pleasingness scale. With respect to interestingness, there was a significant tendency ($p<.05$) for the subjects to rate the MC figures higher than the LC figures. In the case of pleasingness, 15 of the 16 subjects had higher mean ratings for the LC figures ($p<.01$). Furthermore, patterns in the higher complexity X series were regarded as significantly more interesting ($p<.01$), but significantly less pleasing ($p<.01$) than those in the non-X series.

Continuing this line of research, Berlyne and Peckham (1966) had 38 university students rate patterns on a 7-point evaluative scale, ugly-beautiful. Results were graphed in comparison to Day's sequence of judged complexity, whereby LC-non-X patterns, MC-non-X patterns, LC-X patterns, and MC-X patterns emerged as progressively more complex classes of material. The evaluative function was bimodal, peaking at the LC-non-X and the LC-X categories. Similarly, Day indicates that in his study, pleasingness ratings described a congruent bimodal distribution over subjective complexity. The data from Berlyne's (1963a) experiment discussed above, when mean pleasingness ratings are derived for each category and analyzed in this fashion, reinforce the general picture. Day's interestingness ratings were distributed in an inverted U-shaped curve over judged complexity, reaching a peak at the third LC-X level of complexity. Again, an examination of the means from Berlyne's (1963a) earlier experiment shows the same ordering among the 4 classes of material: mean interestingness ratings increase up to the LC-X level and then decrease. In addition, Day (1966) has found that free looking time scores follow the same curvilinear function. Therefore, he suggests that figures are inspected as long as they are interesting; duration of exploration may reach a peak and then decline as complexity becomes extreme.

Considered overall, these findings support the view that responses of interest and preferential responses are distinguishable. Berlyne (1972) points out that experimental aesthetics has relied primarily on verbal judgments of preference or liking; and he maintains that non-verbal measures of preferential reaction to visual stimuli should be employed to supplement such ratings. However, it seems necessary to determine exactly what constitutes a nonverbal expression of liking.

As previously mentioned, Hutt and McGrew (1969) argue that selecting a particular stimulus to view again may be a satisfactory measure of preference. Implementing material from both non-X and X categories, Berlyne (1963a) presented the figures of each pair, one after another, to 40 university students; he then requested them to choose only one of the patterns to inspect a second time. More subjects than expected made either large or moderately small numbers of more complex (MC) choices, and fewer made intermediate numbers. Berlyne suggests that this tendency to make predominately MC or predominately LC selections may reflect the personality differences that have been associated with preference for complexity or simplicity (e.g., Barron, 1952, 1953a). Furthermore, Berlyne and Lewis (1963), using an assortment of pairs from both complexity series, report an average correlation of .32 ($p<.01$) between the frequency of choosing to view the more complex of the 2 stimuli again and complexity preference scores on the Barron-Welsh Art Scale. On the other hand, there was a nonsignificant average correlation of -.12 between duration of exploration and BW scores. Thus, a tenable hypothesis is that choice behavior involves liking. Nevertheless, an examination of the correlation between BW or RA scores and verbal expressions of preference for some of Berlyne's figures might be the next step in the attempt to discover to what extent a selection response does indicate liking.

The divergence manifest between responses of interest and of preference is also relevant to Berlyne's (1960, 1963b, 1966) distinction between "specific" and "diversive" exploration. The purpose of a specific exploratory response is to gain access to additional information so that uncertainty with regard to a particular source of information can be reduced; no other source will do instead. Such exploration appears to be implicated in measures of duration of attention and in ratings of interest. It would seem that these measures are related to arousal-raising properties, in that more complex patterns are usually both inspected longer and rated more interesting. In contrast, diversive exploration is not directed towards stimulation from a specific source, but is reinforced by any source with optimal collative properties; it has an affective basis. Berlyne (1962, 1963b) has remarked that the collative variables coincide with what are called "formal" or "structural" factors in the arts. "Formal beauty" has been characterized as involving two requirements: the first of these is described by phrases such as "maintaining interest," "holding the attention," "presenting a challenge;" the other requirement is "making sense," "having a definite structure," "being coherent." The outcome is one of "unity in diversity" which implies a blend of properties like complexity and ambiguity which increase arousal, and properties like order, simplicity, and symmetry which moderate arousal. Diversive exploration, implicated in preferential choice measures and ratings of pleasingness and liking, appears to be a form of aesthetic activity. Although people in general tend to select the less complex patterns to view again, and to judge such patterns as more pleasing or beautiful, Berlyne (1958a; Berlyne and Peckham, 1966) contends that the preferred or optimal degree of arousal varies from individual to individual depending on personality traits.

Collative Properties as Related to Arousal

"A level of arousal denotes, roughly speaking, how "wide awake," how "alert" or how "attentive" the organism is" (Berlyne, 1962, p.160). What is the evidence supporting the view that complexity induces arousal? According to Fiske and Maddi (1961), impact is a function of varied experience and covaries with activation; and so measures of activation or arousal may serve as indices of impact. In addition, for an external stimulus, impact is hypothesized to be closely linked to attention value. Therefore, within their framework, it is arguable that Berlyne's reports of longer exploration times for more complex patterns indicates that these stimuli are associated with greater arousal than less complex ones. With regard to measures of arousal, Berlyne, Craw, Salapatek, and Lewis (1963) presented a selection of patterns from the non-X and X series one at a time, and observed the frequency of GSRs for each figure. The 53 male and 27 female undergraduates were divided into two groups: those in the extrinsically-motivated (EM) condition were instructed to pay careful attention to the patterns as they would later undergo a recognition test; those in the non-extrinsically-motivated (NEM) condition were told they would not be asked any questions about the figures. In the EM group, the mean number of GSRs was higher for more complex (MC) patterns than for less complex (LC) patterns for 7 categories out of the 8 sampled ($p<.01$). There were no consistent differences in the NEM group. Thus, when subjects were highly attentive, there is some manifestation of more arousal, that is greater incidence of GSRs, with more complex figures. On the other hand, Bryson and Driver (1969), measuring arousal in terms of GSR deflections, found that for all the 40 male university students tested, level of arousal generally increased with the complexity of the stimuli. Furthermore, Berlyne and McDonnell (1965), using non-X and X material, observed that MC patterns evoked, on the average, more EEG desynchronization than LC ones.

Using the term "hedonic value" to include both the reward value of a stimulus, judged by its capacity to reinforce an instrumental response, and preference for the stimulus, reflected in verbal evaluations, Berlyne (1970) postulates: "Positive hedonic value reaches a maximum with moderate arousal potential ... and, then, as arousal potential increases further, hedonic value takes on lower and lower positive values and finally becomes negative" (p.284). "Arousal potential" refers to stimulus properties, such as novelty and complexity, which affect arousal level; the meaning corresponds closely to that of Fiske and Maddi's (1961) term, impact. If individuals exhibit homeostatic behavior in the attempt to maintain preferred or optimal levels of arousal, it is tenable that changes in arousal will influence complexity choice. With a sample of 33 male and 31 female undergraduates, Berlyne and Lewis (1963) manipulated arousal in various ways, and noted the effects on a preferential choice task involving non-X and X patterns. Specifically, the subjects were divided into four groups: one group (MT) in which arousal was heightened by a memory test administered before the choice task began; one group (SE) in which the subjects were told to expect shocks at the completion of the choice task; another group (WN) in which arousal was intensified by white noise, considered to be a "neutral" arousing agent, during the choice task; and the three corresponding control groups (C) combined for data analysis. GSR readings confirmed that arousal was significantly increased for the MT group ($p<.05$), for the SE group ($p<.01$), and for the WN group ($p<.01$); the control group was not affected. The results of allowing subjects to select figures to view again, after brief initial exposures, show that the mean number of MC choices was greater in the C group than in the three experimental groups for 7 categories of the 8 utilized, with a tie for the remaining category ($p<.02$). There were no significant differences in number of MC choices among the three experimental groups. Therefore, individuals who are subjected to arousal-raising treatments do seem to alter their behavior in a manner consistent with a homeostatic theory of arousal.

Projecting pairs from Berlyne's non-X and X series of 25-second intervals, Day and Thomas (1967) investigated the influence of arousal on the proportion of the time period for which the MC alternative was fixated. Sixteen medical students were each tested under two separate conditions: an arousal-raising treatment in which 10 mg. of d-amphetamine were given to the subject; and a placebo-treatment condition. The researchers expected that increased arousal would decrease attention to the MC figures. Instead, 14 of the 16 subjects demonstrated more exploration of the MC patterns with the drug than with the placebo ($p<.01$). Day and Thomas interpret this data in terms of a forced- versus a free-choice situation. That is, an arousal increment may result in more vigorous specific exploration when the organism has no escape, but in the avoidance of complexity and high levels of stimulation whenever possible.

Relevant to the research on arousal, Berlyne and Crozier (1971) have also found that the amount of visual stimulation immediately preceding a choice task modifies complexity selection. In one experiment, 2 male and 22 female university students underwent a succession of 3 selection phases, comprising 50 trials each; a separate pair of stimuli was implemented for every block of 50 trials. These sets of stimuli consisted of a very simple figure paired with a very complex one: 1. an LC figure from category C, heterogeneity of elements, and an MC figure from category XC, random rearrangement; 2. another LC figure from category C, and an MC figure from category XA, number of independent units; and 3. a 4-sided polygon paired with a 160-sided polygon. On each trial, the subject's task was to choose between pressing the key which exposed the less complex pattern or the key which exposed the more complex pattern on a screen. In addition, the key corresponding to the MC pattern was alternated from one selection phase to the next, which Berlyne and Crozier contend is a more rigorous test of choice behavior. Every key press projected the appropriate pattern for 1.5 seconds; between the disappearance of the figure and the buzzer signalling another key press, there were 3.5 seconds of near darkness. The subjects showed a significant tendency ($p<.001$) to seek exposure to the MC patterns, both when each stimulus pair was analyzed separately and when all pairs were considered together. Furthermore, for each choice phase, the number of MC stimuli selected increased significantly ($p<.01$) over the block of trials. With another sample of 12 males and 12 females, every phase was preceded by one of 3 possible prechoice conditions. When a 3-second projection of the 2 patterns, from which the later selection could be made, was seen before each key press, a significant tendency ($p<.001$) to choose a 5-second view of the MC alternative emerged. Thus, monotony and familiarity produce an effect which is similar to the one found in the first experiment. However, when a coloured picture of a tourist attraction was displayed for 3 seconds before each response, the number of MC was significantly decreased. There was an even larger reduction when a different coloured picture preceded every choice. In other words, it appears that the greater the prechoice deprivation of stimulation, the more likely an individual will be to select complexity. Berlyne and Crozier conclude: "It is as if there were a homeostatic mechanism keeping the average input of information fairly stable over quite short periods" (p.245).

In a study designed to examine the influence of familiarity on children's selection responses, Endsley (1967) presents evidence which is interpretable in terms of such a homeostatic mechanism. Specifically, he manipulated familiarity by allowing 4 groups, each composed of 6 male and 6 female 3- to 5- year-old preschool children, either 0, 1, 3, or 5 minutes to play with one of 2 sets of toys. During a subsequent testing session, the subjects were permitted to select, for further play, either the familiarized set of toys or a set not previously exposed. The data show that all 36 of the children, who had received familiarization, chose the novel toys on the first test trial. In addition, the number of times the novel set was selected over the 10 trials increased as a function of amount of prechoice familiarization. Regarding novelty as a collative property capable of raising arousal (Berlyne, 1962, 1963b), a tenable hypothesis is that the subjects were responding in a manner consistent with maintaining a stable level of arousal or incoming information.

With the same 3 pairs of patterns used in the research on prechoice visual stimulation, Berlyne (1971) has extended his investigation to the effects of level of prechoice auditory stimulation on visual complexity choice. Nine male and 15 female undergraduates experienced one of 3 conditions during each selection phase: silence, white noise, or varying excerpts from a recorded story preceded every key press. No difference was disclosed between the white noise and the silence treatments; the proportion of more complex (MC) choices corresponded to those found both after the darkness condition, and after exposure to the patterns that repeatedly followed the selection response (Berlyne and Crozier, 1971). On the other hand, the mean number of MC choices was significantly lower ($p<.01$) for the story treatment. However, white noise has been shown to increase arousal, at least in terms of GSR deflections (Berlyne and Lewis, 1963). Therefore, Berlyne suggests that perhaps it is not arousal, but rather the prechoice level of "exteroceptive information processing" which influences the selection of more complex material. Thus, it may be that information processing increases arousal, but an arousal increment does not necessarily denote information processing.

Two additional pieces of evidence should be mentioned in the present context. First of all, in an earlier experiment, Berlyne and Lewis (1963) reported that white noise did decrease the probability of more complex selections in a preferential choice task. Secondly, research on long-term sensory and perceptual deprivation has drawn attention to the distinction between cortical arousal, as measured by the EEG, and autonomic arousal, as reflected, for example, in a GSR index: "Cognitive (cortical) arousal may vary independently of affective (autonomic) arousal" (Zuckerman, 1969, p.430). So the data with regard to the consequences of amount of prechoice stimulation on deprivation are not unequivocal. Nevertheless, it is arguable that the degree of complexity preferred will be determined more by level of cortical arousal than by level of autonomic arousal.

Curiosity and Creativity

In general, the research on curiosity and exploration has demonstrated that the collative properties have certain consistent effects on behavior. However, as Langevin (1971) emphasizes, curiosity may also be viewed as a personality trait: "Thus, while any novel event may induce exploratory behavior in a large number of individuals, a highly curious person would be expected to show greater interest in seeking new experiences and/or in exploring stimuli at greater length than a less curious person" (p.361). Furthermore, Day (1968a) suggests that the relation between the two concepts of curiosity and creativity may be best approached by "following through the hypothesis that creative persons prefer environments characterized by high levels of collative variability" (p.487). He (1968b; Day and Langevin, 1969) has developed the Specific Curiosity Test, which involves projecting a selection of patterns from Berlyne's non-X and X complexity series, one by one, for 5 seconds on a screen;

the subject's task is to evaluate his degree of interest in each figure on a 7-point scale. Although Day (1966) has found that ratings of interest describe an inverted U-shaped function over judged complexity, peaking at the third LC-X category, he (1968b) also observes that large individual differences underlie this group curve. On the basis of the Specific Curiosity Test, a subject is assigned a "perceptual specific curiosity" score: a high level of perceptual specific curiosity is manifested in high ratings for the most complex patterns coupled with low ratings for the simple patterns.

In a number of studies with high school subjects, ranging in age from 12 to 16, Day (1968b) has examined some of the correlates of the Specific Curiosity Test. With a sample of 112 students, he reports that IQ, as measured by the Dominion Group Test, was significantly correlated ($p < .01$) with end-of-term examination marks in every school subject; in contrast, the index of perceptual specific curiosity did not correlate either with IQ ($r = .01$) or with any of the school grades. The data from another group of 429 subjects similarly showed no relationship between the Specific Curiosity Test and IQ ($r = .01$). However, a positive correlation of .14 ($p < .01$) was found between preference for complexity on the Barron-Welsh Art Scale and perceptual specific curiosity scores. With an additional 247 students, a correlation of .22 ($p < .01$) emerged between the BW scale and the specific curiosity measure. Thus, there appears to be some connection between creativity, in terms of preference for complexity, and curiosity, as reflected in an interest response; however, the reported correlations are quite low. Berlyne and Lewis (1963) found a correlation of .32 ($p < .01$) between BW scores and a measure of diversive curiosity, that is, selecting the more complex of two stimuli to inspect a second time. Nevertheless, as already suggested, the research dealing with the relationship between creativity and curiosity would rest on a better basis if the degree of correlation between verbal preference responses to some of Berlyne's figures and scores or the BW or RA was established.

Overview

In an analysis of the literature on creativity appearing in the psychological journals between 1956 and 1965, Smith (1968) notes that 31 different instruments or procedures were employed to measure creativity in the 105 articles sampled. As a result, one of his conclusions is that "philosophical inconsistency exists between researchers concerning how best to measure factors of creativity, with relatively little explicit attention being given to evaluating the validity and reliability of existing instruments" (p.689). The research with three indices, the RA, random polygons, and Berlyne's figures, comprising stimuli varying along the complexity dimension, has been discussed in this chapter. In the first chapter, it was argued that the RA scale, purported to reflect both simplicity—complexity preference and a corresponding personality dimension of simplicity—complexity, is an index of self-actualizing creativeness. An important concern of this study is to examine the pattern of correlations among verbal expressions of preference to the three complexity measures: it is hypothesized that preference for complexity will be consistent within individuals; that is, there will be positive relations among the scores on the three measures. Such a pattern of correlations would offer support for two related contentions: 1. the RA scale does indicate a preference for complexity; 2. there is a general factor of preference for complexity.

Relevant to the emphasis on consistency, Knapp and Ehlinger (1962) present evidence from a study of preference, involving 32 male and 28 female university students, that there are two distinctive stylistic consistencies across three modalities of aesthetic appreciation, architecture, music, and abstract painting. The first general preference style implicated restless and troubled music, turbulent and diffuse abstract art, and curvilinear architectural forms. The second style combined a liking for mediative and nostalgic music, a dislike of abstract art, and a preference for more stable architectural structures. Contrasting the dynamism of the first constellation with its neurotic overtones to the sober and calm qualities of the second, Knapp and Ehlinger suggest that such stylistic consistencies indicate that aesthetic preference is "a subtle yet penetrating revelation of the temperamental and motivational attributes of the individual" (p.61). The point to be drawn, for the purposes of this research, is that it will be more reasonable to argue that simplicity—complexity preference reflects an underlying simplicity—complexity personality dimension if there is consistency of preference across the various measures. It seems necessary to clarify this issue in the attempt to discover if preference for complexity is, in fact, a manifestation of self-actualizing creativeness.

CHAPTER III.

Complexity Preference in an Educationally Subnormal Sample

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It has been argued that although a threshold level of intelligence is a necessary condition for great-achievement creativity, an individual may manifest self-actualizing creativity, involving the development of his potential, regardless of IQ level. In this chapter, some research dealing with the relation between the three complexity indices and an intelligence measure will be described. Essentially three questions are investigated:

1. Are the three complexity indices, hypothesized to reflect self-actualizing creativity, viable for use with an educationally subnormal (ESN) sample?
2. Will these measures show positive intercorrelations with such a sample?
3. Are the measures related to an intelligence measure?

Relevant to creativity defined in terms of divergent thinking, Guilford (1959b) has emphasized that none of the individual primary abilities are unique to the creative person. Rather, he contends that all persons possess the several abilities in differing degrees since the abilities are continuously distributed variables. Consistent with this view, Day (1968a) points out that "if we want to use the concept of creativity to measure and direct educational programs, the approach must be taken that creative production is not the prerogative only of unique individuals but is a potential characteristic which is normally distributed over the whole population and can be nurtured and developed under optimal conditions" (p.488).

Within the product-oriented framework, Tisdall (1962) notes that mentally retarded individuals will never make valuable creative advancements; however, he maintains that "the possible existence of any trait which may contribute to their maximum development warrants examination" (p.37). With the focus on educational conditions, he has compared the performances of normal children and of educable mentally retarded (EMR) children, that is children with Stanford-Binet IQ scores within the 60 to 85 range, on a battery of Torrance's creativity tests. Specifically, 3 verbal and 3 nonverbal creative productivity measures were administered to 3 groups of children: 27 children (N group) of normal intelligence; 39 EMR children (E group) in special classes geared to their particular needs; and 32 EMR children (C group) in regular classes. There were no differences among the 3 groups on the combined nonverbal originality and elaboration scores. For each of the 3 combined verbal scores of originality, fluency, and flexibility, the means of the N and E groups were significantly higher than the means of the C group; no significant differences emerged between the N and E groups on the verbal measures. Tisdall attributes this superiority of the EMR children in special classes to the encouragement which they are given to formulate and express their ideas.

In related research, Smith (1965, 1967) implemented a selection of both verbal and nonverbal divergent-thinking tests with 2 samples of subjects: 1. 48 10- year-old EMR children, that is children who scored below 80 on the Kuhlman-Anderson Intelligence Test, in regular classes; 2. a sample of 48 children with normal IQs between 90 and 120, matched on the basis of sex, race, socio-economic status, and school and classroom setting with the EMR children. The data from the tests, when scored for various factors such as fluency, flexibility, and originality, indicated that the normal children exceeded ($p<.05$) the mentally retarded children on 12 of the 14 verbal factors. On the other hand, no differences were found between the 2 groups on the 7 nonverbal factors. With regard to verbal creativity, the divergence between the 2 groups may be explainable in terms of intellectual differences. Nevertheless, Smith (1967) concludes: "... to attribute the lack of manifest creative thought to intellectual retardation alone may be inappropriate, since educable mentally retarded children are often associated with social circumstances which are inhibiting, highly structured, threatening, and rigid. Such an environment is thought to stifle creative thought" (p.575). The results of the study by Tisdall (1962), in which EMR children in special classes performed better than EMR children in regular classes, offer support for this interpretation.

In addition, Rouse (1965) presents evidence which demonstrates that retarded subjects benefit from creativity training. She worked with 78 7- to 17- year-old retarded children, with an IQ range of 58 to 81, enrolled in special classes. These subjects were first pretested on Torrance's verbal Product Improvement Test and nonverbal Circles Test, each scored for fluency, flexibility, originality, and elaboration. Forty-seven children from 5 of the classes then served as experimental subjects and underwent 30 consecutive lessons designed to foster creative thinking abilities: the essential characteristic of the training sessions was practice in the expression of ideas without fear of criticism. The 31 control subjects in the other 5 classes did not receive any training. Post-test results with the same verbal and nonverbal measures indicated that in comparison with the control group, the experimental subjects significantly improved their performance on all the factors, with greater gains shown in the verbal areas.

Although the tests used in the research on creativity in retarded children have been of the divergent-thinking variety, the general approach seems to be one which emphasizes self-actualization. Therefore, in the study to be described, the responses of ESN children to preference-for-complexity measures, which are hypothesized to be closely related to the self-actualizing view of creativity, will be investigated.

Description of ESN Children

Children classified as educationally subnormal have IQs falling within the 50 to 70 range. They are educable in that they can be trained to read and write. However, they are by definition slow-learning children, and therefore are taught in schools with curricula adjusted to their particular requirements. Mr. Mooney, the headmaster of the Durham Day School from which the ESN children were selected for this research, indicated that most emphasis was put on giving the children practice in the "social skills." This term is meant to cover both the conventions of social interaction and also such everyday activities as planning meals, setting a table, handling money, using public transport, and ordering food in restaurants.

Method

Subjects

Fifty-three male and female students from the Durham Day School, a school for ESN children, served as subjects. There were 16 11- to 13-year-olds, 13 14- year-olds, 11 15- year-olds, and 13 16- year-olds; their mental ages varied from 6.75 to 11.70.

Procedure

The subjects were tested individually in a room assigned for the study. They were told that E was interested in the types of pictures people liked and asked to state their preferences; however, E marked their answer sheets for them. The RA was administered first, followed by the Random Polygon measure, and then Berlyne's Figures.

Materials

I. RA

The 60 figures making up the Revised Art Scale (RA) of the Welsh

Figure Preference Test were presented one by one. On this measure, the subject's task is to indicate whether he likes or dislikes a figure. A score of 1 is given for each of the 30 complex items which the individual likes and for each of the 30 simple items he dislikes. That is, a high score is in the direction of high complexity preference, with a possible range of 0 to 60.

II. Random Polygons

As the bipolar factor of the RA has been interpreted to reflect simplicity-symmetry—complexity-asymmetry, it was decided to include both symmetrical and asymmetrical shapes. The symmetrical polygons implemented were the 3 Birkhoff shapes used by Eisenman: one example of each of the 4-, 8-, and 10-sided complexity levels. A selection of 18 asymmetrical polygons, comprising 3 examples of each of the 4-, 6-, 8-, 12-, 16-, and 24-sided complexity levels, was taken from Vanderplas and Garvin (1959). All figures were on 4in. by 5in. cards; each stimulus was black on a white ground. The 21 polygons were displayed one by one in a random sequence; the subject was instructed to respond either "like" or "don't like" to every figure.

Four scores were derived from an individual's responses:

1. Mean. Calculated by averaging the number of points on the polygons the subject liked, this was the principal preference-for-complexity score on the Random Polygon measure. It was considered to be an indication of the subject's preferred or optimal amount of complexity.

2. Standard Deviation. Again based only on the polygons the individual liked, this score reflected the width of his complexity-choice range.

3. Number of symmetrical polygons the subject liked.

4. Number of asymmetrical polygons the subject liked. The latter 2 scores were added to the data analysis in order to provide some information

on symmetry—asymmetry preference.

III. Berlyne's Figures

Pairs of patterns from both Berlyne's non-X and X complexity series were implemented: 2 pairs from category A. irregularity of arrangement; 2 pairs from category B. amount of material; 2 pairs from category C. heterogeneity of elements; 2 pairs from category D. irregularity of shape; 2 pairs from category XA. number of independent units; 2 pairs from category XB. asymmetry; and 2 pairs from category XC. random rearrangement. Both the order of presentation and the side on which the less complex (LC) or more complex (MC) alternative occurred were randomly determined. The figures of a pair were labelled A and B and displayed simultaneously; the subject's task was to indicate which figure he preferred or "liked best." A high score was in the direction of high complexity preference: a 1 was assigned for every MC figure an individual preferred; scores could vary from 0 to 14. The reasoning behind the simultaneous presentation was that the preferential-choice characteristic of diversive exploration could be retained, while verbal preference responses were also elicited.

Results and Discussion

The research data will be interpreted with particular reference to the three questions posed earlier in the chapter.

1. Are the 3 complexity indices viable for use with ESN subjects?

The finding that the children were able to meet the response requirements offers some support for an affirmative answer. In addition, an examination of Table 1 shows that the subjects' scores on the RA, Berlyne's Figures, Polygon Mean, and Polygon Standard Deviation fall into the low, medium, and high divisions, with the greatest number of scores on all measures concentrated in the medium category, and lesser dispersions in the two peripheral categories. Such a frequency distribution of the

TABLE 1

Low, Medium, and High Scores on the RA, Berlyne's Figures, Polygon Mean and Standard Deviation: Frequency Distribution of All Subjects by Age Divisions

I. RA

age	low 1-20	medium 21-40	high 41-60		
11-13	3	13	0		16
14	4	9	0		13
15	2	9	0		11
16	1	8	4		13
	10	39	4	= TOTAL:	53Ss
	18.9%	73.6%	7.5%	=	100%

II. Berlyne's Figures

age	low 1-4	medium 5-10	high 11-14		
11-13	4	12	0		16
14	5	8	0		13
15	3	8	0		11
16	3	8	2		13
	15	36	2	= TOTAL:	53Ss
	28.3%	67.9%	3.8%	=	100%

TABLE 1 continued

III. Random Polygons: $\bar{X}$	low	medium	high		
	4-9	10-14	15-24		
age					
11-13	1	15	0		16
14	4	5	4		13
15	1	9	1		11
16	2	3	8		13
	8	32	13	= TOTAL:	53Ss
	15.1%	60.4%	24.5%	=	100%

IV. Random Polygons: S.D.	low	medium	high		
	2-4	5-6	7-8		
age					
11-13	3	10	3		16
14	4	6	3		13
15	0	7	4		11
16	1	12	0		13
	8	35	10	= TOTAL:	53Ss
	15.1%	66%	18.9%	=	100%

scores is consistent with the view that preference for complexity, hypothesized to be a manifestation of self-actualizing creativity, is a continuously distributed variable in retarded children.

With regard to the Polygon Mean, it is also interesting to note that 32 of the 53 subjects (60.4%) had scores falling within the medium range, suggesting that ESN children prefer a moderate amount of complexity. This corresponds with Munsinger and Kessen's contention that people tend to prefer an intermediate amount of complexity, that is, approximately the 10-sided level.

The data from the 53 subjects were analyzed by computer: using the Pearson product-moment correlation coefficient, each score was compared to every other score. The names and identifying numbers of all variables included in the analysis are itemized in Table 2.

2. Are there positive intercorrelations among the preference responses of ESN children to the 3 complexity measures?

As can be seen from Table 3, the results show: a significant positive correlation of .57 ($p<.01$) between complexity preferences on the RA and on Berlyne's Figures; a significant positive correlation of .50 ($p<.01$) between the RA and the Polygon Mean; and a significant positive correlation of .36 ($p<.01$) between Berlyne's Figures and the Polygon Mean. In other words, ESN children appear to be consistent in their complexity preferences. This finding offers additional evidence that the complexity measures are viable for use with retarded children, in that they are actually indications of preference. Furthermore, as argued in the second chapter, uniformity of simplicity—complexity preference suggests that such preference does reflect an underlying simplicity—complexity personality dimension, closely linked to closedness—openness to experience.

3. Do the 3 complexity measures show any relation to an intelligence measure?

TABLE 2

Variables included in the Data Analysis with Identifying Numbers, Means, and Standard Deviations for each of the Measures

		mean	standard deviation
1.	age	13.92	1.69
2.	sex MALE 1 FEMALE 2	1.38	.49
3.	RA	28.28	8.76
4.	Berlyne's figures	5.92	2.68
5.	polygon mean ($\bar{X}$)	12.18	2.78
6.	polygon standard deviation (S.D.)	5.63	1.35
7.	number of symmetrical polygons liked (sym.)	2.04	.73
8.	number of asymmetrical polygons liked (asym.)	10.06	6.73
9.	mental age (M.A.)	9.02	1.89

TABLE 3

Correlation Matrix for ESN Study (N=53)

		1	2	3	4	5	6	7	8	9
1.	age	1.00								
2.	sex M1 F2	.06	1.00							
3.	RA	.19	-.28*	1.00						
4.	Berlyne's figures	-.10	-.26	.57**	1.00					
5.	$\bar{X}$	.27*	-.01	.50**	.36**	1.00				
6.	S.D.	.05	-.03	.21	.24	.56**	1.00			
7.	sym.	-.06	.17	-.42**	-.34*	-.39**	.16	1.00		
8.	asym.	-.05	-.09	.13	-.03	-.12	.06	.25	1.00	
9.	M.A.	.53**	.03	.12	.11	.40**	.20	-.25	-.62**	1.00

** significant at .01 level .35

* significant at .05 level .27

There was a nonsignificant correlation of .12 between mental age and complexity preference on the RA, and of .11 between mental age and scores for Berlyne's Figures. On the other hand, there was a significant correlation of .40 ($p<.01$) between mental age and the Polygon Mean. However, before concluding that the Random Polygon measure is associated with intelligence, it would seem necessary to replicate this research with other subject populations.

Aside from the data bearing on these three central issues, various other results relevant to complexity preference emerged. Specifically, the number of symmetrical polygons liked was negatively related ($p<.01$) to preference for complexity in terms of the RA, Berlyne's Figures, and the Polygon Mean score. This is particularly interesting in view of the evidence that the majority of subjects like symmetry: as can be seen from Table 2, the mean number of symmetrical figures to which an individual responded "like" was 2 out of 3 possible choices. Thus, there is some support for the view that preference for complexity is associated with a rejection of symmetry. No significant correlation was disclosed between any of the complexity measures and the number of asymmetrical figures liked. Finally, sex was negatively correlated ($p<.05$) with RA scores; that is, males preferred more complexity on this measure than did females.

Conclusions

The finding that low-IQ (mean=65) subjects demonstrate consistency of response across the 3 complexity measures suggests that the measures are reflecting the subjects' simplicity—complexity preferences. In addition, such consistency makes it more reasonable to postulate that preference for simplicity—complexity is a manifestation of a relevant underlying simplicity—complexity personality dimension, implicating closedness—openness to both internal and external experiences.

Regarding openness to experience as a prerequisite for self-actualizing creativity, it is arguable that retarded children may, under optimal conditions, become self-actualizing.

Further support for the contention that self-actualization is not dependent on intelligence comes from the data showing that scores on the RA and Berlyne's Figures did not correlate with mental age; however, there was a significant positive correlation between the Polygon Mean and mental age. More research designed to investigate the relation between intelligence and preference for complexity seems to be indicated. Nevertheless, the Random Polygon measure will be retained for the sample of normal children and adults in order to examine the pattern of correlations among complexity measures which emerges with such subjects. Before reporting the preference results for the normal subjects, there will be a discussion of the Impression Formation Tests and the reason for their inclusion in the study of these subjects.

CHAPTER IV.

Integration and its Measurement

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The definition of complexity, consistent with the self-actualizing approach, which has been formulated to serve as the basis of this research is: Creativity is present when the interaction between the uniqueness of the individual, and the materials, events, people, or circumstances of his life results in the emergence of a thought or action which is new to the individual concerned. Two conditions seem to be implicated in this definition: 1. the individual is open to experience; 2. the individual is able to organize or reorganize his experience in novel ways. It has been argued that preference for complexity is a manifestation of openness to experience. In addition, Barron (1958, 1963) contends that a "need for disorder" underlies such preference; that is, the creative response to the "apparent disorder" implicit in complexity is to attempt to impose a comprehensive new ordering. Thus, the use of preference for complexity, particularly as indicated by Revised Art Scale scores, as the measure of self-actualizing creativeness, appears to meet the requirements of the definition.

However, Barron (1966, 1968) also postulates that preference for simplicity—complexity reflects a relevant personality dimension of simplicity—complexity. In other words, perceptual preference is a manifestation of a more pervasive orientation towards experience; or one aspect of a characteristic underlying personality structure. The Impression Formation Tests, which will be discussed within the framework of "conceptual systems theory" as outlined by Harvey, Hunt, and Schroder (1961) and Schroder, Driver, and Streufert (1967), were included in order to investigate this issue. As previously suggested, consistency of simplicity—complexity preference can be taken as evidence in support of the view that such preference does relate to personality differences. The proposition, which will be developed in this chapter, is that the implementation of the Impression Formation Tests constitutes a more direct attempt to discover whether simplicity—complexity preference is an index of an analogous structural dimension of personality organization.

Conceptual Systems Theory

Information processing in any given situation involves the perception and subsequent structuring of various kinds of data. Conceptual systems theory characterizes individuals, in interaction with their environments, as active information-processing systems. A concept, evolved from the experience of objects and events in the environment, represents a category of varying definiteness and breadth along some specifiable dimension, such as small—large, or good—bad; it acts as a gauge with respect to which other stimuli are compared and evaluated. In other words, concepts, or the stored effects of past experience, are mediating links which aid in the processing of information: "... in their matrix of interrelatedness, they serve the critical cognitive function of providing a system of ordering by means of which the environment is broken down and organized, is differentiated and integrated, into its many psychologically relevant facets" (Harvey, Hunt, and Schroder, 1961, p.10). In addition, Harvey, Hunt, and Schroder argue that the self is "the intertwined totality of the individual's concepts;" the individual defines his existence in time and space in terms of his conceptual matrix.

The focus in conceptual systems theory is upon cognitive structure, that is upon "how" an individual thinks, not "what" he thinks. Schroder, Driver, and Streufert (1967) contend that structural variables "provide a metric for measuring the way a person combines information perceived from the outside world, as well as internally generated information, for adaptive purposes" (p.4). A basic assumption of the theory is that a person's concepts are ordered in conceptual systems according to certain patterns of organization. One of the most important properties of this organization is its level of information processing or "conceptual level." Conceptual level, over a given range of stimuli, differs among individuals and is measured in terms of its "integrative complexity." Integrative complexity, which varies along a continuous concrete—abstract dimension, refers to the individual's methods of patterning or relating stimuli.

The Definition of Concrete and Abstract

> The study of how people perceive their environments has indicated that an individual interacts with his environment by analyzing it and organizing it into meaningful patterns that are congruent with his own needs and psychological makeup (Mitchell, 1972, p.35).

Differentiation and subsequent integration are inherent in dealing with the environment, in information processing. Differentiation refers to the breaking up of a more novel, more global, stimulus or event into more clearly defined and articulated parts. Integration is the relating or connecting of such parts to each other and to previous experience. Within the conceptual systems framework, degree of differentiation refers to the number of unique dimensions along which stimuli can "take on" meaning. However, Schroder, Driver, and Streufert (1967) maintain that the number of dimensional attributes has only a low-order relationship to the level of information processing. For example, an individual employing two dimension in "thinking about" a particular class of stimuli may be able to apply them conjointly, combine them in different ways, and compare outcomes; whereas, an individual using three dimensions may apply them independently in a compartmentalized way. In other words, the most salient determinants of conceptual level are the number and interrelatedness of the combinatory conceptual rules for organizing the units of information. Thus, it is not the number of dimensions, but the number of different ways in which they can be integrated, the number of diverse perspectives which can be generated from the same amount of information, which enters into the definition of concreteness—abstractness.

Perhaps the best procedure to elucidate the meaning of the terms concrete and abstract, as used within the context of conceptual systems theory, is to describe the functioning of persons who would be classified at the two extreme ends of the concrete—abstract dimension. A concrete conceptual structure is inferred from a variety of the individual's characteristic manners of behaving: a tendency towards bifurcated black-white evaluations, such as bad-good, wrong-right, etc; a dependence on external cues, that is "stimulus boundness," or inability to go beyond the information given; difficulty in changing set; an intolerance of conflict or ambiguity; and an incapacity to resolve conflict or ambiguity by means other than exclusion (Harvey, 1965; Harvey, Hunt, and Schroder, 1961; Schroder, Driver, and Streufert, 1967; Ware and Harvey, 1967). On the other hand, an abstract individual would manifest behavior in the opposite direction on the criteria outlined above. More specifically, he is able to go beyond any single or externally given interpretation of a stimulus or a situation; to resolve conflict or ambiguity by integrating the diverse elements. The most distinctive feature of the abstract person's activity is a greater awareness of "self" as an agent: "Conceptual level ... provides an objective measure of self-development" (Schroder, Driver, and Streufert, 1967, p.9). This emphasis on an awareness of internal causation and an internal locus of evaluation is closely related to Roger's (1951, 1970) view of the "fully-functioning" or self-actualizing individual, who interprets sensory and visceral data not in terms of values introjected from others, but instead with reference to values experienced directly by the organism. Such values are not held inflexibly; rather they are continually changing, with the result that the self-concept becomes more congruent with experiences of the organism.

Schroder, Driver, and Streufert (1967) compare the difference between concrete and abstract conceptual systems to that between fixed and emergent rule structures. Structures with fixed rules vary with respect to the amount of information processed, and the speed with which it is processed; however, they are alike in that the rules of information processing are minimally modifiable within the system. Individuals with simple or concrete intervening structures demonstrate compartmentalization and a hierarchical integration of rules. That is, the integrating structure is absolute: the dimensional "readings" of a range of stimuli are organized in a fixed way. A major consequence is that there is a comparative absence of conflict within the system; the structure is static. A conceptual system must itself generate uncertainty and ambiguity if it is to develop beyond an adaptation characterized by fixed rules. Emergent rule structures also vary in terms of the amount and speed of information processing, but they are similar in that new information-processing rules emerge within the system itself.

With increasing abstractness of conceptual level, the most significant aspect of change is the extent to which the system becomes less determinate: alternate perspectives and interrelationships can be evolved from the same dimensional values of information. In adapting to a complex, changing situation, an abstract orientation is much more effective than a concrete one which is dependent upon external conditions for developing rules and upon past experience for predicting events. Pertinent to this concrete—

abstract distinction with regard to adaptability is Barron's (1968) comment on the disposition to impose order on complexity: "Now freedom is related in a very special manner to degree and kind of organization. In general, organization in company with complexity generates freedom; the more complex the level of integration, the greater is the repertoire of adaptive responses. But the tendency toward organization may operate in such a way as to maintain a maladaptive simplicity" (p.210).

Creativity in relation to Conceptual Level

It has frequently been suggested that a defining feature of creativity is behavior variously described as the inclination to "integrate," "reorganize," or "restructure" the divergent and even contradictory elements of experience (Barron, 1963, 1968; Bloomberg, 1967, 1971; Karlins, 1967a; Maier, Julius, and Thurber, 1967; Spotts and Mackler, 1967; Wertheimer, 1959). Or as Karlins (1967b; Karlins and Schroder, 1967) points out with reference to creativity, the focus is not upon the amount of information the individual has stored and can recall, but rather upon how effectively he can employ this information in coping with his environment: "... the emphasis is centered not in how much information is known but how that information is utilized in dealing with the unknown" (Karlins and Schroder, 1967, p.873). Within the conceptual systems framework, Schroder, Driver, and Streufert (1967) maintain that individuals with concrete and abstract structures can be equally intelligent; that is, alike in terms of the amount of information at their disposal or the extent to which learned rules can be elicited by specific cues. However, regarding creativity as the ability to generate uncertainty and conflict, to evolve alternate organizations or integrations of diverse perceptions and decisions, they contend that "the degree of creativity is synonymous with the conceptual level in any given area" (p.10). Thus, they consider creativity to be a function of the abstractness or complexity of the individual's personality structure which corresponds to the view advanced by Barron: preference for complexity, which reflects an underlying complexity of personality organization, is a manifestation of creativity.

According to conceptual systems theory, information processing involves the structuring of the data perceived. Similarly, Munsinger and Kessen maintain that the processing of a random shape entails structuring it, that is, organizing it into a meaningful unit. One of the distinguishing traits of the individual with an abstract or complex conceptual structure is that he is inclined to take many perspectives, to educe many interpretations of a stimulus or event. It has been found that more complex figures, both those from the RA scale (Golann, 1962), and many-sided random polygons (Munsinger and Kessen, 1965), are more ambiguous or evocative in that they are suggestive of more meanings. Therefore, it seems reasonable to argue that complexity preference may be related to the abstractness of the individual's conceptual structure: conceptually complex persons, who are disposed to deal with stimuli in variable and idiosyncratic ways, would tend to prefer more complex figures which allow greater scope for such behavior.

Eisenman and Platt (1968) present evidence which offers support for this contention. Within the conceptual systems framework, abstract persons are characterized as being able to accept conflicting or incongruous information to a greater extent than concrete persons, who process information in a rigid, black-or-white manner. Eisenman and Platt consider that there is incongruity inherent in the situation that psychology is regarded as a science, but that clinical psychology can perhaps best be viewed as incorporating both art and science. They hypothesized that students who preferred complexity and had had sufficient background in psychology, would be less likely to rate clinical psychology as a science than those who preferred simplicity and had little experience of psychology; groups of students with low experience-high complexity preference, and high experience-low complexity preference were expected to fall between the "high-high" and "low-low" groups in their ratings.

Forty-two male and 33 female university undergraduates from 2 introductory classes in clinical psychology were requested to choose their 3 most preferred and 3 least preferred shapes from a selection comprising 3 asymmetrical polygons from each of the 4-, 12-, and 24-sided complexity levels, and 3 symmetrical polygons of 4, 8, and 10 sides respectively. A complexity score was derived for each individual by subtracting the total number of points on his 3 least preferred from the total number of points on his 3 most preferred figures. Experience was manipulated by having the subjects judge both psychology and clinical psychology as a science on a 7-point scale, 1 representing "definitely yes" and 7 "definitely no," either at the beginning of the course or 9 weeks after its commencement. With respect to the judgments of clinical psychology, an analysis of variance disclosed a significant simplicity—complexity preference X experience interaction ($p<.01$): the high complexity-high experience group rated farthest of the 4 groups towards the "definitely no" end of the scale, while the low complexity-low experience group rated closest to the "definitely yes" end; the other 2 groups fell in between. In addition, the high complexity-high experience group differed significantly from all other groups. On the other hand, there were no significant differences among the 4 groups in their judgments of psychology: the mean rating for all 75 subjects was 2, demonstrating that they tended to regard psychology as a science. This latter finding suggests that subjects were responding to incongruity in their ratings of clinical psychology. Thus, it appears that individuals who prefer complexity are more likely to be able to handle incongruous or ambiguous data, which in turn is a manifestation of an abstract or complex conceptual structure.

In his desire to avoid conflict and ambiguity, the concrete person tends to hold his opinions with a great deal of certainty, and to resist any information which is inconsistent with his outlook. However, he is also particularly susceptible to the influence of authority, showing a dependence on authority-centered cues as guides to belief and action (Harvey, 1967; Harvey, Hunt, and Schroder, 1961; Schroder, Driver, and Streufert, 1967; Ware and Harvey, 1967). In an experiment on attitude change, Eisenman (1968b) has examined the relation of simplicity—complexity preference to these aspects of behavior. Complexity preference was determined by instructing the 40 psychology-student subjects to select their 3 most preferred and 3 least preferred shapes from 9 asymmetrical polygons varying in complexity from 4 to 24 sides: each student's score consisted of the total number of points on his 3 most preferred shapes minus the total number of points on his 3 least preferred shapes. Half the subjects underwent treatment designed to "involve" them on the "relevant" issue, the other half were involved on the "irrelevant" issue; these issues were topics in psychology. Involvement comprised the experimenter discussing the issue and telling the subjects that they would later be required to give a classroom report on the same topic. All subjects then rated their attitudes towards each issue on a 6-point scale. After a one-week interval, subjects were divided into 2 groups according to whether they had been for or against the relevant issue, and were presented with a persuasive communication in opposition to their original views by the experimenter, an authority on psychology. An analysis of variance of the post-treatment ratings on the relevant issue revealed a significant simplicity—complexity preference X involvement interaction: subjects who preferred simplicity and were low in involvement manifested the most attitude change; subjects who preferred simplicity and were high in involvement manifested the least attitude change; subjects who preferred complexity, regardless of whether they were high or low in involvement, showed an intermediate amount of attitude change. Furthermore, the finding that subjects demonstrated no significant change in their attitudes on the irrelevant issue indicated that the experimental manipulation of attitude was responsible for the change on the relevant topic.

Considered overall, the data from these 2 studies by Eisenman (1968b; Eisenman and Platt, 1968) suggest that those who prefer simplicity function in ways characteristic of individuals with concrete conceptual structures; whereas those who prefer complexity behave in a manner congruent with an abstract conceptual structure. Therefore, a tenable hypothesis is that preference for simplicity reflects a simple structure; and preference for complexity reflects a complex structure.

Environmental Effects on the Development of Conceptual Level

According to conceptual systems theory, all cognitive activity is conjointly determined by the dispositional and situational factors operative at a given time; that is, the organism is continuously adapting to whatever environmental conditions are encountered. Conceptual development occurs as a result of the interaction between the conceptual state of the organism and environmental conditions. From the structural point of view, the concern is not with the content of the responses the child is taught, but rather with what adaptive orientation he evolves while he is learning these responses in a particular training environment: "... the goal of training or its content may have little relationship to what the subject really learns as he copes with the environmental pressures" (Harvey, Hunt, and Schroder, 1961, p.119). Development is regarded as a progressive trend such that the child must master more concrete systems of ordering before more abstract levels can emerge. Under optimal environmental conditions, concrete structures are expected to advance towards abstractness. However, under less than optimal training conditions, development may be arrested at some point along the concrete—abstract continuum. For the purposes of progression, the most salient effect of environmental factors is the extent to which they induce closedness or openness of the conceptual system to alternate and conflicting interpretations of the same stimuli or events, and new ways of interrelating these perspectives.

The results of an analysis by Schaefer (1959) of several empirical studies of maternal behavior indicate that descriptions of mother-child interactions can be organized within a two-dimensional space: the two major dimensions of maternal behavior are labelled Love versus Hostility and Autonomy versus Control. Control implies an authoritarian imposition of standards and rules; whereas autonomy involves democratic and co-operative practices. Harvey, Hunt, and Schroder (1961) propose that training conditions can be ordered along a continuous unilateral—interdependent dimension which bears similarities to Schaefer's control—autonomy dimension. A unilateral environment is conducive to the development of a concrete conceptual structure; while an interdependent environment enhances the potential development of an abstract conceptual structure. Or as Schroder, Driver, and Streufert (1967) formulate the relationship: "In the unilateral condition, the subject learns a response pattern through an adaptive orientation characterized by applying fixed rules; in the interdependent condition, the subject learns a response pattern through an adaptive orientation characterized by applying self-generated rules" (p.49).

More specifically, as outlined by Harvey, Hunt, and Schroder, the defining properties of a unilateral training environment are: an external source provides absolute criteria, or ready-made rules, for behavior; rewards and punishments are determined by how well the child's responses match these external criteria; extrinsic evaluation, that is the child is valued in terms of his achievement as measured against the external criteria held by the training agent. In other words, the child is forced to fit a preconceived mould. Consequently he develops a conceptual orientation based on external causation: stimuli are compared to external standards and interpreted in fixed ways; the delineation of alternate and idiosyncratic interpretations is inhibited. In contrast, the interdependent environment permits maximum information feedback and allows the child to learn from both his successes and his failures. That is, the training agent is aware of the relative criteria of behavior and so encourages the child to generate his own information-processing rules. Therefore, rewards are directed primarily towards means and exploratory acts, not towards some fixed end-response. In addition, the child is valued intrinsically, for himself as a person, not just according to his achievement. These conditions are conducive to the evolvement of a conceptual orientation implicating a more complex perception of the environment. The child develops a sense of internal causation: he evaluates stimuli in his own terms and comes to realize that there are many equally correct interpretations of the same stimuli. Harvey, Hunt, and Schroder (1961) summarize: "Training conditions that assume a passive static organism are more likely to result in arrestation of development at some level. Conversely, training conditions that involve interdependence in which the subject's reactions affect the training agent and vice versa should foster progression" (p.155).

Creativity in relation to Parental Environment

Cross (1966) has carried out a study designed to investigate whether the parents of boys with more abstract conceptual structures provide more interdependent environments than do the parents of boys with more concrete conceptual structures. He approached this question in two fashions. First, the conceptual levels of 182 high school subjects were assessed by means of the Sentence Completion Test, which consists of various sentence stems, for example, Rules ..., Parents ..., When I am in doubt ..., When I am criticized ... etc. Such items are considered to represent the presentation of discrepancy and uncertainty, and to require the subject to generate a response involving some form of "resolution" (Schroder, Driver, and Streufert, 1967). The boys' completions were scored according to the evidence they gave of self-delineation and specification of alternatives. The mothers and fathers of these 127 subjects were sent a questionnaire including 4 scales measuring authoritarianism; a high score on the combined scale was in the direction of nonauthoritarianism. In addition, 27 boys of high conceptual level (CL) were selected from the total sample and matched with 27 boys of low conceptual level. Both parents of the boys in these two extreme groups were interviewed, and the replies to the 6 questions dealing with training conditions were scored from 1 to 5 on a unilateral-interdependent scale: a 1 was assigned if the parent was in complete control, permitting little deviation from established standards; a 5 was given if there was a flow of information between the parent and the child, and the child "takes what is necessary" in order to evolve his own standards. A total score was derived for each parent by summing the scale values for all scorable responses and then dividing by this number of responses.

With regard to the results for the total sample, there was a significant positive correlation ($p<.02$) between combined family nonauthoritarianism and the abstractness of son's conceptual level. The data for the extreme groups show that the training methods of mothers of high CL boys are significantly more interdependent ($p<025$) than those of mothers of low CL boys; fathers of high CL boys are significantly more interdependent ($p<.01$) than fathers of low CL boys; and the combined parental scores of high CL sons are significantly more interdependent ($p<.025$) than those of low CL sons. Thus, a tenable hypothesis is that the interdependence of the parental environment, defined in terms of autonomy and nonauthoritarianism, is functional in the development of an abstract or complex conceptual structure.

Similarly, Nichols (1964) contends that restrictive, controlling attitudes on the part of the mother will have an adverse effect on the creativity of the child. In order to examine this proposition, he administered 11 scales comprising the Authoritarian-Control factor of the Parental Attitude Research Inventory (PARI) to the mothers of 796 male and 450 female high school seniors. The scales have been designed to tap such behaviors as fostering dependency, excluding outside influences, avoidance of communication, suppression of aggression, ascendance of the mother, intrusiveness etc. The creativity of the children was assessed on various measures, including 2 scales constructed by Barron: the Complexity-Simplicity scale, composed of items selected for their significant correlations with scores on the Barron-Welsh Art Scale; and the Independence of Judgment scale. Separate analyses of the data for males and females disclosed significant negative correlations ($p<.01$) between the authoritarian child rearing attitudes of the mother and the child's creativity on both the Complexity-Simplicity scale and the Independence of Judgment scale for each sex. Therefore it seems reasonable to argue that nonauthoritarian parental practices may also be implicated in an individual's preference for complexity.

From the retrospective reports of his most creative group of architects, MacKinnon (1962, 1965) has been able to identify a number of differentiating parental traits. Specifically, the parents were characterized as manifesting an extraordinary respect for the child and a confidence in his ability to do what was appropriate; the child was encouraged to formulate his own ethical code and rules of conduct. There was also evidence of a lack of intense closeness between the parents and the child, such that neither overdependence was fostered nor rejection experienced. MacKinnon (1962) comments: "The expectation of the parent that the child would act independently but reasonably and responsibly appears to have contributed immensely to the latter's sense of personal autonomy which was to develop to such a marked degree" (p.491). Comparing elementary school children's scores on Torrance's tests of creativity with psychiatric ratings of their parents, Weisberg and Springer (1961) also indicate that the family units of highly creative children are not particularly close: such families show little clinging to one another for support; little stress on conformity to parental values; and open and not always calm expression of strong feeling.

Continuing this line of investigation, Dreyer and Wells (1966) have studied the parents of 24 4- and 5- year-old boys and girls, divided into a high-creative and a low-creative group on the basis of 1 nonverbal and 2 verbal tasks designed by Torrance. They found that the parents of the high-creative children demonstrated greater role tension; that is, they were more likely to rate both themselves and their spouses negatively on a list of personality traits than were the parents of the low-creative children. Furthermore, in rankings of the order of importance of 10 domestic values, there was less consensus between the mothers and fathers of high-creative children than between those of low-creative children. These results suggest that in their marital relationships, the parents of creative children are more open to their feelings and more tolerant of a diversity of attitudes and ideas. It seems probable that such behavior would carry over into their interactions with their children. Albert (1971) points out that many researchers have stressed the importance of home atmosphere in the development of creativity, regardless of level of intelligence; and he summarizes: "The common theme appears to be that of respecting the child, and interacting consistently in a manner that is both adult-like, reasonable, and open to disagreement" (pp.23-24). In general, the picture which emerges of the parental environment of the creative individual corresponds to the description of the interdependent environment.

Interdependent training does not consist of a constant set of conditions applied inflexibly by the parent throughout the training sequence. Rather the defining feature is that the behavior of the parent changes through "interdependence," or an exchange of information with the child; there is "maximum synchrony" between environmental conditions and the child's stage of development. Relevant to the importance of the parent regulating his behavior through interaction with the child, Baldwin (1946) reports a correlation between parental warmth and children's adjustment of .64 for 3- year-olds, and .16 for 9- year-olds; and a correlation between parental interference and children's adjustment of -.09 for 3-year-olds, and -.50 for 9- year-olds. Thus, it appears that children have different needs at different stages of their growth. From the view which has been presented of the interdependent environment, a tenable hypothesis is that the parent who is able to evolve his training procedures relative to the particular requirements of his child, must himself be open-minded and adaptable. In other words, it may be that such a parent would himself be creative.

Domino (1969) presents evidence which can be interpreted as offering support for this hypothesis. By means of a composite index comprising teachers' nominations, made on the basis of creative artistic or scientific activity, and two creativity tests, he selected a group of 38 creative high school males; and a noncreative control group of 38 students matched on sex, educational level, and average school marks. The 33 mothers of creative subjects and 31 mothers of noncreative subjects, who agreed to participate in the research, were administered the 18 scales of the California Psychological Inventory (CPI). The mothers of the creative children differed from the mothers of the noncreative children on 12 of the personality dimensions, 11 at the .01 level and 1 at the .05 level.

Furthermore, a number of themes emerged from the personality profiles of these women which both relate to the properties of the interdependent environment and are also reflective of greater creativity. That is, the mothers of the creative children tend to be self-assured and to show initiative; they value autonomy and independent endeavour. With respect to the home environment of his most creative architects, MacKinnon (1962) has remarked: "What is perhaps most significant, though, is the higher incidence of distinctly autonomous mothers among families of the creative architects, who led active lives with interests and sometimes careers of their own apart from their husbands" (p.492). In addition, the mothers of the creative boys in the Domino study are less inhibited, more able to express their impulses, which suggests that they are open to their experiences. They prefer change and unstructured demands which would seem to indicate that they are adaptable. Although they are more insightful about others and more tolerant, they are also less nurturant and obliging towards others. This may explain their ability to adjust their behavior to the development of their children, and yet not become involved in a possessively close relationship. As a result of the consistent trend of the personality differences manifested by these mothers, Domino (1969) concludes "... that the mothers of creative Ss are themselves more creative than the general population, and that both their personality characteristics and their creativity are evocative of greater creativity in their children" (p.183).

An experiment which links together the various components of the argument outlined in this section has been carried out by Bishop and Chase (1971). They postulated that parents with more abstract conceptual structures, or more creative parents within the conceptual systems framework, would report more interdependent attitudes and play-environment conditions: and that the children of such parents would be more creative. The conceptual levels of the mothers and fathers of 45 3- and 4- year-old nursery school children were determined by the This I Believe Test (TIB). This measure requires the subject to complete in 2 or 3 sentences the phrase "This I believe about ...," the blank being filled successively by 10 referents, for example, "religion," "marriage," "friendship," "people," "guilt" etc. (Harvey, 1964; Harvey, 1965; Ware and Harvey, 1967; White and Harvey, 1965). An individual's replies are classified as concrete if they show high absolutism of thought and belief, and as abstract if they demonstrate high relativism and contingency of thought. A series of questions, designed to uncover differences in parental attitudes towards such characteristics of the child's play as autonomy versus control of the child, openness to new play experiences versus moral or functional "oughtness," variety of play experiences, and explorative uses of play, was completed by both parents. A similar questionnaire consisting of items relevant to interdependence, but asking for factual details of the child's home play, was administered only to the mothers. The creativity of the children was assessed by means of a play task: 9 different figures, ranging in complexity from 3 to 24 sides, every figure being displayed in 6 different colours, were arrayed in a 6x9 matrix; each child was instructed to "make anything he wanted" by selecting shapes, one at a time, from the stimulus board and transferring them to the response board located behind him.

Data analysis revealed no consistent trend of differences between concrete and abstract fathers either with regard to the interdependence of their attitudes or in the creativity of their children. On the other hand, the more abstract mothers tended both to have less restrictive attitudes towards their children's play, and also to describe more interdependent conditions of the actual play environment than the more concrete mothers. In addition, the children of the more abstract mothers manifested more creativity on the play task; that is, they selected more complex figures, used a greater variety of colours, and obtained the final set of figures through a more complex choice sequence, being more likely to shift to a different column and row of the stimulus board from one selection to the next. Thus, it seems that more creative mothers have more creative children; and it may be that an important mediating factor is the interdependence of the home environment.

On the basis of the investigations which have been reviewed in this section, a reasonable conclusion is that children's creativity is a function of mothers' creativity. However, the results are more equivocal in the case of fathers. Nevertheless, for the purposes of this research, the correlations between the creativity of both mothers and fathers and the creativity of their children, defined in terms of preference for complexity and conceptual level, will be examined. It is expected that the children's creativity will be positively related to the creativity of their parents; but the correlations may be higher for mothers.

Measurement of Conceptual Structure

Impression Formation in Adults

In a series of experiments Asch (1946) has studied the organizational aspects of other-person judgments. His research procedure consisted of presenting university students with a list of trait-names and instructing them to write their impressions of the individual described by the constellation of traits. The various lists he used frequently included a mixture of positive and negative characteristics, for example: intelligent, industrious, impulsive, critical, stubborn, envious. Nevertheless, he emphasizes the unitary quality of the resulting personality judgments. More specifically, he reports that all subjects integrated the discrete characteristics to form a "single, consistent view" of the person; that is, the impressions were "completed and rounded." Luchins (1948) repeated one of Asch's experiments with a sample of 69 college students. Analyzing the written impressions submitted by his subjects, he points out that "... it would be far-fetched to say of most of them that they were unified, completed, and rounded" (p.322). Rather, he notes the wide individual differences in the way subjects respond to such a task, and compares a personality to an ambiguous stimulus field in that it allows various rearrangements and reorganizations of its elements; it supports a certain range of structurizations.

Continuing this line of investigation, Gollin (1954; 1960; Gollin and Rosenberg, 1956) has requested groups of male university students to formulate their impressions of a person seen in a silent film. By means of a number of discrete scenes, the film shows the young woman to be judged behaving in diverse fashions: two scenes connote promiscuity and two other scenes are suggestive of kindness and generosity. Gollin has found that there are three different ways in which his subjects organize the inconsistent information provided by the film sequence. 1. Related Impressions. Some subjects characterize the "star" with reference to both the "good" and "bad" themes, and also attempt to account for the presence of this diversity in the behavior of one person; that is, they make an interrelational statement. 2. Aggregated Impressions. Other subjects describe the star by enumerating the two major behavioral themes without making any attempt to relate them. 3. Simplified Impressions. The third method of handling the diversity is to ignore the conflict and describe the star only in terms of one behavioral theme; she is considered to be either completely "immoral" or completely "nice."

The integration of the contradictory traits depicted by the star would seem to involve an effort on the subject's part to go beyond the perceptually given. Relevant to this issue, Gollin (1954) had 3 judges sort the written impressions of 55 male undergraduates into 2 categories, according to whether the subjects had organized their responses with reference to the essential molar features of the star's behavior; or whether they based their judgments on minor or incidental details of environment, clothing or behavior. He reports that only 2 of the 14 subjects forming Related impressions depended on minor details; whereas, 28 of the 41 subjects who wrote Aggregated or Simplified impressions utilized incidental criteria. This difference in "stimulus boundness," which is significant beyond the .01 level, may be implicated in the variation in subjects' ordering patterns. Furthermore, after completing their impressions, this sample was instructed to rate the star on a four-item social distance scale, 1 signifying acceptance on each item and 5 indicating rejection. Students whose impressions were classified as "Simplified kind" had a mean social distance scale score of 1.70; those writing "Simplified promiscuous" impressions had a mean score of 3.43; the scores of those who submitted Related or Aggregated impressions fell between these two extremes. In other words, those subjects who ignore conflict in formulating their impressions also appear to manifest intolerance of ambiguity in their judgments of the star, being more likely either to accept or reject her in a relatively unqualified manner. Therefore, Gollin (1954; 1960; Gollin and Rosenberg, 1956) contends that structural differences in the subjects' patterns of response to a constant stimulus configuration relate to structural variations in their underlying personality organizations: "It is suggested that these differences reflect variations in subserving perceptual-cognitive organizing processes, and that these processes might represent general personological trends" (Gollin and Rosenberg, 1956, p.39).

Within the theoretical framework of Harvey, Hunt, and Schroder (1961) and Schroder, Driver, and Streufert (1967), a conceptual system is regarded as "a schema that provides the basis by which the individual relates to the environmental events he experiences" (1961, pp.244-245). Consistent with this definition, all behavior is viewed as a joint function of situational and dispositional factors. Holding situational factors constant, it should be possible to examine the effects of dispositional factors in a given setting. The most important dispositional factor is considered to be the concreteness—abstractness of the conceptual system or information-processing structure. As impression formation has been shown to reveal differences in organizing tendencies, it has been used as an index of the integrative complexity of information processing. The variation of the Impression Formation Test implemented (Schroder, Driver, and Streufert, 1967; Streufert and Driver, 1967) requires the subject to write his impression of an individual described by 3 positive adjectives, for example, reliable, social, independent; then to characterize an individual described by 3 negative adjectives, such as, nervous, obstinate, jealous. Finally, he is told that both sets of traits actually refer to the same person, and is asked to formulate his impression of this person.

The first two tasks serve to make the inconsistency particularly salient. The third criterion response is scored in structural terms, according to the degree of integrative complexity it demonstrates: the impressions are ranged along a concrete—abstract dimension with reference to specifications very similar to those outlined by Gollin. That is, in a response classified as highly concrete, the conflict is negated rather than resolved, usually by omission of the implication of one set of the incongruous adjectives. In a slightly more abstract impression, the contradictory traits are at least mentioned, but remain compartmentalized. The most abstract type of response shows evidence of integration based on an "... understanding of underlying personality components and motivational factors" (Streufert and Driver, 1967, p.1032). In such impressions, the subject goes beyond the perceptually given and implicates the other person's "internal processes" in his judgment. It is argued that the way in which an individual structures his response is an indication of the manner in which he generally perceives and organizes his experience. In other words, the structural characteristic of his impression reflects the structural nature of his conceptual system.

A criticism which should be inserted at this point is one which has been formulated by Luchins (1948). He remarks that there may be a distinction between the actual impression and the written impression; the two are not necessarily isomorphically congruent. Comparing written impressions and spoken impressions, he elucidates: "Because of the writer's inability to express himself, the written exposition may consist of discrete items, while the impression, as revealed through interviews, appears to be well organized; conversely, ability to write a unified composition may belie the hazy or unorganized character of an impression" (p.324). This casts some doubt on the proposal that written impressions can be used to assess structural differences in personality.

Nevertheless, in a number of studies (Streufert and Driver, 1965; Streufert and Schroder, 1965; Streufert, Suedfeld, and Driver, 1965) university students have been divided into concrete and abstract groups on the basis of very low or very high scores on both the Impression Formation Test and the Sentence Completion Test: no significant differences have emerged between these groups on either the SAT quantitative IQ, or more important, the SAT verbal IQ. With a sample of 124 university males, Streufert and Driver (1967) found a significant correlation of .22 ($p<.05$) between SAT verbal IQ and abstractness on the Impression Formation Test; however, this correlation is quite low. Therefore, as the first step in the attempt to discover whether variations in preference for simplicity—complexity relate to variations along a simplicity—complexity dimension of personality organization, the Impression Formation Test will be used as an index of structure. For the purposes of further research, it might be interesting to combine this measure with a spoken-interview technique and/or a nonverbal measure which can be scored according to structural criteria (e.g., Anastasi and Schaefer, 1971).

Impression Formation as related to the Integrative Complexity of Perception

A central assumption of conceptual systems theory is that level of information processing is a consequence of the interaction between dispositional and situational factors. Therefore, the environment is described in terms which facilitate an interactive approach in theory and research. That is, Schroder, Driver, and Streufert (1967) order environments along a complexity dimension, which corresponds to their focussing on the integrative complexity of conceptual structure as the major dispositional dimension. The three primary properties which enter into the specification of environmental complexity are information load, information diversity, and rate of information change. These properties are analogous to those which have been used to delineate the complexity of visual stimuli: information load or number of units of information is equivalent to the number of elements comprising a visual figure; information diversity involves the independence of the elements; and rate of information change is implicated in Fiske and Maddi's (1961) contention that a complex stimulus provides greater variation in stimulation concomitant with scanning the visual field.

With regard to the nature of the interaction, Schroder, Driver, and Streufert (1967) postulate that there is a nonmonotonic relation between environmental complexity and level of cognitive or behavioral integration: the integrative complexity of information processing increases with increasing environmental complexity until an optimal level is reached; if environmental complexity increases further, the information-processing level begins to decrease. This inverted U-shaped function bears similarities to the one implemented by Fiske and Maddi (1961) in order to explain the hypothesized relation between activation level and environmental complexity. In fact, Schroder, Driver, and Streufert formulate a possible link by suggesting that optimal activation could refer to the point at which the conceptual structure reaches its stage of maximal abstractness. Furthermore, Schroder, Driver, and Streufert argue that there is a "family" of these inverted U-shaped curves such that the complexity of an individual's conceptual structure determines the elevation and shape of his curve. Within their theoretical framework, the curve of the abstract person should be higher than that of the concrete person; and it should also reach its optimal level at a higher point on the environmental complexity dimension.

Streufert and Driver (1967) have carried out an experiment which demonstrates that differences in concreteness—abstractness are implicated in differences in the integration of perception. Subjects, homogeneous with regard to structural characteristics, were selected and formed into 20 4-man teams, such that there were 10 teams of individuals who scored very high on the Impression Formation Test, and 10 teams of individuals with very low scores. These teams were placed in the Tactical Game Task (Streufert, Clardy, Driver, Karlins, Schroder, and Suedfeld, 1965). Specifically, each team was given a list of the military resources at its disposal, and instructed to make decisions concerning the invasion of a mythical island. The team members were told that they were playing against an enemy team, which supposedly had received instructions to defend the island. Actually, all the functions of the enemy were performed by the experimenters, following a constant strategy, in order to insure consistency from group to group.

During the 7 separate 30-minute game periods that the teams played, they were exposed to 7 different conditions of environmental complexity; they were provided with either 2, 5, 8, 10, 12, 15, or 25 independent informative statements on the basis of which to devise their strategies. After every game session, each subject answered a series of questions:

1. Describe the strategy which you believe the enemy team is using.

2. How does this strategy relate to enemy activity? 3. Is there any effect of your actions on enemy strategy? 4. What has made the enemy's strategic actions appear reasonable to him? 5. Comment on the possible consequences of enemy strategy for your side and for his. The responses were scored with reference to a number of categories considered to reflect integrative complexity: 1. cause-effect descriptions outlining the interrelated actions of the subject's own and the opposing team; 2. inferences, involving three or more steps, about enemy strategy made from observations; 3. descriptions of long-term intentions of the opposing team, connecting present activity to these intentions; and 4. responses showing enpathy; that is, those which touched on the enemy point of view or state of mind (Schroder, Driver, and Streufert, 1967, pp.154-155; Streufert and Driver, 1965, p.249). Thus essentially, in this situation, integrative complexity is defined as the use of "self-generated information" in organizing perception. This parallels the contention that individuals who prefer visual complexity do so because it affords them greater scope for idiosyncratic interpretations. To phrase it another way, there is more potential for the use of self-generated information in structuring complex stimuli.

An analysis of variance revealed a signifioant main effect ($p<.01$) for complexity of conceptual structure in that the perceptual-integration curve of the abstract subjects was higher than that of the concrete subjects; and a significant main effect ($p<.01$) for environmental complexity due to the functions increasing to a peak and then decreasing in a nonmonotonic fashion. Furthermore, there was a significant interaction effect ($p<.05$) as a result of the concrete subjects reaching an optimal performance level at 8 informative statements, while the abstract subjects performed optimally at information level 12. It is rather interesting to note, however, that both of these complexity levels are close to the 10-sided intermediate amount of visual complexity which Munsinger and Kessen have found subjects tend to prefer.

Overall, the data from this study offer support for the U-curve hypotheses advanced by Schroder, Driver, and Streufert (1967). In addition, they suggest that high scores on the Impression Formation Test indicate the ability to structure or integrate complex perceptions. Therefore, if scores on the visual complexity tests, particularly the RA, correlate with conceptual complexity as measured by the Impression Formation Test, it will be more reasonable to argue that greater preference for complexity involves a greater ability to process or structure it.

Developmental Differences in Impression Formation

As has already been mentioned, conceptual systems theory postulates that there is a developmental trend such that systematic changes occur in conceptual structure over time; the progression is from concreteness to abstractness. Therefore, in a developmental study, it would be expected that abstractness would increase as a function of age. Relevant to this proposition Piaget (1950; Berlyne, 1957a; Brown, 1965; Flavell, 1965) has remarked that children's ability to "decentre" attention, that is to assume various perspectives in viewing a physical stimulus, increases with age. It would seem that ability to decentre in evaluating social situations should improve with age as well. In his research on moral judgments, in which the child is required to form impressions or state opinions of other persons' behavior, Piaget (1948) has found that as children become older, they tend to go beyond the perceptually given; they make their judgments less on the basis of the actions which take place, and more in terms of the motives or intentions of the persons who are acting. These two components, decentring of attention and going beyond the perceptually given, would appear to be implicated in abstractness as assessed by impression formation.

The findings of an investigation by Gollin (1958) provide more direct evidence that abstractness, as measured by impression formation, does increase with age. His research procedure consisted of presenting children with a silent film, similar to the one designed for adults. That is, in a number of discrete scenes, a boy of about eleven, is shown behaving in diverse ways: in two scenes the boy acts kind and helpful; and in two other scenes he is destructive and bullying. The subject's task is to write what he thinks of the boy and the things he saw him do; to give an "opinion" of the boy.

In a pilot study with a sample of 97 male subjects, ranging in age from 8 to 17, Gollin had judges sort the responses according to 1. whether the two major behavioral themes were recognized by the subject; and 2. whether the subject introduced inferential material in formulating his impression of the boy. The results demonstrate that articulation of both the "good" and "bad" themes is positively related to age: only 50% of the youngest age group, the 8- to 9- year-olds, indicate recognition of both themes in their descriptions; the number of subjects manifesting such recognition increases to 76% in the 12- to 15- year-old group; while in the oldest age group, the 16- to 17- year-olds, 90% differentiate the two themes. When the judges sorted the impressions according to whether the subject attempted to go beyond the action presented in the film in accounting for the star's behavior, two types of inferential activity were disclosed. The first category, local inference, is scored if the subject ascribes some underlying condition for one or the other of the behavioral themes. General inference, which Gollin (1960) compares to the "Related" impressions formed by adults, involves an effort on the subject's part to encompass the diversity of behavior within the personality of a single individual. The use of inferential material is also positively related to age: only 1 of the 43 subjects below the age of 12 employed inference; 35% of the 12- to 15- year-olds introduce some form of inference; and 65% of the 16- to 17- year-old group implement such material.

The 712 male and female primary and secondary school students, who took part in the main study, were divided into 3 developmental groups, with mean ages of 10.7, 13.6, and 16.6 respectively. In analyzing the organizational character of the subjects' impression formation, Gollin scored the responses with reference to the inferential categories. However, he did not include the description category employed in the pilot study to determine whether the subjects articulated the two major behavioral themes. He reports that the incidence of inferential material increases as a function of age. In addition, girls exceed boys in the use of both local and general inference at all age levels, with the exception of general inference in the youngest age group where no sex difference is revealed. More specifically, the percentage of boys using local inference at the 3 age levels is 18, 52, and 85 successively; for girls the percentages are 21, 64, and 92. The percentage of boys attempting to account for the star's conflicting behavior by the introduction of general inference is 2, 9, and 39; and for girls 2, 21, and 64 for the respective age groups. Similarly, Wolfe (1963), implementing Gollin's film and scoring criteria in research with 136 male subjects, ranging in age from 11 to 18, found that the impressions of 56% of his subjects contained no inferential material; 26% of the responses showed local inference; and only 18% of the responses were judged to contain general inference. Furthermore, he points out that age was significantly related to abstractness of impression formation.

For the purposes of this study, the important implications of Collin and Wolfe's data are that abstractness does seem to increase as a function of age; and therefore, that the degree of correlation between complexity preference and impression formation scores may increase with age as well. The latter result would be consistent with the suggestion, formulated in Chapter II, that preference for complexity in younger children does not necessarily indicate the ability to process or structure complexity. Rather, it is argued that such preference may portend a greater potential to come to be able to structure it.

In an experiment which bears on Collin's developmental findings, Connolly and Harris (1971) requested 60 boys and girls, varying in age from 5 to 11, to look at a "picture book" comprising a series of congruous pictures of animals and objects, and incongruous pictures composed of mismatched halves of the congruous pictures. Afterwards, the children were asked to assign a "name" to each picture. Connolly and Harris report that children of all ages tended to look longer at the incongruous pictures, and also showed greater incidence of expression change and more sustained expression change to these pictures. In addition, older children were more likely to respond to incongruity in terms of these measures. With regard to picture naming, the researchers note that the majority of children consistently acknowledge only one component in each incongruous picture or consistently acknowledge both components. On the basis of these data, a tenable hypothesis is that younger children do not so much ignore incongruity, as not recognize it. It seems reasonable to argue that conflict or incongruity must be differentiated before it can be organized and integrated. Connolly and Harris suggest that picture naming might be a useful measure of sensitivity to incongruity. Thus, in studying impression formation in children, it seems advisable to include a description score, similar to the one employed by Gollin in his pilot investigation, in order to examine how articulation of incongruity relates to inferential activity.

General Recapitulation

In the next chapter, the reporting of experimental results will begin. Therefore, a brief synopsis of the theoretical argument generating the research will be presented here. In Chapter I, it was suggested that the RA scale, which is supposed to measure variations in preference for simplicity—complexity, is an index of self-actualizing creativeness. The line of reasoning developed was that preference for complexity implicates openness to experience, which is a defining feature of self-actualization. Basically, the two assumptions underlying the use of the RA scale are that it does indicate differences in simplicity—complexity preference; and that these differences relate to differences along a simplicity—complexity dimension of personality organization. The point emphasized in Chapter II was that positive correlations between the RA and the two other measures of preference for complexity could be interpreted as support for both these premises.

With respect to the personality dimension, the essential elements of the proposal are that preference for complexity involves a disposition to impose order on complexity; and this disposition is one manifestation of a more pervasive orientation towards experience. Within the theoretical framework of Harvey, Hunt, and Schroder (1961) and Schroder, Driver, and Streufert (1967), the focus is upon the structural aspects of an individual's orientation towards experience; in other words, upon the concreteness—abstractness of his conceptual system. A view corresponding to Piaget's (Flavell, 1965) view of the interrelatedness of structure and function is fundamental to conceptual systems theory: the conceptual structure of an individual's personality determines how he processes stimuli and events, and this processing in turn determines conceptual structure; that is, conceptual systems structure the environment and are structured by the environment. Thus, it is feasible to regard the structural characteristic of a person's response to a given situation as a reflection of the structural nature of his personality organization.

The purpose of this chapter has been to explain the inclusion of the Impression Formation Tests. It is not viable to study directly the manner in which an individual processes or structures a complex visual stimulus. However, a personality presented for judgment appears to be similar to an ambiguous stimulus field in that the constituent parts can be arranged in a diversity of ways; a number of interpretations are possible. Therefore, it is hypothesized that the impression formation procedure can be implemented to examine an individual's structuring or organizing tendency. Experiments by Luchins (1948) and Gollin (1954, 1958) have demonstrated that subjects do respond in differential fashions to impression formation tasks. And Schroder, Driver, and Streufert (1967) order the various patterns of responding along a concrete—abstract dimension according to the integrative simplicity—complexity they show. If a significant correlation between preference for complexity, particularly on the RA scale, and impression formation scores is disclosed, it will be more reasonable to argue 1. that preference for complexity implies the ability to structure complexity; and 2. that it is one facet of a more generalized approach to experience.

CHAPTER V.

Complexity Preference in Children and Adults

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Introduction

The central concern of this study is to determine whether there is uniformity of complexity preference. Such a finding would offer support for the contention that simplicity—complexity preference reflects a simplicity—complexity dimension of personality organization. In addition, it seems important to discover if there is a developmental trend in simplicity—complexity preference.

With regard to age differences in preference for random polygons, varying in degree of complexity from 3 to 40 sides, Munsinger and Kessen (1964) have argued that experience with complexity would lead to the evolvement of rules for structuring it, and this in turn would result in a tendency to prefer complex shapes. In two studies, one with art students relevant to the effects of long-term experience with complex shapes, and one with university students concerning the effects of short-term experience, their data has been in agreement with the point of view they advanced.

Continuing their line of argument, it seems reasonable to expect that, in general, older subjects would have more experience of complexity, and thus would be more likely to prefer it. However, with a selection of students ranging from 6 years to university age, Munsinger, Kessen and Kessen (1964) report on age-invariant preference for an intermediate degree of complexity, approximately the 10-sided level; and a decreasing preference for greater amounts of complexity with increasing age. More specifically, the decrease in preference for high complexity shapes is systematic: 7-year-olds state lower preference for such figures than do 6- year-olds; 8- year-olds like them less than do 7- year-olds, and so on. Nevertheless, Munsinger and Kessen (1964) and Munsinger, Kessen, and Kessen (1964) also emphasize that at all age levels, there are consistent individual differences underlying the group functions.

Thomas (1966) was interested in the contradiction implicit in the Munsinger and Kessen findings. Therefore, carrying out an analogous developmental experiment, he presented polygons varying from 3 to 40 sides to a sample of subjects aged 7 to 19. First of all, an age-invariant preference for the 10-sided figures did not emerge. Secondly, although the curves for ages 7 through 16 were very similar and showed a monotonically increasing preference for complexity, the preference functions of the 17-, 18-, and 19- year-olds were nonmonotonic and indicated a decreasing preference for complexity with age. So Munsinger and Kessen report a systematic decrease from age 6 onwards; while Thomas notes such a systematic trend occurring only with older adolescents. On the other hand, implementing polygons varying in complexity from 3 to 63 sides Baltes and Wender (1971) present evidence which is interpretable as support for the influence of experience on preference. That is, their 2 groups of older subjects, aged 13 and 15, liked low complexity shapes, the 3- to 16-sided ones, less than did the 2 younger groups of 9- and 11- year-olds.

In conclusion, two questions remain in need of clarification: 1. Is there an age-invariant mid-range of complexity preference? 2. What is the effect of experience on complexity choice? This latter issue will be considered in two ways: 1. by an examination of age differences within the developmental sample ranging from age 6 to adulthood; and 2. by the inclusion of an art class.

Method

Subjects

Children

A pilot study was carried out in order to make certain that the complexity preference tests were viable for use with young children. The schools from which subjects were drawn were situated in the City of Durham district, County Durham. The sample comprised 14 6- to 7- year-old male and female students from St. Nicholas Infant School; and 35 10- to 11- year-old male and female subjects from Pittington Primary Mixed School.

The sample of male and female subjects taking part in the main study was selected from schools in the City of Sunderland district, County Durham. There were 37 8- to 9- year-old students, and 38 10- to 11- year-old students from Chester Road Junior School. A first-form class of 28 subjects and a third-form class of 29 subjects were seen at Bede Grammar School. The students tested at Thornhill Comprehensive School included a class of 30 first-formers; a class of 26 third-formers; 28 sixth-form subjects; and a fifth-form class of 19 students qualifying for "O" level exams in art. It should be mentioned at this point, that the schools chosen in both districts were designated as serving "mixed-class" areas.

The only distinction between the pilot and main investigations is that subjects in the former were not administered the Impression Formation Test. Therefore, in this chapter, the complexity preference results for the 284 children who completed the three visual complexity tests will be presented. The reasons for the utilization of the Impression Formation Tests, one suitable for children and one for adults, have been formulated in Chapter IV. In Chapter VI, the combined results for the complexity preference tests and the Impression Formation Tests will be analyzed.

Adults

The adult sample was made up of the parents of children from Chester Road Junior School and Thornhill Comprehensive School, which are located in the same catchment area. In other words, children who begin their primary education at Chester Road School will most likely continue their secondary education at Thornhill.

TABLE 4

Complexity Preference: Developmental Divisions

	Ages	Number of Subjects
1.	6- to 7- year-olds	14
2.	8- to 9- year-olds	37
3.	10- to 11- year-olds	73
4.	1st form: 11- to 12- year-olds	58
5.	3rd form: 13- to 14- year-olds	55
6.	5th form: 15- to 16- year-olds	19
7.	6th form: 16- to 18- year-olds	28
8.	parental sample: adults	64
	TOTAL SAMPLE	348

The children tested at these two schools were given a note-form to take home to their parents. The note briefly outlined the purpose of the research as concerned with the change in design preference with age, and the similarities of "taste" between parents and their children. Those parents who were interested in participating were requested to specify convenient days and times on the form, and to return it with their children to the school. Then the 64 parents, 31 couples and 2 mothers, who agreed to be seen, were contacted and an interview appointment was arranged.

A breakdown of the subject population by age division is summarized in Table 4.

Procedure

Children

The children were tested by class in their usual school room. The teacher was not present during the administration of the visual tasks. There was no attempt to impose a test-like atmosphere; instead, the children were told that E wanted to find out what kinds of pictures people liked, and were asked to help by stating their preferences.

Adults

The mothers and fathers were interviewed, by prearranged appointment, in their homes. Each couple was again informed of the objects of the study. Then the visual stimuli were shown to the two of them, and they were requested to indicate their preferences.

The order of task presentation for both children and adults was: the RA, the Random Polygon measure, and finally, Berlyne's Figures.

Materials

The tests implemented have been described in detail in the chapter dealing with the ESN sample. However, for convenience, the essentials will be outlined here as well.

I. RA

This is the most important preference-for-complexity measure for the purposes of this research. The subject's task is to mark L for "Like" or D for "Don't Like," next to the appropriate number on his answer sheet, for every one of the 60 figures displayed. A score of 1 is assigned for each of the 30 complex items the person likes and for each of the simple items he dislikes. Scores can vary from 0 to 60, with a high score in the direction of high complexity preference.

II. Random Polygons

Symmetrical Shapes: one example of each of the 4-, 8-, and 10-sided complexity levels.

Asymmetrical Shapes: three examples of each of the 4-, 6-, 8-, 12-, 16-, and 24-sided complexity levels.

The subject is required to write either L or D on his answer sheet next to the number corresponding to the figure shown.

Four scores were calculated from an individual's responses to this measure:

1. Mean. That is, the average of the number of points on the polygons the subject liked, which was regarded as his preferred or optimal amount of complexity.

2. Standard Deviation. This score is considered to indicate the width of the individual's complexity preference range.

3. Number of symmetrical polygons the subject liked.

4. Number of asymmetrical polygons the subject liked. The latter two scores were included as a means of obtaining some data on symmetry—asymmetry preference.

III. Berlyne's Figures

Pairs of patterns were selected from both Berlyne's non-X (lower-complexity) and X (higher-complexity) series. The less complex (LC) and more complex (MC) alternatives were randomly labelled A or B. Each pair of patterns was displayed simultaneously: the subject's task was to specify which figure he preferred or "liked best" by writing either A or B on his answer sheet. This form of the task was used with a view to retaining the preferential-choice characteristic of diversive exploration, while at the same time eliciting a verbal preference response. Scoring involved giving a 1 for every MC pattern the individual preferred. Scores could range from 0 to 14, such that a high score reflected high complexity preference.

Results and Discussion

There are many different ways in which to organize the same set of data. Therefore, various forms of analysis have been included in the attempt to understand the complexity preference results. Where necessary, a form of analysis will be explained before interpreting the relevant findings.

Distribution of 284 Children's Scores

As can be seen from Table 5, the children's scores on the RA, Berlyne's figures, the Polygon $\bar{X}$ and Polygon S.D. fall into the low, medium, and high categories with the largest concentration of scores on all measures in the medium division, and lesser scatterings in the two peripheral divisions. Such a frequency distribution indicates that preference for complexity is a continuously distributed variable in a sample of normal children, replicating the results which emerged with the ESN children. However, it is rather interesting to note that in the 6- to 7- year-old subgroup, none of the children score in the high category on either the RA or Berlyne's figures.

Bearing on the question of whether there is an age-invariant preference for a mid-range of complexity, 194 of the 284 children (68.3%) had

TABLE 5

Low, Medium, and High Scores on the RA, Berlyne's Figures, Polygon Mean and Standard Deviation: Frequency Distribution of 284 Children by Age Divisions

I. RA

age	low 1–20	medium 21–40	high 41–60		
6–7	5	9	0		14
8–9	7	26	4		37
10–11	9	61	3		73
11–12	15	36	7		58
13–14	18	28	9		55
15–16	2	14	3		19
16–18	5	19	4		28
	61	193	30	= TOTAL:	284Ss
	21.5%	68%	10.5%	=	100%

II. Berlyne's Figures

age	low 1–4	medium 5–10	high 11–14		
6–7	9	5	0		14
8–9	11	26	0		37
10–11	27	44	2		73
11–12	25	31	2		58
13–14	23	31	1		55
15–16	11	8	0		19
16–18	12	14	2		28
	118	159	7	= TOTAL:	284Ss
	41.6%	56%	2.4%	=	100%

TABLE 5 continued

III. Random Polygons: $\bar{X}$	low 4–9	medium 10–14	high 15–24		
age					
6–7	2	9	3		14
8–9	5	29	3		37
10–11	5	54	14		73
11–12	4	35	19		58
13–14	6	35	14		55
15–16	1	13	5		19
16–18	3	19	6		28
	26	194	64	= TOTAL:	284Ss
	9.2%	68.3%	22.5%	=	100%

IV. Random Polygons: S.D.	low 2–4	medium 5–6	high 7–8		
age					
6–7	2	7	5		14
8–9	5	21	11		37
10–11	5	53	15		73
11–12	3	31	24		58
13–14	7	31	17		55
15–16	2	10	7		19
16–18	3	13	12		28
	27	166	91	= TOTAL:	284Ss
	9.5%	58.5%	32%	=	100%

a Polygon $\bar{X}$ score falling within the medium category. In addition, an examination of the dispersions by age level shows that for each subgroup, the largest number of subjects prefer a moderate amount of complexity. Overall, these findings are consistent with the Munsinger and Kessen developmental data.

Intercorrelation Data for Children

By means of computer, the Pearson product-moment correlation coefficient was calculated between each score and every other score for the children's results. The names and identifying numbers of the variables submitted for analysis are itemized in Table 6.

The correlation matrix for the 284 children is presented in Table 7.

I. Age

None of the more important preference-for-complexity scores, that is, the RA, Berlyne's figures, or the Polygon $\bar{X}$, showed any significant correlation with age. There was, however, a significant negative correlation ($p < .01$) between age and both the number of symmetrical figures liked and the number of asymmetrical figures liked. This perhaps means that children manifest an increasing specificity of choice as they become older.

II. Sex

No significant relation between sex and any of the other variables was revealed. On this basis, it can be tentatively suggested that, with a sample of normal children, there are no sex differences in preference for complexity.

III. Complexity Preference Measures

There was a significant positive correlation of .55 ($p<.01$) between the RA and Berlyne's figures; a significant positive correlation of .29 ($p<.01$) between the RA and the Polygon $\bar{X}$; and a significant positive

TABLE 6

Complexity Preference: Developmental Study of 284 Children

Variables included in the Data Analysis with Identifying Numbers, Means, and Standard Deviations for each of the Measures

		mean	standard deviation
1.	age	11.81	2.66
2.	sex MALE 1 FEMALE 2	1.53	.50
3.	RA	28.33	10.07
4.	Berlyne's figures	5.23	2.62
5.	polygon mean ($\bar{X}$)	12.63	2.51
6.	polygon standard deviation (S.D.)	6.01	1.25
7.	number of symmetrical polygons liked (sym.)	2.15	.77
8.	number of asymmetrical polygons liked (asym.)	9.63	3.08

TABLE 7

Complexity Preference Tests: Correlation Matrix for 284 Children

	1	2	3	4	5	6	7	8
1. age	1.00							
2. sex M1 F2	.02	1.00						
3. RA	.15	-.02	1.00					
4. Berlyne's figures	.00	-.06	.55**	1.00				
5. $\bar{X}$	.00	.06	.29**	.21*	1.00			
6. S.D.	-.06	.15	.05	.15	.58**	1.00		
7. sym.	-.25**	.17	-.28**	-.17	-.14	.25**	1.00	
8. asym.	-.27**	.12	.16	.26**	.21*	.37**	.03	1.00

** significant at .01 level .25

* significant at .05 level .20

correlation of .21 ($p<.05$) between Berlyne's figures and the Polygon $\bar{X}$. Thus, the sample of normal children demonstrate consistency in their liking for complexity on the 3 principal preference scores. Furthermore, there was a significant positive correlation of .58 ($p<.01$) between the Polygon $\bar{X}$ and Polygon S.D.; but the Polygon S.D. did not show a significant relation to either the RA or Berlyne's figures.

To summarize briefly at this point: it would seem that the child, who scores in the direction of high preference for complexity on the RA, is also disposed to select the more complex (MC) alternatives of Berlyne's figures, and is more likely to have a high $\bar{X}$ on the Random Polygon measure.

IV. Symmetry—Asymmetry

First of all, inspection of Table 6 shows the mean Sym. score to be 2.15 out of a possible 3, indicating that the majority of children tend to like the symmetrical figures. However, there was a significant negative correlation ($p<.01$) between the RA and number of symmetrical figures liked. The correlations between Sym. and Berlyne's figures and between Sym. and the Polygon $\bar{X}$, although negative, were not significant. On the other hand, there was a significant positive correlation between Asym. and both Berlyne's figures ($p<.01$) and the Polygon $\bar{X}$ ($p<.05$). Rather surprising is the finding that the Polygon S.D. was positively related ($p<.01$) to both Sym. and Asym. This is explainable when it is observed that there is a correlation of .03 between Sym. and Asym., which suggests independence rather than polarity.

Factor Analysis Data for Children

In a factor analysis of the 8 variables performed by computer, 4 principal components, which accounted for 74.3% of the total variance, were extracted from the intercorrelation matrix and then rotated to the varimax criterion (Kaiser, 1958). Interpretation of factors will be based on loadings with a value of .30 or greater.

Principal Component Factor Analysis

The unrotated factor loadings and percentage of total and common variance accounted for by each factor appear in Table 8. The first factor in a principal component solution is typically a large general factor; and Factor I does account for a sizeable proportion, 36.3%, of the common variance. Hence, it is noteworthy that all the complexity preference scores load highly on it: the RA .62; Berlyne's figures .65; the Polygon $\bar{X}$ .73; the Polygon S.D. .65; and Asym. also loads .59 on this general factor. Such a pattern of loadings reinforces the picture of consistency of complexity preference.

Varimax Rotation Factor Analysis

Table 9 details the factor loadings and percentage of common and total variance accounted for by each of the rotated factors. In the varimax solution, 2 complexity factors were separated out from the large general complexity factor.

Factor I

Score	Loading
Polygon $\bar{X}$	.87
Polygon S.D.	.88
Asym.	.31

The first complexity factor accounts for 27.9% of the common variance. It may emerge due to the large correlation of .58 between the Polygon $\bar{X}$ and the Polygon S.D., particularly as the S.D. is not significantly related to the other 2 principal complexity preference scores, the RA or Berlyne's figures.

TABLE 8

Complexity Preference Tests: Principal Components Factor Analysis for 284 Children

	I	II	III	IV	
1. age	-.07	-.52	.69	-.07	
2. sex M1 F2	.12	.38	.44	-.74	
3. RA	.62	-.53	-.08	-.25	
4. Berlyne's figures	.65	-.35	-.32	-.24	
5. $\bar{X}$	.73	-.09	.35	.39	
6. S.D.	.65	.51	.30	.27	
7. sym.	-.15	.73	-.04	-.14	
8. asym.	.59	.33	-.35	-.14	
Percentage of Total Variance	27.0	21.6	14.0	11.7	
Total variance extracted, 74.3%					
Percentage of Common Variance	36.3	29.1	18.8	15.8	= 100%

NOTE: In this and all subsequent factor analyses, both the Principal Components and the Varimax Rotation solutions are presented. There is little difference between them. However, the factors are clearer in the varimax solution.

TABLE 9

Complexity Preference Tests: Varimax Rotation Factor Analysis for 284 Children

	I	II	III	IV	
1. age	.05	-.09	.85	-.12	
2. sex M1 F2	.06	.00	.04	-.94	
3. RA	.11	-.84	.13	-.02	
4. Berlyne's figures	.09	-.82	-.17	.02	
5. $\bar{X}$	.87	-.21	.09	.07	
6. S.D.	.88	.03	-.20	-.17	
7. sym.	.06	.47	-.46	-.38	
8. asym.	.31	-.35	-.60	-.16	
Percentage of Total Variance	20.7	22.3	17.4	13.9	
Total variance extracted, 74.3%					
Percentage of Common Variance	27.9	30.0	23.4	18.7	= 100%

Factor II

Score	Loading
RA	-.84
Berlyne's figures	-.82
Sym.	.47
Asym.	-.35

This second complexity factor accounts for 30% of the common variance.

The discussion of the complexity factors, especially a consideration of the possible reasons for the disjunction between them, will be deferred until the factor analysis results for the adult sample are presented.

Factor III

Score	Loading
Age	.85
Sym.	-.46
Asym.	-.60

This factor, accounting for 23.4% of the common variance, is clearly an age factor. A tenable interpretation of the finding that increasing age is negatively associated with number of both symmetrical and asymmetrical figures liked is that, as children become older, they tend to become more selective in their preference.

Factor IV

Score	Loading
Sex	-.94
Sym.	-.38

Factor IV, which accounts for 18.7% of the common variance, is a sex-typing factor indicating that females are more likely to react positively to symmetry.

Distribution of 64 Adults' Scores

Examination of Table 10 shows that the adults' scores on the RA and Berlyne's figures are scattered mainly in the low and medium divisions,

TABLE 10

Low, Medium, and High Scores on the RA, Berlyne's Figures, Polygon Mean and Standard Deviation: Frequency Distribution of 64 Adults

I. RA	low 1-20	medium 21-40	high 41-60	
	35	25	4	= 64Ss
	54.6%	39.1%	6.3%	= 100%
II. Berlyne's Figures	low 1-4	medium 5-10	high 11-14	
	41	23	0	= 64Ss
	64.1%	35.9%	0%	= 100%
III. Random Polygons: $\bar{X}$	low 4-9	medium 10-14	high 15-24	
	13	47	4	= 64Ss
	20.3%	73.4%	6.3%	= 100%
IV. Random Polygons: S.D.	low 2-4	medium 5-6	high 7-8	
	12	37	15	= 64Ss
	18.8%	57.8%	23.4%	= 100%

with the largest concentration in the low division. In fact, the distribution of the adults' scores on these 2 measures corresponds most closely to that of the 6- to 7- year-old subgroup. This applies particularly to Berlyne's figures, as most of the 6- to 7- year-olds score in the low category on this measure; and none of these children score in the high category.

However, on the Polygon $\bar{X}$ and Polygon S.D., the adults' score fall into the low, medium, and high categories, with the greatest number concentrated in the medium category, and lesser dispersions in the two peripheral ones. With regard to the Polygon $\bar{X}$, it should be noted that 47 of the 64 subjects (73.4%) scored within the medium range, which accords with the results for the children's sample. Once again, Munsinger and Kessen's contention that people in general tend to prefer an intermediate amount of complexity is supported.

Intercorrelation Data for Adults

The names and identifying numbers of the variables included in the data analysis are tabulated in Table 11. Except for the absence of an age variable, these variables are the same as those for the children's sample. Using the Pearson product-moment correlation coefficient, each score was compared to every other score.

The correlation matrix for the 64 adults appears in Table 12.

I. Sex

Congruent with the finding for the children, no significant correlation occurred between sex and any of the other variables for the adults. Thus, with normal subjects, the data so far do not provide evidence of sex differences in preference for complexity.

II. Complexity Preference Measures

There was a significant positive correlation of .69 ($p<.01$) between

TABLE 11
Complexity Preference: Adult Sample Comprising 64 Cases

Variables included in the Data Analysis with Identifying Numbers, Means, and Standard Deviations for each of the Measures

		mean	standard deviation
1.	sex MALE 1 FEMALE 2	1.52	.50
2.	RA	21.05	11.07
3.	Berlyne's figures	4.09	2.42
4.	polygon mean ($\bar{X}$)	11.25	2.57
5.	polygon standard deviation (S.D.)	5.77	1.16
6.	number of symmetrical figures liked (sym.)	2.05	.87
7.	number of asymmetrical figures liked (asym.)	9.42	2.23

TABLE 12

Complexity Preference Tests: Correlation Matrix for 64 Adults

	1	2	3	4	5	6	7
1. sex M1 F2	1.00						
2. RA	.02	1.00					
3. Berlyne's figures	-.04	.69**	1.00				
4. $\bar{X}$	-.05	.50**	.34**	1.00			
5. S.D.	-.07	.16	.14	.62**	1.00		
6. sym.	-.02	-.31*	-.27*	-.37**	-.12	1.00	
7. asym.	.20	-.08	.01	.20	.26*	-.28*	1.00

** significant at .01 level .33

* significant at .05 level .25

the RA and Berlyne's figures; a significant positive correlation of .50 ($p<.01$) between the RA and the Polygon $\bar{X}$; and a significant positive correlation of .34 ($p<.01$) between Berlyne's figures and the Polygon $\bar{X}$. Although the Polygon S.D. showed a significant positive relation of .62 ($p<.01$) to the Polygon $\bar{X}$, it was not significantly related to either the RA or Berlyne's figures.

So in terms of the preference measures, the pattern of the adults' correlations parallels the children's pattern. In other words, the individual, who prefers complexity on the RA, is more inclined to select Berlyne's MC figures, and tends to have a higher optimal complexity level as reflected by his Polygon $\bar{X}$ score. In addition, it is interesting to observe the higher absolute values of the correlations among the complexity indices in the adult sample. This would seem to indicate that adults are more consistent in their liking for complexity than children.

III. Symmetry—Asymmetry

As can be seen by referring to Table 11, the mean score for Sym. is 2.05 out of a possible 3. Thus, the majority of adults, like the majority of children react positively to symmetrical figures. In addition, for the adult sample, there was a significant negative correlation of −.28 ($p<.05$) between Sym. and Asym.

With regard to symmetry — asymmetry and the complexity preference measures, significant negative correlations were revealed between the number of symmetrical polygons liked and the RA ($p<.05$), Berlyne's figures ($p<.05$), and the Polygon $\bar{X}$ ($p<.01$); and a significant positive relation ($p<.05$) between the Polygon S.D. and Asym.

The significant correlation between both Sym. and Asym. and the 3 principal complexity preference scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$, which do arise in the children's and adults' samples, are in the expected directions. However, the 2 complete sets of symmetry—asymmetry correlations are not entirely congruent. Therefore, to summarize with a view to both sets of data: 1. symmetry and asymmetry do not seem to define the ends of a dimension; 2. there appears to be some relation between preference for simplicity—complexity and symmetry/asymmetry, but it is not very clear-cut and requires more investigation. As Grove and Eisenman (1970) have already suggested, for experimental purposes, it might be advisable to keep the simplicity-complexity and symmetry-asymmetry constructs separate.

Factor Analysis Data for Adults

The 7x7 matrix of intercorrelations was factor analyzed: 3 principal components, accounting for 71.5% of the total variance, were extracted and rotated to the varimax criterion. Loadings of .30 and upwards will be considered in interpreting the factors.

Principal Component Factor Analysis

Table 13 reports the unrotated factor loadings and the percentage of total and common variance accounted for by each factor. Factor I is a general factor accounting for a considerable proportion, 50.2%, of the identified variance. As was found for the children's principal component solution, all the complexity preference scores load on this first factor: the RA .76; Berlyne's figures .70; the Polygon $\bar{X}$ .83; and the Polygon S.D. .59. It is interesting to note that Asym. also loads .28 on the general factor. Furthermore, Sym. loads -.58 in the opposite direction.

Varimax Rotation Factor Analysis

Table 14 comprises the factor loadings for the 3 rotated factors and the percentage of total and common variance accounted for by each one. The varimax solution again divides the large general complexity factor

TABLE 13

Complexity Preference Tests: Principal Components Factor Analysis for 64 Adults

	I	II	III	
1. sex M1 F2	-.02	.34	.75	
2. RA	.76	-.47	.21	
3. Berlyne's figures	.70	-.46	.22	
4. $\bar{X}$	.83	.16	-.27	
5. S.D.	.59	.42	-.52	
6. sym.	-.58	-.16	-.29	
7. asym.	.28	.77	.21	
Percentage of Total Variance	35.9	19.6	16.0	
Total variance extracted, 71.5%				
Percentage of Common Variance	50.2	27.4	22.4	= 100%

TABLE 14

Complexity Preference Tests: Varimax Rotation Factor Analysis for 64 Adults

	I	II	III	
1. sex M1 F2	.04	-.27	.78	
2. RA	.91	.12	-.03	
3. Berlyne's figures	.86	.07	-.03	
4. $\bar{X}$	.46	.76	.04	
5. S.D.	.04	.89	-.01	
6. sym.	-.45	-.27	-.41	
7. asym.	-.15	.45	.70	
Percentage of Total Variance	28.7	24.8	18.0	
Total variance extracted, 71.5%				
Percentage of Common Variance	40.1	34.7	25.2	= 100%

into 2 complexity factors.

Factor I

Score	Loading
RA	.91
Berlyne's figures	.86
Polygon $\bar{X}$	.46
Sym.	-.45

The first complexity factor accounts for 40.1% of the identified variance. It is most similar to Factor II in the varimax solution for the children's data: the common features of the 2 factors are that the RA and Berlyne's figures contribute very high loadings, and Sym. loads to a lesser degree in the opposite direction.

Factor II

Score	Loading
Polygon $\bar{X}$	.76
Polygon S.D.	.89
Asym.	.45

The second complexity factor, which accounts for 34.7% of the common variance, may result because the S.D. is significantly related to the $\bar{X}$ (.62) and yet does not correlate with either the RA or Berlyne's figures. It coincides with the children's Factor I which also has high loadings from the Polygon $\bar{X}$ and Polygon S.D., and a smaller loading from Asym.

Thus, for both the children's and the adults' data, 2 more precise complexity factors are separated out from the large general complexity factor disclosed in the principal component analysis. The defining property of this separation seems to be that the RA and Berlyne's figures are linked; and the Polygon $\bar{X}$ and Polygon S.D. are linked. There are two possible interpretations offered for this finding. Firstly, the factor with high loadings from the $\bar{X}$ and S.D. is perhaps "created" by the large correlations between these 2 scores in the children's (.58) and the adults' (.62) samples. Secondly, the disjunction may emerge because the RA and Berlyne's figures tap different "kinds" of complexity, while the Random Polygon measure implicates a more limited view of complexity. This latter proposal necessitates elucidation.

Berlyne generated his two complexity series (non-X, X) with the intention of sampling the various attributes he feels are covered by the word "complexity," in its everyday meaning. To recapitulate, the figures used in this research include the following categories: A. irregularity of arrangement; B. amount of material; C. heterogeneity of elements; D. irregularity of shape; XA. number of independent units; XB. asymmetry; and XC. random rearrangement. Berlyne (1963b, 1966) argues that although information theory concepts can be implemented in the attempt to specify and measure complexity, they are not sufficient for a comprehensive description and explanation of it.

On the other hand, the random polygons are constructed according to information theory principles, and are more amenable to description and explanation in these terms. A "simpler" approach to the study of complexity is inherent in the original development of the methods for producing random figures: Attneave and Arnoult's (1956) object was to determine the "psychologically important parameters" of form, and so they tried to control most of the variables entering into the composition of the random figures. More specifically, the figures differ only with regard to number and independence of elements.

In both the children's and the adults' correlation matrices, the RA relates more closely to Berlyne's figures than it does to the Random Polygon scores. An inspection of the various complexity measures reproduced in Appendix I shows that the random polygons are, in fact, more cohesive in appearance than the examples from the RA, or Berlyne's figures. Thus, it is suggested that one factor which may contribute to the higher correlations between the RA and Berlyne's figures and their subsequent division from the Polygon $\bar{X}$ and S.D. in the varimax solution, is that the RA and Berlyne's figures incorporate more "kinds" of complexity than does the Random Polygon measure.

Factor III

Score	Loading
Sex	.78
Sym.	-.41
Asym.	.70

This factor accounts for 25.2% of the common variance. Like Factor IV in the children's varimax rotation results, it is a sex-typing factor. However, in the children's sample, females were more likely to react positively to symmetry. Whereas this factor indicates that for adults, females are less acceptant of symmetry and more acceptant of asymmetry.

Age Division

A correlational analysis inevitably involves a certain degree of distortion, since many of the irregularities present in the raw data are levelled. For this reason, the deductions from the results generated by this method can only reservedly be applied to single cases, or even to small groups from the sample. Therefore, it was decided to examine the correlation matrices by developmental subgroup: 1. to investigate whether the general pattern of relations, which is disclosed with the 284 children, is consistent throughout; 2. and also to determine whether there is any age trend evident in the patterns of correlation.

Intercorrelation Data for Each Age Level

The correlational outcomes for the various age levels 1. the 6-

to 7- year-olds, 2. the 8- to 9- year-olds, 3. the 10- to 11- year-olds, 4. the 11- to 12- year-olds, 5. the 13- to 14- year-olds, 6. the 15- to 16- year-olds, and 7. the 16- to 18- year-olds are presented in Tables 15, 16, 17, 18, 19, 20, and 21 respectively.

For the 6- to 7- year-old subgroup, sex is significantly correlated with the Polygon S.D. ($p<.01$), denoting that females tend to have a wider complexity-choice range. Sex is also positively related to Sym. ($p<.05$); that is, girls like a larger number of symmetrical figures. There is a significant positive correlation between the Polygon $\bar{X}$ and the Polygon S.D. ($p<.05$); and between the Polygon S.D. and Sym. ($p<.05$).

For the 8- to 9- year-old subgroup, there is a significant positive correlation ($p<.05$) between sex and Sym.: at this age level, girls again manifest a greater acceptance of symmetry. With regard to the complexity preference measures, there were significant positive correlations between the RA and Berlyne's figures ($p<.01$) and between the RA and the Polygon $\bar{X}$ ($p<.05$); a significant positive correlation ($p<.05$) between Berlyne's figures and both the Polygon $\bar{X}$ and the Polygon S.D.; and a significant positive correlation ($p<.01$) between the Polygon $\bar{X}$ and S.D. Sym. was negatively related ($p<.01$) to the Polygon $\bar{X}$; and there was a significant positive relation ($p<.05$) between Asym. and the Polygon S.D.

No significant correlation between sex and any of the other variables was revealed for the 10- to 11- year-olds. Only 2 significant relations arose among the complexity preference scores: a positive correlation ($p<.01$) between the RA and Berlyne's figures; and a positive correlation ($p<.01$) between the Polygon $\bar{X}$ and Polygon S.D. Sym. was negatively related to the RA ($p<.05$) and the Polygon $\bar{X}$ ($p<.01$); Asym. was positively related ($p<.05$) to Berlyne's figures.

TABLE 15

Age Division: Correlation Matrix for 6- to 7- year-olds (N=14)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	.30	1.00					
3. Berlyne's figures	.33	.29	1.00				
4. $\overline{X}$	-.01	.25	-.43	1.00			
5. S.D.	.67**	.21	-.07	.60*	1.00		
6. sym.	.52*	.10	.35	.04	.52*	1.00	
7. asym.	.41	.05	.42	.08	.37	-.02	1.00

** significant at .01 level .62

* significant at .05 level .50

TABLE 16

Age Division: Correlation Matrix for 8- to 9- year-olds (N=37)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	-.14	1.00					
3. Berlyne's figures	-.02	.46**	1.00				
4. $\overline{X}$	-.32	.37*	.38*	1.00			
5. S.D.	-.27	.05	.36*	.69**	1.00		
6. sym.	.37*	-.25	-.08	-.47**	-.15	1.00	
7. asym.	.08	.02	.18	.09	.33*	-.20	1.00

** significant at .01 level .42

* significant at .05 level .33

TABLE 17

Age Division: Correlation Matrix for 10- to 11- year-olds (N=73)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	-.17	1.00					
3. Berlyne's figures	-.18	.57**	1.00				
4. $\overline{X}$	.13	.18	.13	1.00			
5. S.D.	-.01	-.14	.18	.39**	1.00		
6. sym.	.08	-.25*	-.14	-.46**	.14	1.00	
7. asym.	-.02	.15	.25*	-.14	.17	.02	1.00

** significant at .01 level .30

* significant at .05 level .23

In the 11- to 12- year-old subgroup, there is again a significant tendency ($p<.01$) for girls to like a larger number of symmetrical figures. With reference to the complexity preference measures, the RA is positively related ($p<.01$) to both Berlyne's figures and the Polygon $\bar{X}$; there is also a significant positive correlation ($p<.05$) between Berlyne's figures and the Polygon $\bar{X}$; and a significant positive correlation ($p<.05$) between the Polygon $\bar{X}$ and Polygon S.D. Sym. shows a significant negative relation ($p<.01$) to all 3 principal complexity preference scores, that is, the RA, Berlyne's figures, and the Polygon $\bar{X}$.

No significant correlation occurred between sex and any of the other variables in the 13- to 14- year-old subgroup. For these subjects, the RA was positively related to Berlyne's figures ($p<.01$), the Polygon $\bar{X}$ ($p<.01$), and the Polygon S.D. ($p<.05$); the score on Berlyne's figures was also positively related ($p<.01$) to the Polygon $\bar{X}$ score. In addition, there was a significant positive correlation ($p<.01$) between the Polygon $\bar{X}$ and Polygon S.D. Significant negative correlations ($p<.05$) were revealed between Sym. and each of the 3 principal complexity preference scores; and a significant positive correlation ($p<.01$) emerged between Asym. and each of these 3 scores. Finally, there was a significant positive correlation ($p<.01$) between Asym. and the Polygon S.D.

For the 15- to 16- year-old subgroup, sex is significantly correlated with Asym. ($p<.01$); that is, the female subjects are disposed to like a greater number of asymmetrical figures. There is a significant positive relation ($p<.01$) between the Polygon $\bar{X}$ and Polygon S.D. A positive correlation ($p<.01$) is disclosed between the Polygon S.D. and both Sym. and Asym.

In accord with the finding for the 15- to 16- year-olds, females in the 16- to 18- year-old subgroup like a larger number ($p<.01$) of

TABLE 18

Age Division: Correlation Matrix for 11- to 12- year-olds (N=58)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	-.20	1.00					
3. Berlyne's figures	-.09	.56**	1.00				
4. $\bar{X}$	-.08	.41**	.32*	1.00			
5. S.D.	.17	-.01	.06	.34*	1.00		
6. sym.	.40**	-.43**	-.37**	-.41**	.18	1.00	
7. asym.	-.17	.14	-.02	-.03	.10	-.22	1.00

** significant at .01 level .35

* significant at .05 level .27

TABLE 19

Age Division: Correlation Matrix for 13- to 14- year-olds (N=55)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	.00	1.00					
3. Berlyne's figures	-.09	.71**	1.00				
4. $\overline{X}$	.19	.51**	.35**	1.00			
5. S.D.	.24	.28*	.26	.51**	1.00		
6. sym.	-.05	-.28*	-.34*	-.32*	.06	1.00	
7. asym.	.19	.35**	.43**	.36**	.52**	-.13	1.00

** significant at .01 level .35

* significant at .05 level .27

TABLE 20

Age Division: Correlation Matrix for 15- to 16- year-olds (N=19)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	.04	1.00					
3. Berlyne's figures	-.25	.35	1.00				
4. $\overline{X}$	.34	.01	-.24	1.00			
5. S.D.	.42	-.12	-.42	.63**	1.00		
6. sym.	.11	-.07	-.24	.34	.67**	1.00	
7. asym.	.59**	.19	-.12	.37	.62**	.31	1.00

** significant at .01 level .55

* significant at .05 level .43

TABLE 21

Age Division: Correlation Matrix for 16- to 18- year-olds (N=28)

	1	2	3	4	5	6	7
1. sex	1.00						
2. RA	.38*	1.00					
3. Berlyne's figures	.41*	.60**	1.00				
4. $\bar{X}$	.24	.21	.39*	1.00			
5. S.D.	.34	.02	.31	.83**	1.00		
6. sym.	.29	-.28	-.10	.29	.54*	1.00	
7. asym.	.49**	.28	.57**	.63**	.50*	-.01	1.00

** significant at .01 level .46

* significant at .05 level .36

asymmetrical figures. However, at this age level, females also express significantly greater ($p<.05$) preference for complexity on the RA and Berlyne's figures. With regard to the interrelations among the complexity preference measures, a significant positive correlation arises between the RA and Berlyne's figures ($p<.01$); between Berlyne's figures and the Polygon $\bar{X}$ ($p<.05$); and between the Polygon $\bar{X}$ and Polygon S.D. ($p<.01$). Asym. shows a significant positive relation ($p<.01$) with both Berlyne's figures and the Polygon $\bar{X}$. The Polygon S.D. is positively correlated ($p<.05$) with Sym. and Asym.

Summary of Findings

A brief discussion of these intercorrelational results in conjunction with those for the adult subgroup follows. The focus is upon the regularly recurring findings.

Sex

First of all, it should be noted that there is very little evidence of variation by sex in complexity preference manifest on the 3 principal scores, the RA, Berlyne's figures, or the Polygon $\bar{X}$. Within the developmental span of 6 years to adulthood, sex differences emerge only for the 16- to 18- year-old subgroup: girls of this age prefer more complexity on the RA and Berlyne's figures than do the boys. It may be that this effect is peculiar to late adolescence, especially as it does not occur with the 15- to 16- year-olds, nor does it persist with the parental sample. Furthermore, Eisenman's (1967c, 1968a; Taylor and Eisenman, 1968) studies, in which he reports that females like more complexity than males, have all been conducted with university students.

Secondly, there is some evidence of sex differences, subject to changes with age, in scores on Sym. and Asym. To elucidate, the sex-typing factor which was revealed in the varimax factor analysis for the

284 children's data indicated that females tended to like a greater number of symmetrical figures. In contrast, the sex-typing factor in the varimax solution for the adults' data showed that females were inclined to like a greater number of asymmetrical figures. It is therefore interesting to observe that relative to boys, girls at the 6- to 7- year-old, 8- to 9- year-old, and 11- to 12- year-old age levels are more acceptant of symmetry; while girls in the 15- to 16- year-old and 16- to 18- year-old subgroups are more acceptant of asymmetry. Thus, the 2 older age levels appear to correspond more closely to the adult sample in this respect.

Complexity Preference Measures

One significant correlation which arises in each age subgroup, from the 6- to 7- year-old level to adulthood, is that between the Polygon $\bar{X}$ and the Polygon S.D. In other words, a higher $\bar{X}$ score tends to be associated with a wider complexity-choice range. This requires some explanation. An individual can obtain a Polygon $\bar{X}$ of approximately 10 in 2 ways: 1. by restricting his like ratings to the 8- and 12-sided figures; 2. or by dispersing his ratings, for example, marking L for a 4-, 6-, 8-, and 24-sided polygon. Thus, the higher the subject's optimal complexity level as reflected by his Polygon $\bar{X}$ score, the more likely he is to demonstrate the latter type of behavior.

With regard to the complexity preference measures, the only other relation which occurred consistently in each subgroup was that between the RA and Berlyne's figures. The correlations merit inspection by age level: 1. 6- to 7- year-olds, .29 (nonsignificant); 2. 8- to 9- year-olds, .46 ($p<.01$); 3. 10- to 11- year-olds, .57 ($p<.01$); 4. 11- to 12- year-olds, .56 ($p<.01$); 5. 13- to 14- year-olds, .71 ($p<.01$); 6. 15- to 16- year-olds, .35 (nonsignificant); 7. 16- to 18- year-olds,

.60 ($p<.01$); and 8. adults, .69 ($p<.01$). Overall, there appears to be a trend such that the extent of correlation increases with age. More precisely, this suggests that the uniformity of complexity preference manifest on these 2 measures increases as a function of age.

Symmetry—Asymmetry

Correlations of Sym. and Asym. with the 3 principal complexity preference scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$, where significant, are in the expected directions. That is, preference for complexity, in terms of these scores, implicates a rejection of symmetry and an acceptance of asymmetry.

Subset Analysis

In a further attempt to investigate whether there is any developmental trend discernible in complexity preference, a subset analysis was carried out (Youngman, 1971, 1972a, 1972b). The method will be explicated in detail, but essentially what it involves is a comparison between each subgroup, deemed worth inspecting, and the total population specified; and a comparison of each subgroup with every other subgroup. Because of the general similarity between the correlational results for the 284 children and the 64 adults, it was considered suitable to base the analysis on the combined data. This made possible an examination of the variation over the entire age range, 6 years to adulthood.

Intercorrelation Data for 284 Children and 64 Adults

First of all, in order to ascertain the parameters and the characteristic scoring pattern for the total population of children and adults, a correlational analysis was conducted on the combined set of results. The names and identifying numbers of the variables included in this analysis, and also in the subsequent subset analysis, are itemized in Table 22.

The correlation matrix for the total sample of 284 children and 64

TABLE 22

Complexity Preference: Sample comprising 284 Children and 64 Adults

Means and Standard Deviations of the 7 Variables

		mean	standard deviation
1.	sex MALE 1 FEMALE 2	1.53	.50
2.	RA	26.99	10.64
3.	Berlyne's figures	5.02	2.61
4.	polygon mean ($\bar{X}$)	12.38	2.58
5.	polygon standard deviation (S.D.)	5.97	1.23
6.	number of symmetrical polygons liked (sym.)	2.13	.80
7.	number of asymmetrical polygons liked (asym.)	9.59	2.94

adults is reproduced in Table 23.

Sex

In accordance with the correlation matrices for the 2 samples taken separately, sex was not significantly related to any of the other variables.

Complexity Preference Measures

The pattern of correlations among the complexity preference scores conforms with those which arose for the children's and adults' data considered independently. In other words, there was a significant positive relation ($p<.01$) between the RA and Berlyne's figures; a significant positive relation ($p<.01$) between the RA and the Polygon $\bar{X}$; and a significant positive relation ($p<.01$) between Berlyne's figures and the Polygon $\bar{X}$. Finally, the Polygon S.D. correlated positively ($p<.01$) with the Polygon $\bar{X}$, but did not correlate with either the RA or Berlyne's figures.

In summary, the individual, who manifests preference for complexity on the RA, is also more inclined to choose Berlyne's more complex (MC) figures, and tends to have a higher optimal complexity level as indicated by his higher Polygon $\bar{X}$ score. One rather interesting trend should be touched upon at this point. The person who obtains a high Polygon $\bar{X}$ typically has a wider complexity-choice range as reflected by his Polygon S.D. In contrast, the person who scores high on all 3 principal complexity preference measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$, does not show this breadth of complexity choice. Thus, there is some intimation that such an individual is actually rejecting simplicity.

Symmetry—Asymmetry

By referring to Table 22, it can be seen that the mean score for Sym. is 2.13 out of a possible 3: the majority of the total sample of children and adults like the symmetrical figures. However, a significant

TABLE 23

Complexity Preference: Correlation Matrix for Total Sample of 284 Children and 64 Adults

	1	2	3	4	5	6	7
1. sex M1 F2	1.00						
2. RA	-.01	1.00					
3. Berlyne's figures	-.05	.59**	1.00				
4. $\bar{X}$	.04	.37**	.26**	1.00			
5. S.D.	.12	.09	.16	.59**	1.00		
6. sym.	.14	-.27**	-.18	-.18	.18	1.00	
7. asym.	.13	.12	.23*	.21*	.36**	-.02	1.00

** significant at .01 level .25

* significant at .05 level .20

negative correlation ($p < .01$) emerged between the RA and Sym. Significant positive correlations were revealed between Asym. and Berlyne's figures ($p < .05$), and the Polygon $\tilde{X}$ ($p < .05$). Therefore, the relations between Sym. or Asym. and the 3 principal preference-for-complexity scores, where significant, offer support for the view that such preference implicates positive reaction to asymmetry and negative reaction to symmetry. In addition, the Polygon S.D. was positively correlated ($p < .01$) with Asym.

Part I: Each Age Subgroup Compared with the Total Population

The first part of the subset method comprises an analysis of the difference between each subgroup being examined and the total population on all variables. The subgroups were the developmental levels: 1. the 6- to 7- year-olds; 2. the 8- to 9- year-olds; 3. the 10- to 11- year-olds; 4. the 11- to 12- year-olds; 5. the 13- to 14- year-olds; 6. the 15- to 16- year-olds; 7. the 16- to 18- year-olds; and 8. the adults. The steps in the procedure are outlined below:

1. Measurement of the full population. The means and standard deviations for the entire population, in this case the 284 children and the 64 adults, are computed for comparative purposes. These are tabulated in Table 22. In addition, the Population mean (P.M.) on every variable is included in the table relevant to each subgroup in order to facilitate inspection.

2. Measurement of each subgroup. The members of a subgroup are first identified; and then a number of statistics are calculated for this subgroup, both to define the group, and also to determine the degree to which it differs from the total population.

A. Group mean (G.M.). The average score for the subgroup alone is computed on each variable.

B. Group standard deviation (S.D.). This indicates the extent to which the group's scores are scattered about the average. It is not possible to attribute meaning to a particular value, as the size depends on actual scores on the pertinent measure.

C. T-value. This is the main statistic used to characterize a subgroup. The T-value, which takes into account the size of both the subgroup and the total population, is a measure of the degree to which the group deviates from the population. Also taken into account is the variability of both: an apparent difference between the average of the subgroup and that of the population need not be significant, especially if there is great variability in their respective scores as shown by the group and population standard deviations; the T-value requires a larger difference for significance in such an instance. If the T-value is positive (+), the group's mean is higher than that of the population; if the T-value is negative (-), the group's average score is lower.

D. F-ratio. The divergence between a subgroup and the total population is less meaningful if there is a great deal of variation within the subgroup. That is, the average score of the group may be significantly higher or lower, but within the group, there could easily be many members not much different from the population. The F-ratio provides a measure of the homogeneity of a subgroup: if the group's variance (standard deviation^2) is small, compared with the population variance, the F-ratio will be relatively large. Such an outcome makes it more reasonable to generalize the finding for the entire subgroup to the individual members.

The subset analysis data for the various age levels 1. the 6- to 7- year-olds, 2. the 8- to 9- year-olds, 3. the 10- to 11- year-olds, 4. the 11- to 12- year-olds, 5. the 13- to 14- year-olds, 6. the 15- to 16- year-olds, 7. the 16- to 18- year-olds, and 8. the adults are set out in Tables 24, 25, 26, 27, 28, 29, 30, and 31 respectively.

The negative T-value indicates that the 6- to 7- year-old subgroup prefers significantly less ($p<.05$) complexity on the RA than the total population. Furthermore, as can be seen from the significantly higher ($p<.05$) F-ratio, the group members manifest relative cohesiveness in this behavior. The subgroup also scores significantly lower ($p<.05$) than the population on Berlyne's figures.

The 8- to 9- year-old subjects diverge from the population only in uniformly liking a significantly greater ($p<.01$) number of the symmetrical figures.

Compared with the total population, the 10- to 11- year-olds have significantly higher ($p<.05$) average scores on the 3 principal complexity preference measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$. In addition, this age level reacted positively to a larger ($p<.01$) number of asymmetrical figures.

A relatively cohesive tendency to obtain both a higher ($p<.01$) Polygon $\bar{X}$ and a higher ($p<.05$) Polygon S.D. than the total population was disclosed in the 11- to 12- year-old subgroup.

There is a smaller ($p<.05$) proportion of females in the 13- to 14- year-old subgroup than in the population. The one other divergence is that the members score lower ($p<.05$) on Asym.

The members of the 15- to 16- year-old subgroup show greater ($p<.05$) preference for complexity on the RA than the total population.

Corresponding with the result for the 15- to 16- year-old subjects, the 16- to 18- year-olds also score significantly higher ($p<.05$) on the RA than the population does. The other difference revealed is that they are inclined to like fewer ($p<.05$) asymmetrical figures.

In comparison with the total population, the adult subgroup demon-

TABLE 24

Subset Analysis: 6- to 7- year-old Group Compared with Total Sample (N=348)

		P.M.	G.M.	S.D.	T-value	F-ratio
1.	sex	1.53	1.64	.48	.89	1.09
2.	RA	26.99	22.64	6.48	-2.51*	2.70*
3.	Berlyne's figures	5.02	3.50	2.06	-2.76*	1.61
4.	$\overline{X}$	12.38	11.85	2.79	-.71	.86
5.	S.D.	5.97	6.14	.84	.75	2.15
6.	sym.	2.13	2.29	.70	.82	1.29
7.	asym.	9.59	9.93	3.17	.40	.86

P.M. = population mean; i.e. mean for total sample

G.M. = group mean

S.D. = group standard deviation

+ = G.M. higher than P.M.

- = G.M. lower than P.M.

** = significant at .01 level

* = significant at .05 level

TABLE 25

Subset Analysis: 8- to 9- year-old Group Compared with Total Sample (N=348)

	F.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.51	.50	-.19	1.00
2. RA	26.99	27.73	9.18	.49	1.34
3. Berlyne's figures	5.02	5.73	2.50	1.73	1.10
4. $\bar{X}$	12.38	11.90	2.19	-1.33	1.39
5. S.D.	5.97	5.88	1.17	-.49	1.11
6. sym.	2.13	2.49	.55	3.91**	2.08**
7. asym.	9.59	10.24	2.86	1.39	1.06

TABLE 26

Subset Analysis: 10– to 11– year–old Group Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T–value	F–ratio
1. sex	1.53	1.53	.50	.09	1.00
2. RA	26.99	29.06	7.08	2.49*	2.26**
3. Berlyne's figures	5.02	5.66	2.67	2.04*	.97
4. $\bar{X}$	12.38	12.93	1.82	2.57*	2.01**
5. S.D.	5.97	6.09	.76	1.35	2.65**
6. sym.	2.13	2.26	.62	1.77	1.64**
7. asym.	9.59	11.25	2.68	5.29**	1.21

TABLE 27

Subset Analysis: 11- to 12- year-old Group Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.55	.50	.35	1.01
2. RA	26.99	27.22	10.46	.17	1.04
3. Berlyne's figures	5.02	5.09	2.65	.19	.97
4. $\overline{X}$	12.38	13.29	1.96	3.56**	1.73**
5. S.D.	5.97	6.24	.87	2.33*	2.01**
6. sym.	2.13	2.19	.68	.64	1.36
7. asym.	9.59	9.14	2.34	-1.47	1.58*

TABLE 28

Subset Analysis: 13- to 14- year-old Group Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.36	.48	-2.55*	1.08
2. RA	26.99	27.09	12.25	.06	.75
3. Berlyne's figures	5.02	5.16	2.53	.42	1.07
4. $\bar{X}$	12.38	12.64	2.42	.79	1.14
5. S.D.	5.97	5.90	1.44	-.37	.74
6. sym.	2.13	1.96	.89	-1.40	.79
7. asym.	9.59	8.76	2.54	-2.41*	1.34

TABLE 29

Subset Analysis: 15- to 16- year-old Group Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.68	.47	1.46	1.15
2. RA	26.99	32.95	9.51	2.73*	1.25
3. Berlyne's figures	5.02	4.42	2.06	-1.27	1.61
4. $\bar{X}$	12.38	12.90	3.67	.63	.49
5. S.D.	5.97	5.64	2.04	-.71	.37
6. sym.	2.13	1.79	.77	-1.95	1.08
7. asym.	9.59	8.26	3.97	-1.46	.55

TABLE 30

Subset Analysis: 16- to 18- year-old Group Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.68	.47	1.70	1.14
2. RA	26.99	31.71	11.57	2.16*	.85
3. Berlyne's figures	5.02	5.29	2.75	.51	.91
4. $\overline{X}$	12.38	11.67	3.68	-1.02	.49
5. S.D.	5.97	5.97	1.84	-.01	.45
6. sym.	2.13	1.89	1.05	-1.21	.58
7. asym.	9.59	8.07	3.71	-2.15*	.63

TABLE 31

Subset Analysis: Adult Group Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.52	.50	-.21	1.00
2. RA	26.99	21.05	11.07	-4.30**	.93
3. Berlyne's figures	5.02	4.09	2.42	-3.06**	1.17
4. $\bar{X}$	12.38	11.25	2.57	-3.52**	1.01
5. S.D.	5.97	5.77	1.16	-1.36	1.14
6. sym.	2.13	2.05	.87	-.78	.83
7. asym.	9.59	9.42	2.23	-.60	1.74**

strates significantly less ($p<.01$) preference for complexity on the 3 principal scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$.

Summary of Part I

In Part I of the subset analysis, evidence bearing on the issue of age-related changes in preference for complexity emerged. The RA scores provide the most clearly interpretable data and the age sequence will be briefly described. The 6- to 7- year-olds manifest significantly lower preference for complexity on the RA. The 8- to 9- year-olds do not deviate from the population. There is a significant increase in preference for complexity on the RA at the 10- to 11- year-old level. Yet this increase is not maintained, as neither the 11- to 12- year-old subgroup nor the 13- to 14- year-old subgroup differs from the total population. On the other hand, both the 15- to 16- year-old and the 16- to 18- year-old subjects demonstrate greater complexity preference on the RA. Finally, the adults, like the 6- to 7- year-olds, score significantly lower than the population on this measure.

The most salient implication of this patterning of RA scores is that there seems to be a developmental trend such that preference for complexity increases and subsequently decreases with age. To elaborate, the youngest children, the 6- to 7- year-olds, like less complexity. This contention is reinforced by the finding that these subjects also score lower than the total population on Berlyne's figures. Complexity preference on the RA shows an increment for the 8- to 9- year-old children and then remains fairly stable through age 14, with the exception of a peak at the 10- to 11- year-old level. This peak was not anticipated, but the increase in complexity preference for the 10- to 11- year-old subgroup is quite general, extending to higher average scores on Berlyne's figures and the Polygon $\bar{X}$. The question arises as to whether such an increase is specific to this developmental population or whether it would be a regular outcome with other populations as well.

At age 15, there is a further increment in preference for complexity on the RA which persists through age 18. This result merits some comment: it is relevant to the influence of experience, in terms of specialized training, on complexity preference. As has been mentioned, the 15- to 16- year-old subgroup was composed of 19 students preparing for the "O" level qualification in art. As would perhaps be expected, these subjects scored higher on the RA, which was originally an "art" preference scale, in that it separated artists from "people in general." This greater preference for complexity shown by the art students is also consistent with Munsinger and Kessen's (1964) report that their art-student subjects preferred more complexity than the rest of their university population. However, in the present research, the 16- to 18- year-olds, who were not art students, also demonstrated significantly higher preference for complexity on the RA than the total population. Thus, insofar as there is any effect of experience on complexity preference, it is arguable that it is experience which accrues as children become older, and not as a consequence of more specific artistic training.

Nevertheless, the increase in preference for complexity does not continue into adulthood. In fact, the adult subgroup was most similar to the 6- to 7- year-old subgroup, having significantly lower scores on the RA and Berlyne's figures. Furthermore, the adult group obtained a significantly lower Polygon $\bar{X}$.

Part II: <u>Each Age Subgroup Compared with Every Other Subgroup</u>

The first part of a subset analysis serves to delineate the various subgroups in terms of their divergence from the total population. In the second part of the subset analysis, a T-value is computed between the mean of each subgroup and every other subgroup on all variables. More specifically, the second part is carried out with a view to determining what significant differences, if any, exist among the various subgroups. The utility of this procedure can be exemplified with reference to age effects. The 6- to 7- year-old subgroup score significantly lower than the total population on the RA. However, if there is indeed a developmental trend, it would be expected that this subgroup would also score lower than all the older subgroups.

The data for the RA, Berlyne's figures, the Polygon $\bar{X}$, the Polygon S.D. Sym. and Asym. appear in Tables 32A, B, C, D, E, and F respectively. There will be a brief consideration of group variations on each score and then a general discussion of implications.

RA

In Part I of the subset analysis it was seen that, compared with the total population, the 6- to 7- year-olds express significantly less preference for complexity on the RA. Part II shows that all of the older subgroups of children score higher than this youngest group; and with the exception of the 13- to 14- year-old group significantly higher. The adults score lower, but not significantly so. On the other hand, the adults who had a significantly lower RA mean than the total population, do score significantly lower than all the remaining children's groups on this measure.

The 15- to 16- year-olds, who manifest significantly greater preference for complexity than the total population, score significantly higher than the 6- to 7- year-olds, the 11- to 12- year-olds, and the 13- to 14- year-olds. Although the differences are not significant, they also score higher than the 8- to 9- year-olds, and the 10- to 11- year-olds, and

TABLE 32A

Complexity Preference in Total Sample of Children and Adults (N=348): T-values between the Mean of Each Group and Every Other Group

Revised Art Scale

Groups	1 N=14	2 N=37	3 N=73	4 N=58	5 N=55	6 N=19	7 N=28	8 N=64
1. 6- to 7- year-olds	.00							
2. 8- to 9- year-olds	2.16*	.00						
3. 10- to 11- year-olds	3.24**	.76	.00					
4. 11- to 12- year-olds	2.02*	-.25	-1.13	.00				
5. 13- to 14- year-olds	1.81	-.28	-1.05	-.06	.00			
6. 15- to 16- year-olds	3.59**	1.92	1.63	2.17*	2.10*	.00		
7. 16- to 18- year-olds	3.17**	1.48	1.12	1.17	1.66	-.39	.00	
8. adults	-.70	-3.23**	-4.93**	-3.14**	-2.78**	-4.06**	-4.51**	.00

+ = higher than

− = lower than

** = significant at .01 level

* = significant at .05 level

F - significant at .001 level.

NOTE: F was calculated for each measure and its significance level is reported in the table relevant to the measure. However, even if F was not significant, T-values were computed and the results were discussed in the text for purposes of theoretical interest.

negligibly higher than the 16- to 18- year-olds.

The 16- to 18- year-old subjects, who also demonstrated significantly greater complexity preference on the RA than the total population, score significantly higher than the 6- to 7- year-olds; and higher, though not significantly so, than all other younger subgroups excepting the 15- to 16- year-old one.

Berlyne's figures

Part I of the subset analysis disclosed that the 6- to 7- year-olds prefer significantly less complexity on Berlyne's figures than the total population. Table 32B confirms that all older age levels obtain a higher average score on this measure; and all but the 15- to 16- year-olds and the adults obtain a significantly higher one.

In comparison with the total population, the adults also express significantly less preference for complexity on Berlyne's figures. Although they score higher than the 6- to 7- year-old subgroup, they score lower than the rest of the children's subgroups, and significantly lower than all but the 15- to 16- year-olds and the 16- to 18- year-olds.

The mean score of the 15- to 16- year-old subgroup is significantly lower than that of the 8- to 9- year-old group and of the 10- to 11- year-old group.

Polygon $\bar{X}$

In Part I of the subset analysis, it was found that the adults had a significantly lower Polygon $\bar{X}$ than the total population. Examination of Table 32C shows that they score lower than all other age levels on this measure, but only significantly lower than the 10- to 11- year-olds, the 11- to 12- year-olds, and the 13- to 14- year-olds.

Both the 10- to 11- year-old and the 11- to 12- year-old subgroups have significantly higher Polygon $\bar{X}$ score than the 8- to 9- year-old sub-

TABLE 32B

Complexity Preference in Total Sample of Children and Adults (N=348):

T-values between the Mean of Each Group and Every Other Group

Berlyne's Figures

Groups	1 N=14	2 N=37	3 N=73	4 N=58	5 N=55	6 N=19	7 N=28	8 N=64
1. 6- to 7- year-olds	.00							
2. 8- to 9- year-olds	3.15**	.00						
3. 10- to 11- year-olds	3.31**	-.14	.00					
4. 11- to 12- year-olds	2.36*	-1.18	-1.21	.00				
5. 13- to 14- year-olds	2.49*	-1.05	-1.06	.16	.00			
6. 15- to 16- year-olds	1.23	-2.05*	-2.14*	-1.11	-1.25	.00		
7. 16- to 18- year-olds	2.29*	-.66	-.60	.31	.19	1.20	.00	
8. adults	.92	-3.17**	-3.57**	-2.13*	-2.32*	-1.95	-.57	.00

F — SIGNIFICANT AT .001 LEVEL

TABLE 32C

Complexity Preference in Total Sample of Children and Adults (N=348):

T-values between the Mean of Each Group and Every Other Group

Polygon $\bar{X}$

Groups	1 N=14	2 N=37	3 N=73	4 N=58	5 N=55	6 N=19	7 N=28	8 N=64
1. 6– to 7– year–olds	.00							
2. 8– to 9– year–olds	.06	.00						
3. 10– to 11– year–olds	1.34	2.42*	.00					
4. 11– to 12– year–olds	1.77	3.11**	1.10	.00				
5. 13– to 14– year–olds	.93	1.50	-.74	-1.57	.00			
6. 15– to 16– year–olds	.91	1.07	-.02	-.43	.29	.00		
7. 16– to 18– year–olds	-.17	-.29	-1.70	-2.16*	-1.24	-1.11	.00	
8. adults	-.72	-1.34	-4.32**	-4.93**	-3.01**	-.54	-1.79	.00

F — SIGNIFICANT AT .001 LEVEL

group. Finally, the 16- to 18- year-old subjects obtain a significantly lower Polygon $\bar{X}$ than the 11- to 12- year-old subjects.

Polygon S.D.

The one inter-group difference revealed on this measure indicates that the adults have a significantly smaller complexity-choice range than the 11- to 12- year-olds.

Sym.

The 11- to 12- year-olds, the 13- to 14- year-olds, the 15- to 16- year-olds, the 16- to 18- year-olds, and the adults like significantly fewer symmetrical figures than the 8- to 9- year-olds. The 13- to 14- year-old subjects and the 15- to 16- year-old subjects like a smaller number of symmetrical figures than do the 10- to 11- year-olds. The 15- to 16- year-olds also like a smaller number of these figures than the 11- to 12- year-olds.

Without taking into account significance levels, the interesting feature of the patterning of minus signs in Table 32E, particularly within the age span of 10 to 18 (groups 3 to 7), is that there appears to be a trend such that all older subgroups like fewer symmetrical figures than a younger subgroup.

Asym.

Both the 13- to 14- year-old subjects and the 16- to 18- year-old subjects express preference for a significantly smaller number of asymmetrical figures than the 8- to 9- year-old subjects. The 11- to 12- year-olds, 13- to 14- year-olds, 15- to 16- year-olds, 16- to 18- year-olds, and the adults like a significantly smaller number of these figures than do the 10- to 11- year-olds.

In addition, corresponding to the finding for Sym., the configuration of minus signs in Table 32F, at least between the ages 11, 12

TABLE 32D

Complexity Preference in Total Sample of Children and Adults (N=348): T-values between the Mean of Each Group and Every Other Group

Polygon S.D.

	Groups	1 N=14	2 N=37	3 N=73	4 N=58	5 N=55	6 N=19	7 N=28	8 N=64
1.	6- to 7- year-olds	.00							
2.	8- to 9- year-olds	-.86	.00						
3.	10- to 11- year-olds	-.19	1.00	.00					
4.	11- to 12- year-olds	.38	1.59	1.01	.00				
5.	13- to 14- year-olds	-.79	.08	-.90	-1.50	.00			
6.	15- to 16- year-olds	-.94	-.46	-.93	-1.21	-.50	.00		
7.	16- to 18- year-olds	-.41	.22	-.34	-.73	.17	.55	.00	
8.	adults	-1.33	-.42	-1.85	-2.49*	-.51	-.50	.27	.00

F — NONSIGNIFICANT

TABLE 32E

Complexity Preference in Total Sample of Children and Adults (N=348):

T-values between the Mean of Each Group and Every Other Group

Number of Symmetrical Figures Liked (Sym.)

Groups	1 N=14	2 N=37	3 N=73	4 N=58	5 N=55	6 N=19	7 N=28	8 N=64
1. 6- to 7- year-olds	.00							
2. 8- to 9- year-olds	.93	.00						
3. 10- to 11- year-olds	-.12	-1.93	.00					
4. 11- to 12- year-olds	-.45	-2.31*	-.61	.00				
5. 13- to 14- year-olds	-1.41	-3.43**	-2.09*	-1.49	.00			
6. 15- to 16- year-olds	-1.87	-3.44**	-2.42*	-1.98*	-.80	.00		
7. 16- to 18- year-olds	-1.40	-2.68**	-1.71	-1.34	-.30	.38	.00	
8. adults	-1.07	-3.07**	-1.62	-1.00	.51	.67	1.22	.00

F — SIGNIFICANT AT .01 LEVEL

TABLE 32F

Complexity Preference in Total Sample of Children and Adults (N=348):

T-values between the Mean of Each Group and Every Other Group

Number of Asymmetrical Figures Liked (Asym.)

Groups	1 N=14	2 N=37	3 N=73	4 N=58	5 N=55	6 N=19	7 N=28	8 N=64
1. 6- to 7- year-olds	.00							
2. 8- to 9- year-olds	.31	.00						
3. 10- to 11- year-olds	1.41	1.75	.00					
4. 11- to 12- year-olds	-.85	-1.94	-4.77**	.00				
5. 13- to 14- year-olds	-1.23	-2.51*	-5.30**	-.81	.00			
6. 15- to 16- year-olds	-1.30	-1.88	-3.02**	-.89	-.50	.00		
7. 16- to 18- year-olds	-1.64	-2.53*	-4.07**	-1.37	-.87	-.16	.00	
8. adults	-.55	-1.48	-4.32**	.68	1.48	1.76	1.19	.00

F — SIGNIFICANT AT .001 LEVEL

and 18 (groups 4, 5, 6, and 7), suggests that all older groups like fewer asymmetrical figures than a younger group. Thus, the patterning of scores by age on both Sym. and Asym. offers some slight support for the proposition formulated during the discussion of the 284 children's intercorrelation and factor analysis results: as children become older, they are inclined to become more selective in their preference.

General Summary

This review will be oriented towards the issue of developmental changes in preference for complexity. In the first place, it should be remarked that at each age level, there are inter-individual differences such that some persons like complexity and some like simplicity. On the basis of Part I and Part II of the subset analysis, the strongest conclusion warranted is that the youngest children, the 6- to 7- year-olds, and the adults tend to prefer less complexity on the RA and Berlyne's figures. Between the ages of 8 to 18, there is not much evidence of regular age effects on complexity preference as reflected by the 3 principal scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$.

Considering the data within the context of the other developmental studies dealing with preference for complexity, which have been described in the introduction to this chapter, it seems that they accord most closely with those reported by Thomas (1966). To recapitulate, with a sample of children ranging in age from 7 to 19, Thomas found negligible variation in complexity preference for ages 7 through 16; and a systematic decrease in such preferences for ages 17, 18, and 19. In the present research, although the 6- to 7- year-olds evinced less preference for complexity, there was little change from ages 8 to 18. While a decrease in complexity preference does not occur in late adolescence, it does emerge in adulthood.

Cluster Analysis

As sex does not appear to play a decisive role in complexity preference, and as there was no clearly discernible trend by age subgroup, the final method of organizing the data comprised a means of generating subgroups from a population. That is, employing the computer, a cluster analysis (Wishart, 1969) was conducted on the 284 children's results; and then on the combined results for the 284 children and 64 adults. The variables included in this grouping procedure were scores on the RA, Berlyne's figures, and the Random Polygon measure, that is, the Polygon $\bar{X}$, the Polygon S.D., Sym. and Asym. A description of the approach implicit in cluster analysis should serve to explain the effectiveness of the method (Brennan and Youngman, 1971; Entwistle and Brennan, 1971; Youngman, 1972b).

Description of the Method

Classifications by age or sex are constructed a priori and are based on predetermined intervals. These a priori "type" constructions represent externally imposed groupings and may bear little relationship to the "natural" typological structure of the data (Brennan and Youngman, 1971). On the other hand, the classification involved in a cluster analysis technique is based on the entire set of specified variables. All the individual's scores, in this case those on the RA, Berlyne's figures, and the Random Polygon measure, are simultaneously considered. The reasoning behind this procedure is that each individual is defined in terms of a particular combination of scores on all variables.

Essentially, the object of a cluster analysis is to produce subgroups from a population in such a fashion that every subgroup is homogeneous, yet at the same time different from other subgroups. Entwistle and Brennan (1971) formulate a cogent comparison: "The simplest way of conceptualizing this approach is to contrast it with factor analysis. The basic aim in factor analysis is to condense many variables into a few factors which summarize the interrelationships between the variables in a parsimonious manner. Variables which have elements in common are replaced by a factor. In cluster analysis people whose profiles of scores are similar are grouped into clusters to describe types of individuals. Thus, a cluster of people is analogous to a factor derived from a series of tests" (p.268).

In this research, the form of cluster analysis implemented was Ward's method (Ward, 1963; Wishart, 1969). A brief account of the procedure follows. First of all, Ward (1963) defines "objective function" as "any functional relation that an investigator selects to reflect the relative desirability of grouping" (p.237). His criterion for grouping, or objective function, is loss of information; that is, grouping is carried out with a view to minimizing this loss.

To elaborate, Ward (1963; Wishart, 1969) developed his method on the premise that the greatest amount of information is available when a set of n members is ungrouped. Therefore, the clustering process starts with these n members, termed subsets or clusters, even though they contain only one individual. The computer begins by calculating the similarity between all possible pairs of individuals or subsets; and then chooses two of these n subsets which, when united, will reduce by one the number of subsets, while causing the least impairment of the optimal value (0) of the objective function (loss of information). After every such fusion, the n-1 resulting subsets are examined to determine if a third member should be united with the first pair, or another pairing made, to secure the optimal value of the objective function for n-2 groups. That is, similarities between the modified subset and all other subsets are recompiled; and the two most similar subsets are combined. This procedure can be continued, if desired, until all members of the original population are again in one group. Since the number of subsets is systematically reduced (n, n-1 ... 1), the process is called "hierarchical grouping." In summary, Ward's method of cluster analysis is a procedure for forming hierarchical groups of mutually exclusive subsets, each of which has members who are maximally alike with respect to specified characteristics.

Results for 284 Children

Ward's method produces a series of partitions of the total sample such that at each level every subject is allocated to one cluster. The computer printout consists of the identifying numbers of the individuals making up the subgroups at each cluster level. Thus, once the subgroups have been obtained, it remains to ascertain the characteristics of the members. This is achieved by using the subset analysis method previously described. As has been mentioned, the variables involved in the cluster analysis for the 284 children's data were scores on the RA, Berlyne's figures, and the Random Polygon measure, the Polygon $\bar{X}$, S.D., Sym. and Asym. However, the age and sex variables were included in the subset analysis to furnish supplementary information about the membership of the clusters.

The application of cluster analysis is still at an exploratory stage (Entwistle and Brennan, 1971, p.276) and a central problem is that of "How many clusters?" (Brennan and Youngman, 1971, p.3). It is often interesting to examine a dichotomy.

The T-values between the means on all variables for the 2-group division are presented in Table 33. This division does not provide a sufficiently detailed structuring of the data: cluster 1 contains 257

TABLE 33

Cluster Analysis Results for the Two Group Level: T-values between the Means

	Means		T-values
	Cluster 1	Cluster 2	
	N=257	N=27	
1. age	11.80	11.83	.05
2. sex	1.55	1.33	2.25*
3. RA	28.89	23.04	2.96**
4. Berlyne's figures	5.41	3.56	4.12**
5. $\overline{X}$	13.18	7.39	9.73**
6. S.D.	6.34	2.96	11.00**
7. sym.	2.16	2.07	.42
8. asym.	9.96	6.48	4.51**

** = significant at .01 level

* = significant at .05 level

(90.5%) of the subjects; while cluster 2 contains only 27 (9.5%) of the subjects.

Nevertheless, the distinction between the 2 clusters merits a short synopsis. First of all, cluster 2 is predominantly male, comprising 18 boys. Furthermore, the children in cluster 2 score significantly lower ($p<.01$) than those in cluster 1 on the RA, Berlyne's figures, the Polygon $\bar{X}$, and the Polygon S.D.; and they like a significantly smaller ($p<.01$) number of asymmetrical figures.

However, the most suitable structuring of the data appeared to be the 3-cluster solution. The findings of Part I and Part II of the subset analysis on this 3-cluster outcome will be briefly reported. To recapitulate, the first part of the subset analysis involves a consideration of the differences between each cluster and the total population; while in the second part, an investigation of the differences among the various clusters is carried out.

The results of Part I of the subset analysis for clusters, 1, 2, and 3 are reproduced in Tables 34, 35, and 36 respectively.

Cluster 1 is composed of 162 (57.1%) of the children. Inspection of Table 34 shows that this cluster contains a higher proportion of females than the total population. Some comment seems requisite. In the total sample of 284 children, there is a fairly even division by sex: 153 females (53.9%) and 131 males (46.1%). In contrast, 106 (65.4%) of the children in cluster 1 are female.

With regard to the complexity preference measures, these subjects have a significantly lower ($p<.01$) average score than the total population on the RA and Berlyne's figures. Although they do not deviate from the population on the Polygon $\bar{X}$ score, they do tend to have a wider complexity-choice range as reflected by their significantly higher ($p<.01$) Polygon S.D.

TABLE 34

Cluster Analysis with Children: Cluster One (N=162) Compared with Total Sample of Children (N=284)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. age	11.81	11.84	2.83	.16	.89
2. sex	1.53	1.64	.48	2.93**	1.08
3. RA	28.33	24.71	8.72	-5.29**	1.33*
4. Berlyne's figures	5.23	4.00	1.80	-8.68**	2.11**
5. $\bar{X}$	12.63	12.80	1.76	1.20	2.03**
6. S.D.	6.01	6.40	.68	7.26**	3.38**
7. sym.	2.15	2.35	.74	3.34**	1.10
8. asym.	9.63	9.67	2.88	.20	1.14

Percentage of Total Sample: 57.1

P.M. = population mean; i.e. mean for total sample

G.M. = group mean

S.D. = group standard deviation

\+ = G.M. higher than P.M.

\- = G.M. lower than P.M.

** = significant at .01 level

* = significant at .05 level

TABLE 35

Cluster Analysis with Children: Cluster Two (N=27) Compared with Total Sample of Children (N=284)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. age	11.81	11.83	3.11	.05	.73
2. sex	1.53	1.33	.47	-2.19*	1.12
3. RA	28.33	23.04	9.58	-2.87**	1.11
4. Berlyne's figures	5.23	3.56	2.13	-4.08**	1.51
5. $\bar{X}$	12.63	7.39	2.99	-9.11**	.71
6. S.D.	6.01	2.96	1.55	-10.22**	.64
7. sym.	2.15	2.07	1.02	-.40	.58
8. asym.	9.63	6.48	3.82	-4.27**	.65

Percentage of Total Sample: 9.5

TABLE 36

Cluster Analysis with Children: Cluster Three (N=95) Compared with Total Sample of Children (N=284)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. age	11.81	11.74	2.18	-.31	1.49*
2. sex	1.53	1.40	.49	-2.62**	1.04
3. RA	28.33	36.02	7.62	9.83**	1.75**
4. Berlyne's figures	5.23	7.80	1.91	13.15**	1.88**
5. $\bar{X}$	12.63	13.84	1.32	8.88**	3.61**
6. S.D.	6.01	6.22	.48	4.30**	6.89**
7. sym.	2.15	1.84	.64	-4.73**	1.48*
8. asym.	9.63	10.44	2.56	3.11**	1.45*

Percentage of Total Sample: 33.4

They react positively to a significantly larger ($p<.01$) number of symmetrical figures.

Cluster 2 contains 27 (9.5%) of the children. As can be seen from Table 35, this cluster is composed of a smaller proportion of females than the total population: 18 (66.7%) of the children are males.

In terms of complexity preference, cluster 2 appears to be made up of the low scoring subjects. Compared with the total population, these children manifest significantly less ($p<.01$) preference for complexity on the 3 principal scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$. They also obtain a significantly lower ($p<.01$) Polygon S.D. Finally, they like a significantly smaller ($p<.01$) number of asymmetrical figures.

Cluster 3, with 95 children, constitutes 33.4% of the total sample. Examination of Table 36 shows that cluster 3, like cluster 2, contains a lower proportion of females: 57 (60%) of the subjects are males.

However, cluster 3 seems to comprise the high scoring subjects. In comparison with the total sample of children, the children in cluster 3 express significantly greater ($p<.01$) complexity preference on the RA, Berlyne's figures, and the Polygon $\bar{X}$. They demonstrate breadth of complexity choice as reflected by their higher ($p<.01$) Polygon S.D. They are inclined to like a smaller ($p<.01$) number of symmetrical figures, and a larger ($p<.01$) number of asymmetrical ones.

The results of Part II of the subset analysis, in which a T-value is computed between the mean of each cluster and every other cluster on all variables, are set out in Table 37. There will be a consideration of the group variations on each score, followed by a discussion which will take into account the combined data of Part I and Part II.

<u>Age</u>

There is no divergence in the age composition of the 3 clusters.

TABLE 37

Cluster Analysis with 284 Children: T-values between the Mean of Each Cluster and Every Other Cluster

		Means			T-values		
		Cluster 1 N=162 MEDIUM	Cluster 2 N=27 LOW	Cluster 3 N=95 HIGH	Clusters 1 and 2	Clusters 1 and 3	Clusters 2 and 3
X	1. age	11.84	11.83	11.74	.01	.33	.15
	2. sex	1.64	1.33	1.40	3.09**	3.84**	.63
	3. RA	24.71	23.04	36.02	.84	10.83**	6.37**
	4. Berlyne's figures	4.00	3.56	7.80	1.01	15.67**	9.19**
	5. $\bar{X}$	12.80	7.39	13.84	8.98**	5.33**	10.71**
	6. S.D.	6.40	2.96	6.22	11.13**	2.44*	10.58**
	7. sym.	2.35	2.07	1.84	1.31	5.73**	1.11
	8. asym.	9.67	6.48	10.44	4.07**	2.21*	4.98**

** = significant at .01 level

* = significant at .05 level

X indicates a nonsignificant value of F. All the other values of F were significant at the .001 level. However, T-values were calculated among the clusters on all measures for reasons of theoretical interest.

Sex

Both cluster 2 and cluster 3 contain a smaller ($p<.01$) proportion of females than cluster 1.

RA

Although the difference is not significant, the children in cluster 2 score lower than those in cluster 1 on the RA. The children in cluster 3 score significantly higher ($p<.01$) than those in cluster 1 and in cluster 2.

Berlyne's figures

A similar patterning of scores occurs for Berlyne's figures: cluster 2 scores lower, but not significantly so, than cluster 1; cluster 3 scores significantly higher ($p<.01$) than both cluster 1 and cluster 2.

Polygon $\bar{X}$

Cluster 2 subjects obtain a significantly lower ($p<.01$) Polygon $\bar{X}$ than those in cluster 1; while cluster 3 subjects score significantly higher ($p<.01$) than those in cluster 1 and in cluster 2 on this measure.

Polygon S.D.

The children in cluster 2 demonstrate a significantly smaller ($p<.01$) complexity-choice range than the children in cluster 1. Although the children in cluster 3 score lower ($p<.05$) than those in cluster 1, they have a wider ($p<.01$) complexity-choice range than the children in cluster 2.

Sym.

The only inter-group differences which emerges on this measure shows that the children in cluster 3 like fewer ($p<.01$) symmetrical figures than do the children in cluster 1.

Asym.

Cluster 2 subjects like a significantly smaller ($p<.01$) number of asymmetrical figures than those in cluster 1. Cluster 2 subjects like a larger number of these figures than do the children in cluster 1 ($p<.05$) and in cluster 2 ($p<.01$).

Summary

To summarize most concisely, cluster 1 appears to comprise the medium scorers, cluster 2 the low scorers, and cluster 3 the high scorers. Thus, at an intuitive level the cluster analysis findings make sense: on the basis of a form of composite complexity score, the subjects are distributed into low, medium, and high groups, with the largest number placed in the medium group, and lesser dispersions in the low and high groups. It remains to define the clusters in a more precise manner by referring to their scoring characteristics.

Age

As the children's clusters do not vary with respect to age, it seems reasonable to argue that, in most general terms, there is stronger evidence of inter-individual differences than of any developmental trend.

Sex

It is interesting to observe that females tend to be concentrated in the medium scoring cluster, while males preponderate in the low and high scoring clusters. With the exception of scores on Sym. and Asym., the results thus far do not evince sex differences. However, the distribution by sex, disclosed in the cluster analysis for the children's data, suggests that further study of sex variations in complexity preference might prove profitable.

Complexity Preference Measures

The high scorers manifest the greatest preference for complexity on the RA and Berlyne's figures. The medium and low scorers do not deviate significantly from one another; however, there is some intimation that the low scorers prefer less complexity on these 2 measures.

On the other hand, the configuration of scores on the Polygon $\bar{X}$ clearly distinguishes the clusters: the high scorers like the most complexity; the low scorers like the least complexity; and the medium scorers are intermediate in their preference.

With regard to the Polygon S.D., the low scorers show the smallest complexity-choice range; while the medium scorers have the widest complexity-choice range. So the high scoring children fall in between the low and medium scoring ones. This outcome can be construed to indicate that the low scorers tend to reject the complex polygons and the high scorers to reject the simple polygons.

Symmetry—Asymmetry

The relative ordering of scores on Sym. suggests that the medium scoring children like the most symmetrical figures; the low scoring children like fewer; and the high scoring children like the smallest number of symmetrical figures. In contrast, the high scoring children like the largest number of asymmetrical figures; the low scoring children like the smallest number; and the medium scoring children fall in between these two extremes.

Since all the differences on Asym. are significant, the contention that preference for complexity involves positive reaction to asymmetry and preference for simplicity involves negative reaction to asymmetry receives support. It is tentatively proposed that preference for complexity also implicates rejection of symmetry.

Results for 284 Children and 64 Adults

As there was close agreement between the intercorrelation and factor analysis results for the 284 children and the 64 adults, it was deemed worthwhile to conduct a cluster analysis on the conjoined data. The variables included in this cluster analysis were scores on the RA, Berlyne's figures, and the Random Polygon measure, that is, the Polygon $\bar{X}$, the Polygon S.D., Sym. and Asym. The sex variable was added for the subset analysis.

The 2-group level was inspected first. The T-values between the means on all variables for this level are reproduced in Table 38. Corresponding to the outcome for the children alone, a dichotomy is not a particularly meaningful structuring of the data: cluster 1, with 310 subjects, constitutes 89.1% of the total sample; while cluster 2, with 38 subjects, comprises only 10.9% of the total sample.

To outline the divergence between the 2 groups: cluster 2 individuals evince significantly lower ($p<.01$) preference for complexity on the RA, Berlyne's figures, and the Polygon $\bar{X}$; they show less ($p<.01$) breadth of complexity choice on the Polygon S.D.; and they like fewer ($p<.01$) asymmetrical figures than do the individuals in cluster 1.

Once again, the 3-cluster grouping provides the most appropriate solution. The results of Part I of the subset analysis pertinent to cluster 1, 2, and 3 appear in Tables 39, 40, and 41 respectively.

Cluster 1 contains 233 (67%) of the total sample of children and adults. Compared with this total sample, the subjects in cluster 1 have a significantly lower ($p<.01$) average score on the RA and Berlyne's figures. On the other hand, they score significantly higher on the Polygon $\bar{X}$ ($p<.05$), and Polygon S.D. ($p<.01$). Finally, they express liking for a significantly larger ($p<.05$) number of symmetrical figures.

Cluster 2, with 38 subjects, constitutes 10.9% of the total sample of children and adults. As was found for the children taken separately, cluster 2 comprises the low scoring individuals: these subjects prefer significantly less ($p<.01$) complexity on the RA, Berlyne's figures, and the Polygon $\bar{X}$ than the total sample; they have a significantly smaller

TABLE 38

Cluster Analysis Results for the Two Group Level: T-values between the Means

	Means		T-values
	Cluster 1	Cluster 2	
	N=310	N=38	
1. sex	1.54	1.42	1.41
2. RA	27.84	20.08	4.54**
3. Berlyne's figures	5.24	3.26	5.39**
4. $\bar{X}$	12.98	7.44	12.86**
5. S.D.	6.32	3.10	14.64**
6. sym.	2.14	2.11	.18
7. asym.	9.91	7.00	5.08**

** = significant at .01 level

* = significant at .05 level

TABLE 39

Cluster Analysis with Children and Adults: Cluster One (N=233)

Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.55	.50	.63	1.01
2. RA	26.99	24.19	8.86	-4.83**	1.44**
3. Berlyne's figures	5.02	4.26	1.96	-5.95**	1.79**
4. $\bar{\bar{X}}$	12.38	12.68	1.89	2.40*	1.87**
5. S.D.	5.97	6.37	.64	9.51**	3.77**
6. sym.	2.13	2.25	.74	2.31*	1.14
7. asym.	9.59	9.72	2.89	.70	1.03

Percentage of Total Sample: 67.0

P.M. = population mean; i.e. mean for total sample

G.M. = group mean

S.D. = group standard deviation

+ = G.M. higher than P.M.

– = G.M. lower than P.M.

** = significant at .01 level

* = significant at .05 level

TABLE 40

Cluster Analysis with Children and Adults: Cluster Two (N=38) Compared with Total Sample (N=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.42	.49	-1.34	1.02
2. RA	26.99	20.08	9.76	-4.37**	1.19
3. Berlyne's figures	5.02	3.26	2.04	-5.32**	1.65*
4. $\bar{X}$	12.38	7.44	2.56	-11.92**	1.02
5. S.D.	5.97	3.10	1.32	-13.38**	.87
6. sym.	2.13	2.11	.99	-.17	.64
7. asym.	9.59	7.00	3.35	-4.77**	.77

Percentage of Total Sample: 10.9

TABLE 41

Cluster Analysis with Children and Adults: Cluster Three (N=77)

Compared with Total Sample ($\bar{N}$=348)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. sex	1.53	1.52	.50	-.16	1.00
2. RA	26.99	38.88	6.25	16.68**	2.90**
3. Berlyne's figures	5.02	8.20	2.00	13.93**	1.71**
4. $\bar{X}$	12.38	13.92	1.19	11.37**	4.72**
5. S.D.	5.97	6.19	.47	4.07**	6.98**
6. sym.	2.13	1.81	.74	-3.88**	1.16
7. asym.	9.59	10.47	2.02	3.81**	2.11**

Percentage of Total Sample: 22.1

($p<.01$) complexity-choice range; and they like significantly fewer ($p<.01$) asymmetrical figures.

Cluster 3, which contains 77 (22.1%) of the subjects, is a high scoring group. More specifically, the individuals in cluster 3 express significantly greater ($p<.01$) preference for complexity than the total population on the 3 principal measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$; they also have a wider ($p<.01$) complexity-choice range. They like a smaller ($p<.01$) number of symmetrical figures, and a larger ($p<.01$) number of asymmetrical ones.

The advantage of the second part of the subset analysis is that it makes possible an examination of the relative ordering of scores among the 3 clusters. The group differences on all variables are detailed in Table 42.

Sex

Paralleling the outcome for the children alone, clusters 2 and 3 contain a smaller proportion of females than cluster 1. However, there is no significant deviation disclosed in the sex composition of the groups.

RA

Cluster 2 scores significantly lower ($p<.05$) on the RA than cluster 1; while cluster 3 scores significantly higher ($p<.01$) than both clusters 1 and 2.

Berlyne's figures

The same configuration of scores emerges for Berlyne's figures: cluster 2 individuals express significantly less ($p<.01$) complexity preference on this measure than do the individuals in cluster 1; cluster 3 individuals demonstrate significantly greater ($p<.01$) complexity preference than those in cluster 1 and in cluster 2.

Polygon $\bar{X}$

This relative arrangement of scores is repeated for the Polygon $\bar{X}$:

TABLE 42

Cluster Analysis with 284 Children and 64 Adults: T-values between the Mean of Each Cluster and Every Other Cluster

		Means			T-values		
		Cluster 1	Cluster 2	Cluster 3	Clusters	Clusters	Clusters
		N=233	N=38	N=77	1 and 2	1 and 3	2 and 3
		MEDIUM	LOW	HIGH			
X	1. sex	1.55	1.42	1.52	1.47	.45	.99
	2. RA	24.19	20.08	38.88	2.41*	15.91**	10.70**
	3. Berlyne's figures	4.26	3.26	8.20	2.78**	14.98**	12.16**
	4. $\bar{X}$	12.68	7.44	13.92	11.96**	6.75**	14.67**
	5. S.D.	6.37	3.10	6.19	14.76**	2.64**	13.79**
	6. sym.	2.25	2.11	1.81	.82	4.49**	1.63
	7. asym.	9.72	7.00	10.47	4.67**	2.49*	5.80*

** = significant at .01 level

* = significant at .05 level

X indicates a nonsignificant value of F. All the other values of F were significant at the .001 level. However, T-values were calculated among the clusters on all measures for reasons of theoretical interest.

cluster 2 obtains a significantly lower ($p<.01$) Polygon $\bar{X}$ than cluster 1; cluster 3 has a significantly higher ($p<.01$) Polygon $\bar{X}$ score than cluster 1 and cluster 2.

Polygon S.D.

The subjects in both cluster 2 and cluster 3 manifest less ($p<.01$) breadth of complexity choice than those in cluster 1. However, cluster 3 subjects have a wider ($p<.01$) complexity-choice range than cluster 2 subjects.

Sym.

Only one significant inter-group difference is revealed on this measure: subjects in cluster 3 tend to like fewer ($p<.01$) symmetrical figures than do subjects in cluster 1.

Asym.

A patterning of scores similar to that for the RA, Berlyne's figures, and the Polygon $\bar{X}$ occurs for Asym.: cluster 2 individuals like a significantly smaller ($p<.01$) number of asymmetrical figures than those in cluster 1; while cluster 3 individuals express liking for a significantly larger number of asymmetrical figures than the individuals in cluster 1 ($p<.05$) and in cluster 2 ($p<.01$).

General Summary

The significant divergence by sex in the makeup of the clusters does not persist with the combined sample of 284 children and 64 adults. However, the results pertinent to the 3 principal complexity preference scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$ are more clear-cut in that all the differences among the clusters are significant. In other words, the trend suggested by the configuration of children's scores is substantiated: on these 3 measures, cluster 3 subjects, the high scorers, evince high preference for complexity; cluster 2 subjects, the low scorers show low preference for complexity; and cluster 1 subjects, the medium scorers, are intermediate in their preference.

The relative ordering of Polygon S.D. scores is also confirmed: the medium scorers have the broadest complexity-choice range; the low scorers have the most restricted complexity-choice range; and the high scorers fall in between. That is, the low scorers appear to reject complexity and the high scorers to reject simplicity.

Finally, the patterning of scores on Sym. and Asym. remains unchanged. To summarize, the results for Sym. are somewhat equivocal. Nevertheless, it seems that the medium scorers like the most symmetrical figures, the low scorers like a lesser number, and the high scorers like the least. On Asym., all inter-cluster differences are significant: the high scorers like the largest number of asymmetrical figures; the low scorers like the smallest number; and the medium scorers fall in between these two extremes. Therefore, an arguable hypothesis is that the high scorers react positively to asymmetry and tend to reject symmetry; while the low scorers are inclined to reject asymmetry.

A recapitulation, with a view to both sets of cluster analysis data, follows. When individuals, varying in age from 6 years to adulthood, are subjected to a grouping procedure based on a composite complexity index, the most applicable solution is the 3-group level. Specifically, the individuals are divided into low, medium, and high scoring clusters, with the largest number concentrated in the medium cluster, and lesser dispersions in the two peripheral clusters. Furthermore, the findings reinforce those from the correlational analyses. The most salient implication is that of consistency of preference: a person who scores high on 1 of the 3 principal measures, scores high on the other 2; the medium and low scorers behave in analogous ways.

Interim Conclusions

The unifying idea channelling this research is that the RA scale, purported to reflect preference for simplicity—complexity, can serve as a measure of self-actualizing creativity. The proposal as developed is that preference for complexity implicates an openness to experience, and signifies a willingness to allow complexity into the structuring of one's perceptions, of one's world of meaning. However, as was pointed out in Chapter II, the simplicity—complexity dimension was not implicit in the generation of the figures making up the RA scale; instead, it was an explanation applied to the drawings as a consequence of a factor analysis. Therefore, two other measures, composed of stimuli varying in complexity, were included in the present study. For in order to base research on the RA, it seems necessary to ensure the satisfaction of certain requirements: 1. the scale does indicate preference for complexity; and 2. there is uniformity of complexity preference. It was argued that positive interrelations among the three measures could be construed as evidence that these requirements are fulfilled.

Overall, the results are in agreement with the view formulated. In both the 284 children's and the 64 adults' correlation matrices, the three principal complexity preference scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$, intercorrelate significantly with one another. It is interesting to note the higher absolute values of the correlations in the adults' matrix, suggesting that degree of consistency increases with age. Furthermore, in the principal component factor analysis solutions for the children's and the adults' data, each of these three scores loads highly on the large general factor. Finally, the outcomes of the two cluster analyses, in which the RA, Berlyne's figures, and the Polygon $\bar{X}$ are aligned in low, medium, and high terms, strengthen the picture of consistency.

With the aim of determining whether regular changes occur in complexity preference as a function of age, the total sample of 284 children and 64 adults was further divided into developmental subgroups: 1. the 6- to 7- year-olds; 2. the 8- to 9- year-olds; 3. the 10- to 11- year-olds; 4. the 11- to 12- year-olds; 5. the 13- to 14- year-olds; 6. the 15- to 16- year-olds; 7. the 16- to 18- year-olds; and 8. the adults. As regards the three principal complexity preference scores, it should be mentioned that the highest correlation for both the 284 children and the 64 adults is that between the RA and Berlyne's figures (children, .55; adults, .69). In addition, a positive correlation between the RA and Berlyne's figures emerges for each age subgroup: 1. .29 (nonsignificant); 2. .46 ($p<.01$); 3. .57 ($p<.01$); 4. .56 ($p<.01$); 5. .71 ($p<.01$); 6. .35 (non significant); 7. .60 ($p<.01$); and 8. .69 ($p<.01$). Inspection of the relation by respective subgroup shows that uniformity of complexity preference on these two measures tends to increase with age.

The finding that the correlation between the RA and Berlyne's figures is most persistent bears on another issue: the meaning of complexity. Bieri (1961) has emphasized that it is important to ascertain what properties enter into the definition of complexity. Also relevant to this issue are the varimax factor analysis results for both the children and the adults: the RA and Berlyne's figures are linked and distinguished from the Polygon $\bar{X}$ and Polygon S.D.

So although there are common properties shared by the three sets of complex stimuli (e.g., number of constituent parts), the RA and Berlyne's figures may relate more closely to one another because they incorporate more properties (e.g., heterogeneity of elements, irregularity of arrangement), and thus tap more "kinds" of complexity. For a better understanding of what is involved in consistency of complexity preference, it seems essential to elaborate the definition of complexity in a more precise manner. Berlyne's general approach of investigating the different properties, covered by the term complexity, both separately and conjointly, appears to be profitable.

In addition to the positive correlation between the RA and Berlyne's figures, another outcome arises at each age level: the majority of subjects score within the medium category (10-14) on the Polygon $\bar{X}$. This finding accords with Munsinger and Kessen's contention that there is an age-invariant mid-range of complexity preference. The results of the cluster analyses in which, on the basis of a form of composite complexity index, the largest number of individuals are placed in the medium cluster, can also be interpreted as support for Munsinger and Kessen's position.

The subset analysis by age subgroup shows that the youngest children, the 6- to 7- year-olds, and the adults are inclined to prefer less complexity on the RA and Berlyne's figures. Nevertheless, between the ages of 8 and 18, there is little variation in complexity preference manifest on the three principal scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$. Furthermore, no divergence is disclosed in the age composition of the children's low, medium, and high clusters. Overall, there is more evidence of inter-individual differences than of any developmental trend in amount of complexity preferred.

There is some evidence of sex differences, contingent on age changes, in scores on Sym. and Asym.: relative to males, females at the younger age levels, that is, 6 to 7, 8 to 9, and 11 to 12, like more symmetrical figures; while females at the older age levels, 15 to 16, 16 to 18, and adult, like more asymmetrical figures. With reference to the three principal preference scores, sex differences are revealed only for the 16- to 18- year-old subgroup, in that girls of this age express greater liking for complexity on the RA and Berlyne's figures than do the boys. It was argued that this is perhaps an effect specific to late adolescence.

On the other hand, there is significant variation in the sex composition of the children's clusters: the majority of subjects in the medium scoring group are females; while males predominate in the low and high scoring groups. Such a distribution suggests that it might be useful to further pursue the study of the relation of sex to complexity preference. In Chapter VI, an examination of complexity preference by sex will be feasible when the children are separated into male and female samples for the purpose of investigating the influence of birth order.

The most important finding, in terms of adjudging the RA scale a measure of self-actualizing creativeness, is that in general, subjects demonstrate consistency in their simplicity—complexity preference. In other words, it now seems more reasonable to maintain that simplicity—complexity preference reflects an underlying simplicity—complexity dimension of personality. The research to be described in the remaining two experimental chapters constitutes an attempt to discover some of the ramifications of simplicity—complexity preference, and thus to delineate the personality dimension.

CHAPTER VI.

Complexity Preference and Impression Formation

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Complexity Preference and Impression Formation

Introduction

The study of how people perceive their environments has indicated that an individual interacts with his environment by analyzing it and organizing it into meaningful patterns that are congruent with his own needs and psychological makeup (Mitchell, 1972, p.35).

Barron regards preference for complexity as a manifestation of complexity of personality. In other words, such preference is only one aspect of a more pervasive orientation towards experience. More specifically, Barron explains preference for complexity in terms of a "need for disorder," suggesting that the person, who can accept the "apparent" disorder implicit in complexity, strives to incorporate all the ambiguity and diversity of experience into the organization of his perceptions, of his world of meaning.

Bieri, Bradburn, and Galinsky (1958) maintain that a person tends to prefer those stimuli to which he can respond most effectively. Continuing this line of reasoning, it seems that the person who likes complexity should be better able to structure it. However, the way in which an individual processes or structures a complex visual stimulus cannot be investigated directly. Nevertheless, Luchins (1948) has pointed out that a personality presented for judgment is similar to a complex drawing in that the components can be organized in various ways; a certain range of structurizations can result. Therefore, the impression formation procedure was implemented in order to examine structuring or organizing tendencies. Responses to the impression formation tasks are ordered along a concrete—abstract dimension with reference to criteria of integrative simplicity—

complexity.

The emphasis in this chapter will be upon the relationship between complexity preference and impression formation. Significant intercorrelations would offer support for the contention that simplicity—complexity preference reflects a structural dimension of personality organization. To elucidate, the view underlying the implementation of the Impression Formation Tests is that structure and function are inseparable. Thus, a person's manner of structuring an ambiguous situation is considered to be an outcome of the structure of his personality organization. However, a criticism outlined in Chapter IV should be reiterated here. As noted by Luchins (1948), because of differences in verbal facility, the actual impression and the written impression are not necessarily isomorphically congruent. So perhaps a written impression is not the best index of the structural characteristics of an individual's personality.

Two other sets of results relevant to personality will also be reported in this chapter. Firstly, as Eisenman (1967a, 1967c; Taylor and Eisenman, 1968) has found a sex X birth order interaction such that first-born males like more complexity than later-born males, while later-born females like more complexity than first-born females, the children were divided into male and female samples with the aim of determining whether similar birth order effects would emerge. This separation served the further purpose of making possible a within-sex analysis of complexity preference and impression formation. Secondly, in an attempt to discover some of the personality correlates of simplicity—complexity preference, the teacher of the art class was asked to rate each of the fifth-form art students on 12 semantic differential scales.

Method

Subjects

Children

Essentially, the children's sample is the same as detailed in Chapter V, except that the subjects in the pilot study were not administered the Impression Formation Test. However, because the Impression Formation Test, a film, was shown in a separate session, either after a recess break or on another day, occasionally a student who had been present for the 3 complexity preference tests was absent for the film. So, for the purposes of the analyses in this chapter, the children's sample comprises: 38 8- to 9- year-old subjects and 38 10- to 11- year-old subjects from Chester Road Junior School; 27 first-formers and 28 third-formers from Bede Grammar School; and 29 first-form students, 26 third-form students, 19 fifth-form students, and 28 sixth-form students from Thornhill Comprehensive School. To summarize, 231 male and female children from schools in the City of Sunderland district, County Durham, completed the 3 complexity preference tests and the impression formation task.

Adults

The composition of the adult sample remains unchanged: 64 parents, 31 couples and 2 mothers, of children from Chester Road Junior School and Thornhill Comprehensive School, completed the 3 visual complexity tests and an impression formation task.

A specification of the subject population by developmental subgroup appears in Table 43.

Materials

Complexity Preference Tests

The 3 complexity preference tests were presented to all subjects in the following order: the RA, the Random Polygons, and Berlyne's Figures. As these tests have already been described, the remainder of the method

TABLE 43

Complexity Preference and Impression Formation:
Developmental Divisions

Ages	Number of Subjects
Children	
1. 8- to 9- year-olds	36
2. 10- to 11- year-olds	38
3. 1st form: 11- to 12- year-olds	56
4. 3rd form: 13- to 14- year-olds	54
5. 5th form: 15- to 16- year-olds	19
6. 6th form: 16- to 18- year-olds	28
TOTAL	231
Adults	
Parental sample	64

section will focus on the Impression Formation Tests. Concerning the complexity preference tests, it need only be mentioned here that exactly the same forms and scoring procedures were utilized for the children and the adults.

Impression Formation Tests

The reasons for including the Impression Formation Tests were discussed in Chapter IV. However, the two forms of the test used in the present research, one suitable for children and one for adults, will now be considered in detail.

Children

The type of impression formation task deemed most workable for a sample of children, ranging in age from 8 to 18, was a silent film. The film made was modelled on the one designed by Gollin (1958) for his developmental study. That is, in 6 discrete scenes, a boy of about 14, called John, is shown behaving in diverse fashions. In the first scene (1), John is seen walking away from a house. This scene was inserted so the children could become familiar with the boy they were to observe. The next 2 scenes depict the boy acting in socially approved or "good" ways: (2) John is sitting on a rock. A little boy, aged about 10, rides past on a bicycle, falls off, and appears to have hurt himself. John runs up, helps the boy back onto his bike, and gets him started again. (3) Two small 10- year-old boys are playing catch, when a larger boy, of about 12, breaks up their game by shoving the boy with the ball and snatching the ball from him. John enters and recovers the ball, drives the larger boy away, and returns the ball to the two smaller boys. The subsequent 2 scenes connote socially disapproved or "bad" behavior: (4) A 12- year-old boy is sitting on a rock, eating sweets from a bag. As John comes up, the boy offers him a sweet. However, John knocks the boy's hand, pushes him off the rock, and takes the whole bag. (5) Three small boys are seated on the grass in a backyard reading comic books. There is a pile of comics placed in the centre of the group. When John approaches, the boys offer him a choice of the comics on the ground. But he walks right through the pile of books, scattering them, and pushing the three smaller boys out of his path. The final scene (6), like the first, again shows John alone, strolling across a lawn. Running time for the entire film is approximately two minutes.

Adults

The adults' impression formation task (Schroder, Driver, and Streufert, 1967; Streufert and Driver, 1967) consists of 3 parts. The subject is asked to formulate two impressions: one of a person described by the adjectives intelligent, industrious, impulsive; and the other of a person characterized as critical, stubborn, envious. The 3 adjectives used in the first presentation are somewhat inconsistent with the 3 adjectives used in the second presentation; and the function of the two introductory tasks is to make this inconsistency especially salient. For his last impression, the subject is informed that both sets of adjectives actually apply to one person. Only the final response is scored. Having administered the Impression Formation Test, implementing this particular series of adjectives, once and then again 5 weeks later, Streufert and Driver (1967) report a test-retest reliability of .92 for the final response.

Procedure

Children

The children were tested by class in their usual school room. They saw the film after they had completed the complexity preference tests. As already specified, the Impression Formation Test was administered in a separate session, either after recess or on a different day.

Before the presentation of the film, the following instructions were read to the subjects: "You are now going to see a film about a boy, call him John. The film shows him doing a number of things. He is the boy you will see walking alone in both the first and last scene of the film. He also appears in all the other scenes. Watch the film closely. At the end of the film you will be asked to write about this boy. Note especially the beginning of the film so you will know which boy to watch. Remember I shall want you to write your opinion about the boy, what you think of him, so watch very closely."

The film was run twice in succession, and then the final instructions were read: "Write down what you think of the boy in the film, and the things you saw him do. Please write as much about the boy as you can, that is, pretend you are telling someone about him. Give your opinion of the boy, write what you think about him."

Adults

The mothers and fathers were tested together in their homes. Every couple completed the 3 complexity preference tests. Then there was typically a conversational break, after which the Impression Formation Test was given.

A paper relevant to the two separate sets of adjectives was handed out to each subject. The typed instructions for the first task were: Please write a paragraph describing the impression you form of a person characterized by the following 3 adjectives — intelligent, industrious, impulsive. The instructions for the second task were very similar: Please write a paragraph describing the impression you form of a person characterized by these 3 adjectives — critical, stubborn, envious. A space for writing purposes was left after each set of adjectives.

When both parents had finished these two tasks, the paper for the last combined impression was distributed. The instructions were as follows: For your final impression, imagine that the 6 adjectives already used are characteristic of 1 individual. Please write a paragraph describing what you think such a person would be like. The 6 adjectives were listed, and adequate writing space was provided.

Scoring

Children

As mentioned in Chapter IV, Connolly and Harris (1971) present evidence which suggests that young children do not so much ignore conflict or incongruity, like that depicted in the film, as they just don't recognize it. It seems that an individual must at least discern incongruity before he can integrate it. Therefore, in dealing with children, it was argued that it would be worthwhile to investigate how differentiation of incongruous elements, in this case of both the good and bad film themes, relates to organizational activity. Two description scores were included for this purpose: I. the first is a measure of discrimination or recognition of the two major behavioral themes; and II. the second reflects fineness of discrimination. A more precise designation of the scores follows.

Description Scores

I. Articulation of the good theme/bad theme or both themes.

Description good. Considered to indicate recognition of the good theme and scored if either of two criteria is met: 1. the word good or some equivalent used to characterize John's behavior; or 2. one or two good acts reported.

Description bad. Considered to indicate recognition of the bad theme and scored if either 1. the word bad or some equivalent used to characterize John's behavior; or 2. one or two bad acts reported.

Description both. If a subject's response falls within this category, it is taken to mean that he has recognized both themes. The category is fulfilled if either 1. the words good and bad, or some equivalent of each, present in the subject's view of John's behavior; or 2. some or all of both the good and bad actions reported.

Description good/Description bad: scored 1
Description good and bad: scored 2

II. Description: Incomplete-Complete

The first description score provides a gross measure of differentiation. In contrast, the second score takes into account fineness of discrimination. More specifically, a subject's response is adjudged complete only if the two good actions and the two bad actions performed by John are described; the behavior need not be reported in great detail nor in the right sequence. If the above criterion is not satisfied, a response is rated incomplete.

Description incomplete: scored 1
Description complete: scored 2

The description categories are restricted to the material directly given in perception. The question which arises concerns the various manners in which an individual can organize this material. The relevant scoring categories for the children reflect differences in response as a function of the subject's tendency to invoke factors not apparent in the presented behavior; that is, to go beyond the perceptually given, making inferences and attributing motives and attitudes. Inference was found to occur in three ways, two of the scoring categories being derived from Gollin's (1958) developmental study.

I. Simplified Inference. An individual's response is classified as simplified for one of two possible reasons: 1. The subject mentions some of John's good and bad behavior, and yet proceeds to conclude that John is either all good or all bad. 2. He disregards the good or bad actions (i.e., does not describe them), and infers that John is all bad or all good.

II. Local Inference. This category is fulfilled if in the course of writing his opinion of John, the subject ascribes some motive or introduces some underlying condition for any part (e.g., one good act) of the behavior which has been portrayed (Gollin, 1958).

III. General Inference. General inference is scored if the subject's response comprises an attempt to explain the diversity of behavior, that is, the occurrence of the two major behavioral themes portrayed by John. The subject must account for both the socially approved and the socially disapproved behavior; however, the account need not be good or sufficient (Gollin, 1958).

Simplified inference:	scored 1
Local inference:	scored 2
General inference:	scored 3

In order to determine the reliability of the inferential rating categories, the responses of the first-, third-, and sixth-form children from Thornhill Comprehensive School were scored once by E, and again by another rater. There was 95.2% agreement on the 83 papers processed in this fashion.

Examples of the types of opinion submitted by the children are reproduced verbatim in Appendix II.

Adults

The adults' final responses were sorted into two categories, concrete or abstract, according to their degree of integrative complexity (Schroder, Driver, and Streufert, 1967; Streufert and Driver, 1967). To qualify as abstract, a response had to be "a meaningful rounded person perception": it had both to implicate the positive and negative aspects of the individual's personality, and also to suggest underlying motivational factors. That is, the subject goes beyond the material given and explains the diversity of the other person's behavior with reference to inferred "internal processes." Any characterization which did not meet this criterion was classified as concrete. More specifically, the concrete category included physical descriptions, responses which omitted or denied the incongruous elements, and responses which merely enumerated the various traits.

Concrete: scored 1

Abstract: scored 2

As a measure of the reliability of the scoring categories, all 64 responses were rated by E and subsequently by another person. There was concurrence on 61 (95.3%) of the 64 protocols. The 3 papers over which disagreement arose were changed from an abstract to a concrete rating.

Examples of the concrete and abstract responses submitted by the adults appear in Appendix II.

Because different forms of the impression formation task were used for the children and the adults, their respective results will be presented separately.

Results and Discussion

Before reporting the children's data, the hypotheses pertinent to developmental changes in impression formation, which were discussed in Chapter IV, will be briefly reviewed. Both Gollin (1958) and Wolfe (1963), implementing the film procedure and the local and general inference scoring criteria, found that the incidence of inferential activity increased with age. Going beyond the perceptually given, in terms of these two categories of response, can be considered a step in the direction of abstractness. And the general inference category, with its stress on the integration of the good and bad film themes, approximates the adults' abstract category as described. Therefore, it would seem that abstractness becomes more prevalent as a function of age. Regarding both complexity preference and abstractness of impression formation as reflections of complexity of personality structure, it has been argued that the two sorts of measures should correlate. However, because of the anticipated developmental trend in impression formation, it may be that the correlations between the two will be greater with older groups of children.

In summary, the reporting of the children's results will be oriented towards the following three questions:

1. Does impression formation ability improve with age?
2. Does this ability show any relation to complexity preference?
3. Will the relation between impression formation and complexity preference increase with age?

Intercorrelation Data for Children

The names and identifying numbers of the 11 variables included in the data analysis are itemized in Table 44. By means of computer, the Pearson product-moment correlation coefficient was calculated between each score and every other score.

The correlation matrix for the 231 children is presented in Table 45.

Although the emphasis in this chapter will be upon the impression formation outcomes, the consideration of the conjoined complexity preference and impression formation results will inevitably involve some repetition of the material in Chapter V. However, it is interesting to note that in spite of the changes in the composition of the children's sample, the pattern of correlations among the first 8 variables corres-

TABLE 44

Complexity Preference and Impression Formation:
Developmental Study of 231 Children

Variables Included in the Data Analysis with
Identifying Numbers, Means, and Standard
Deviations for each of the Measures

			mean	standard deviation
1.	age		12.29	2.55
2.	sex	MALE 1 FEMALE 2	1.55	.50
3.	RA		28.60	10.68
4.	Berlyne's figures		5.28	2.64
5.	$\bar{X}$		12.65	2.55
6.	S.D.		5.99	1.35
7.	sym.		2.12	.80
8.	asym.		9.41	3.07
9.	description:	good or bad 1 good and bad 2	1.98	.13
10.	description:	incomplete 1 complete 2	1.70	.46
11.	inference:	simplified 1 local 2 general 3	1.19	1.29

TABLE 45

Complexity Preference and Impression Formation:

Correlation Matrix for 231 Children

	1	2	3	4	5	6	7	8	9	10	11
1. age	1.00										
2. sex MALE 1, FEMALE 2	.04	1.00									
3. RA	.11	.00	1.00								
4. Berlyne's figures	-.80	-.03	.55**	1.00							
5. $\bar{X}$	-.04	.09	.30**	.24*	1.00						
6. S.D.	-.08	.16	.05	.16	.55**	1.00					
7. sym.	-.27**	.16	-.30**	-.22*	-.14	.25*	1.00				
8. asym.	-.28**	.15	.19	.29**	.27**	.42**	.04	1.00			
9. one theme or both themes	.11	.01	.04	-.05	.05	.02	.02	.02	1.00		
10. incomplete-complete	.27**	.05	.17	.03	.06	.04	-.14	-.02	.20*	1.00	
11. inference: simplified 1, local 2, general 3	.59**	.07	.04	-.05	.03	-.07	-.19	-.11	.10	.05	1.00

** significant at .01 level .25

* significant at .05 level .20

ponds to that which emerged with the 284 children.

I. Age

There is a significant negative correlation ($p<.01$) between age and both Sym. and Asym. That is, as children become older, they become increasingly selective in their choice of symmetrical and asymmetrical figures.

The first description score, which indicates recognition of the two major film themes, shows a nonsignificant positive correlation (.11) to age. However, the second description score, which reflects fineness of discrimination, shows a significant positive correlation (.27 $p<.01$) to age. There is a high positive correlation of .59 ($p<.01$) between age and the use of inference. In other words, impression formation ability does improve with age: as children become older, they are more likely to try to account for the occurrence of both the good and bad actions performed by John.

II. Sex

No significant correlation is disclosed between sex and any of the other variables.

III. Complexity Preference

There is a significant positive correlation of .55 ($p<.01$) between the RA and Berlyne's figures; a significant positive correlation of .30 ($p<.01$) between the RA and the Polygon $\bar{X}$; and a significant positive correlation of .24 ($p<.05$) between Berlyne's figures and the Polygon $\bar{X}$. In addition, the Polygon $\bar{X}$ was positively related (.55 $p<.01$) to the Polygon S.D.

IV. Symmetry—Asymmetry

As can be seen from Table 44, the mean Sym. score is 2.12 out of a possible 3. Even though the majority of subjects tend to like the symmetrical figures, there is a significant negative correlation between Sym.

and preference for complexity on the RA ($p<.01$) and Berlyne's figures ($p<.05$). Asym. is positively related to preference for complexity on Berlyne's figures ($p<.01$) and the Polygon $\bar{X}$ ($p<.01$). Yet the correlation of .04 between Sym. and Asym. suggests that the two are independent of one another; and in fact, the Polygon S.D. is positively related to both Sym. ($p<.05$) and Asym. ($p<.01$).

V. Impression Formation

There is no significant correlation between any of the complexity preference scores and any of the impression formation scores.

A positive correlation of .20 ($p<.05$) is revealed between the two description scores. Because articulation of the two major film themes is the first requirement for a complete rating, this outcome is not unexpected. However, the small size of the correlation can be construed to indicate that differentiation of the major themes is a necessary but not sufficient condition for more precise differentiation.

Factor Analysis Data for Children

In a factor analysis performed on the 11 variables, 5 principal components, which accounted for 70.7% of the total variance, were extracted from the intercorrelation matrix and rotated to the varimax criterion. Interpretation of the factors is based on loadings of .30 and upwards.

Principal Component Factor Analysis

The unrotated factor loadings together with the percentage of total and common variance accounted for by each factor are set out in Table 46.

It seems worthwhile to examine the first component which is usually a general factor. Factor I accounts for 29.4% of the common variance, and as was found in the principal component solution for the 284 children

TABLE 46

Complexity Preference and Impression Formation:

Principal Components Factor Analysis for 231 Children

	I	II	III	IV	V
1. age	-.23	.77	.33	-.18	-.02
2. sex	.18	-.07	.53	-.18	.73
3. RA	.59	.46	-.34	.07	.21
4. Berlyne's figures	.65	.22	-.43	-.03	.18
5. $\bar{X}$	.71	.10	.22	-.14	-.39
6. S.D.	.65	-.24	.48	-.11	-.29
7. sym.	-.10	-.64	.42	.08	.09
8. asym.	.67	-.24	.08	-.01	.11
9. one theme or both	.03	.22	.35	.67	-.16
10. incomplete-complete	.11	.43	.22	.59	.17
11. inference	-.16	.64	.37	-.41	-.09
Percentage of Total Variance	20.8	18.5	13.2	9.8	8.4
Total variance extracted, 70.7%					
Percentage of Common Variance	29.4	26.2	18.7	13.8	11.9 = 100%

in Chapter V, all the complexity preference scores load highly on it: the RA .59; Berlyne's figures .65; the Polygon $\bar{X}$ .71; the Polygon S.D. .65; and Asym. also contributes a high loading of .67. But the finding of interest for the present chapter is that the 3 impression formation scores load to a negligible degree on the general complexity factor.

Varimax Rotation Factor Analysis

Table 47 comprises the factor loadings of the 5 rotated factors and the percentage of total and common variance accounted for by each one.

Factor I

Score	Loading
Polygon $\bar{X}$	.81
Polygon S.D.	.88
Asym.	.53

This factor, which accounts for 23.5% of the common variance, is a complexity factor. It parallels the first complexity factor which emerged in the varimax rotation solution for the 284 children's data in Chapter V.

Factor II

Score	Loading
Age	.86
Sym.	-.37
Asym.	-.31
Inference	.86

Factor II, accounting for 22.8% of the identified variance, is an age factor. Equally high positive loadings on this factor are contributed by the age and inference variables. Thus, it would seem that increasing age is closely associated with increment in impression formation ability. Factor II also shows that with development, children are dis-

TABLE 47

Complexity Preference and Impression Formation:
Varimax Rotation Factor Analysis for 231 Children

	I	II	III	IV	V
1. age	-.11	.86	-.05	.20	.03
2. sex	.08	.09	.03	.02	.93
3. RA	.12	.04	-.83	.13	.04
4. Berlyne's figures	.20	-.14	-.79	-.07	.03
5. $\bar{X}$	.81	.11	-.24	.03	-.10
6. S.D.	.88	-.06	.09	.03	.13
7. sym.	.15	-.37	.59	.00	.32
8. asym.	.53	-.31	-.26	-.02	.27
9. one theme or both	.10	.02	.12	.78	-.10
10. incomplete-complete	-.06	.12	-.20	.75	.12
11. inference	.05	.86	.01	-.03	.06
Percentage of Total Variance	16.6	16.1	16.8	11.3	9.9
Total variance extracted, 70.7%					
Percentage of Common Variance	23.5	22.8	23.8	15.9	14.0 = 100%

posed to like fewer of both the symmetrical and the asymmetrical figures.

Factor III

Score	Loading
RA	-.83
Berlyne's figures	-.79
Sym.	.59

This factor is a second complexity factor accounting for 23.8% of the identified variance. The features it shares with the 284 children's second complexity factor are high loadings from the RA and Berlyne's figures, and a smaller loading in the opposite direction from Sym.

Factor IV

Score	Loading
One theme or both themes	.78
Incomplete-complete	.75

Factor IV, which accounts for 15.9% of the common variance, is plainly a description factor. The description scores are fundamentally connected in the sense that an individual must distinguish the two major film themes before he can differentiate all the good and bad acts performed by John.

Factor V

Score	Loading
Sex	.93
Sym.	.32

Factor V, accounting for 14% of the common variance, is a sex-typing factor. It suggests that females tend to like more symmetrical figures. As Asym. loads .27 on this factor, there is some intimation that females also like more asymmetrical figures.

Age Division

The correlational results indicate that with increasing age, children are more likely to give complete descriptions, that is, to make fine discriminations, and to incorporate inferential material in their responses to the impression formation task. With a view to determining whether the developmental progress is systematic, the total sample of 231 children was broken down into age subgroups and a subset analysis was carried out. The subset method was explicitly described in Chapter V. Nevertheless, to review briefly, the first part of the subset method involves an investigation of the differences between each subgroup and the total population on all variables; while in the second part, the differences among the subgroups are considered.

Subset Analysis

Part I: Each Age Subgroup Compared with the Total Population

The outcomes of Part I of the subset analysis for the various developmental levels 1. the 8- to 9- year-olds, 2. the 10- to 11- year-olds, 3. the 11- to 12- year-olds, 4. the 13- to 14- year-olds, 5. the 15- to 16- year-olds, and 6. the 16- to 18- year-olds appear in Tables 48, 49, 50, 51, 52, and 53 respectively.

The members of the 8- to 9- year-old subgroup obtain a significantly lower ($p<.05$) Polygon $\bar{X}$ than the total population. They also react positively to a significantly larger ($p<.01$) number of the symmetrical figures. With regard to impression formation, the group mean on the first description score is 1.94 out of a possible 2. In other words, the majority of these subjects differentiate the two major film themes. However, they submit significantly fewer ($p<.05$) complete descriptions than the total population; and they are less likely ($p<.01$) to employ inference.

In comparison with the total population, the 10- to 11- year-olds demonstrate greater breadth of complexity choice as evidenced by their significantly higher ($p<.05$) Polygon S.D. They are inclined to like significantly more ($p<.01$) of the asymmetrical figures. The subgroup

TABLE 48

Subset Analysis: 8- to 9- year-old Group Compared with Total Sample of Children
(N=231)

		P.M.	G.M.	S.D.	T-value	F-ratio
1.	age	12.29	8.72	.51	-42.32**	25.39**
2.	sex	1.55	1.50	.50	-.55	.99
3.	RA	28.60	27.78	9.30	-.53	1.32
4.	Berlyne's figures	5.28	5.69	2.53	.99	1.09
5.	$\bar{X}$	12.65	11.88	2.22	-2.07*	1.32
6.	S.D.	5.99	5.86	1.84	-.69	1.29
7.	sym.	2.12	2.47	.55	3.86**	2.10**
8.	asym.	9.41	10.28	2.89	1.81	1.13
9.	one theme or both themes	1.98	1.94	.23	-1.00	.32
10.	incomplete-complete	1.70	1.50	.50	-2.42*	.84
11.	inference	1.19	.11	.46	-14.14**	7.91**

P.M. = population mean; i.e. mean for total sample
G.M. = group mean
S.D. = group standard deviation
\+ = G.M. higher than P.M.
\- = G.M. lower than P.M.
** = significant at .01 level
* = significant at .05 level

TABLE 49

Subset Analysis: 10- to 11- year-old Group Compared with Total Sample of Children

(N=231)

		P.M.	G.M.	S.D.	T-value	F-ratio
1.	age	12.29	10.46	.48	-23.61**	28.44**
2.	sex	1.55	1.66	.47	1.46	1.10
3.	RA	28.60	29.18	7.98	.45	1.79*
4.	Berlyne's figures	5.28	5.76	2.87	1.04	.85
5.	$\overline{X}$	12.65	12.99	1.52	1.38	2.81**
6.	S.D.	5.99	6.22	.61	2.30*	4.83**
7.	sym.	2.12	2.24	.67	1.11	1.44
8.	asym.	9.14	11.47	2.58	4.93**	1.41
9.	one theme or both	1.98	2.00			
10.	incomplete-complete	1.70	1.58	.49	-1.53	.86
11.	inference	1.19	.55	.91	-4.33**	2.01**

mean on the first description score is 2: all subjects at this age level distinguish the good and the bad behavioral themes. On the incomplete-complete description variable, these subjects score lower than the total population, though not significantly so; they score significantly lower ($p<.01$) on the inference variable.

The 11- to 12- year-old subgroup has both a significantly higher ($p<.05$) Polygon $\bar{X}$ and a significantly higher ($p<.05$) Polygon S.D. than the total sample of children. The group mean of 1.98 on the first description score denotes that most of the children of this age articulate the good and the bad film themes. Again, like the two younger subgroups, the 11- to 12- year-olds make less frequent ($p<.05$) use of inference.

The 13- to 14- year-old subgroup contains a smaller proportion ($p<.01$) of females than does the total population. As the group mean on the first description score is 1.98, it seems that the majority of these subjects also differentiate the two major film themes. However, there is a noteworthy change in that the members of this subgroup score significantly higher ($p<.01$) than the total population on the inference variable.

All the 15- to 16- year-olds distinguish the two major behavioral themes depicted in the film. In addition, these subjects show a significant tendency to formulate complete descriptions ($p<.05$) and to include inferential material in their responses ($p<.01$).

Corresponding to the outcome for the 15- to 16- year-olds, every one of the 16- to 18- year-olds articulates the good and the bad film themes. Similarly, the responses of these subjects are more likely to meet the complete criterion ($p<.01$) and to evince inferential activity ($p<.01$) than are those of the total population.

Before proceeding to the findings of Part II of the subset analysis,

TABLE 50

Subset Analysis: 11- to 12- year-old Group Compared with Total Sample of Children

(N=231)

		P.M.	G.M.	S.D.	T-value	F-ratio
1.	age	12.29	11.40	.38	-17.40**	44.36**
2.	sex	1.55	1.55	.50	.12	1.00
3.	RA	28.60	27.20	10.51	-1.00	1.03
4.	Berlyne's figures	5.28	5.13	2.67	-.43	.98
5.	$\bar{X}$	12.65	13.27	1.98	2.36*	1.67*
6.	S.D.	5.99	6.23	.88	2.03*	2.32**
7.	sym.	2.12	2.20	.67	.89	1.44
8.	asym.	9.41	9.11	2.30	-.97	1.78**
9.	one theme or both	1.98	1.98	.13	-.03	.97
10.	incomplete-complete	1.70	1.71	.45	.22	1.03
11.	inference	1.19	.84	1.19	-2.21*	1.17

TABLE 51

Subset Analysis: 13- to 14- year-old Group Compared with Total Sample of Children (N=231)

		P.M.	G.M.	S.D.	T-value	F-ratio
1.	age	12.92	13.48	.41	21.43**	39.10**
2.	sex	1.55	1.37	.48	-2.66**	1.06
3.	RA	28.60	27.04	12.36	-.93	.75
4.	Berlyne's figures	5.28	5.11	2.53	-.48	1.09
5.	$\bar{X}$	12.65	12.69	2.41	.13	1.13
6.	S.D.	5.99	5.89	1.45	-.52	.86
7.	sym.	2.12	1.94	.89	-1.42	.81
8.	asym.	9.41	8.78	2.55	-1.81	1.45
9.	one theme or both	1.98	1.98	.14	-.07	.94
10.	incomplete-complete	1.70	1.72	.45	.34	1.04
11.	inference	1.19	1.76	1.19	3.53**	1.18

TABLE 52

Subset Analysis: 15- to 16- year-old Group Compared with Total Sample of Children
(N=231)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. age	12.29	15.37	.72	18.56**	12.46**
2. sex	1.55	1.68	.47	1.30	1.15
3. RA	28.60	32.95	9.51	1.99	1.26
4. Berlyne's figures	5.28	4.42	2.06	-1.81	1.64
5. $\overline{X}$	12.65	12.90	3.67	.30	.48
6. S.D.	5.99	5.64	2.04	-.77	.43
7. sym.	2.12	1.79	.77	-1.86	1.09
8. asym.	9.41	8.26	3.97	-1.26	.60
9. one theme or both	1.98	2.00			
10. incomplete-complete	1.70	1.90	.31	2.75*	2.22*
11. inference	1.19	2.37	.81	6.35**	2.54*

TABLE 53

Subset Analysis: 16- to 18- year-old Group Compared with Total Sample of Children

(N=231)

	P.M.	G.M.	S.D.	T-value	F-ratio
1. age	12.29	16.77	.59	40.14**	18.68**
2. sex	1.55	1.68	.47	1.51	1.14
3. RA	28.60	31.71	11.57	1.43	.85
4. Berlyne's figures	5.28	5.29	2.75	.02	.92
5. $\overline{X}$	12.65	11.67	3.68	-1.41	.48
6. S.D.	5.99	5.97	1.84	-.14	.47
7. sym.	2.12	1.89	1.05	-1.13	.58
8. asym.	9.41	8.07	3.71	-1.90	.68
9. one theme or both	1.98	2.00			
10. incomplete-complete	1.70	1.93	.26	4.67**	3.16**
11. inference	1.19	2.25	1.15	4.86**	1.25

two points should be made on the basis of the Part I results. With reference to complexity preference, in the present subset analysis as contrasted with the one reported in Chapter V, the data of the lower scoring subgroups, that is, the 6- to 7- year-olds and the adults, were not involved in the computation of the population means. Thus, it can be seen, in the course of comparing each subgroup with the total population, that between the ages of 8 and 18, there is little variation in complexity preference manifest on the 3 principal scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$. More specifically, only two deviations arise: the 8- to 9- year-olds have a significantly lower Polygon $\bar{X}$ than the total population; and the 11- to 12- year-olds have a significantly higher Polygon $\bar{X}$.

On the other hand, there do appear to be systematic increments with age on 2 of the variables pertaining to impression formation: the second description score, which reflects fineness of discrimination, and the inference score. However, as was emphasized in Chapter V, if there is in fact a regular developmental trend, all older subgroups should score higher than a younger subgroup on these 2 variables. The second part of the subset analysis, in which a T-value is calculated between the mean of each subgroup and every other subgroup on all variables, serves to settle this type of issue.

Part II: <u>Each Age Subgroup Compared with Every Other Subgroup</u>

The data relevant to the subgroup differences on the RA, Berlyne's figures, the Polygon $\bar{X}$, the Polygon S.D., Sym., Asym., Description: One theme or both themes, Description: Incomplete-complete, and Inference are detailed in Tables 54 A, B, C, D, E, F, G, H, and I respectively.

<u>RA</u>

Only two significant inter-group differences are disclosed on the

TABLE 54A

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Revised Art Scale

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	.69	.00				
3. 11- to 12- year-olds	-.27	-1.03	.00			
4. 13- to 14- year-olds	-.32	-1.00	-.07	.00		
5. 15- to 16- year-olds	1.89	1.45	2.17*	2.10*	.00	
6. 16- to 18- year-olds	1.44	.98	1.71	1.67	-.39	.00

+ = higher than

− = lower than

** = significant at .01 level

* = significant at .05 level

F = nonsignificant.

NOTE: F was calculated for each measure and its significance level is reported in the table relevant to the measure. However, even if F was not significant, T-values were computed and the results were discussed in the text for purposes of theoretical interest.

RA: the 15- to 16- year-old subjects express greater preference for complexity than both the 11- to 12- year-old and the 13- to 14- year-old subjects.

Berlyne's figures

No significant divergence is revealed in complexity preference on Berlyne's figures.

Polygon $\bar{\bar{X}}$

The 10- to 11- year-old subgroup and the 11- to 12- year-old subgroup obtain significantly higher Polygon $\bar{\bar{X}}$ scores than the 8- to 9- year-old subgroup. The 16- to 18- year-olds score significantly lower than the 11- to 12- year-olds on this measure.

Polygon S.D.

The subgroups do not deviate significantly from one another on the Polygon S.D.

Sym.

The 11- to 12- year-olds, the 13- to 14- year-olds, the 15- to 16- year-olds, and the 16- to 18- year-olds like significantly fewer symmetrical figures than do the 8- to 9- year-olds. The 15- to 16- year-old subjects also like a significantly smaller number of these figures than both the 10- to 11- year-old subjects and the 11- to 12- year-old subjects.

Asym.

The 11- to 12- year-old, the 13- to 14- year-old, and the 16- to 18- year-old subgroups express preference for a significantly smaller number of asymmetrical figures than the 8- to 9- year-old subgroup. The 11- to 12- year-olds, the 13- to 14- year-olds, the 15- to 16- year-olds, and the 16- to 18- year-olds like significantly fewer of these figures than the 10- to 11- year-olds.

TABLE 54B

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Berlyne's Figures

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	.11	.00				
3. 11- to 12- year-olds	-1.02	-1.08	.00			
4. 13- to 14- year-olds	-1.06	-1.11	-.03	.00		
5. 15- to 16- year-olds	-1.97	-1.98	-1.17	-1.16	.00	
6. 16- to 18- year-olds	-.60	-.67	.25	.28	1.20	.00

F — NONSIGNIFICANT

TABLE 54C

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Polygon $\bar{X}$

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	2.45*	.00				
3. 11- to 12- year-olds	3.01**	.77	.00			
4. 13- to 14- year-olds	1.62	-.72	-1.36	.00		
5. 15- to 16- year-olds	1.08	-.09	-.40	.23	.00	
6. 16- to 18- year-olds	-.27	-1.76	-2.12*	-1.31	-1.11	.00

F — SIGNIFICANT AT .05 LEVEL

TABLE 54D

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Polygon S.D.

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	1.63	.00				
3. 11- to 12- year-olds	1.61	.08	.00			
4. 13- to 14- year-olds	.12	-1.48	-1.47	.00		
5. 15- to 16- year-olds	-.43	-1.19	-1.21	-.49	.00	
6. 16- to 18- year-olds	-.09	-1.03	-1.04	-.17	.31	.00

F — NON SIGNIFICANT

TABLE 54E

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Number of Symmetrical Figures Liked (Sym.)

	Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1.	8- to 9- year-olds	.00					
2.	10- to 11- year-olds	-1.64	.00				
3.	11- to 12- year-olds	-2.13*	-.29	.00			
4.	13- to 14- year-olds	-3.43**	-1.78	-1.66	.00		
5.	15- to 16- year-olds	-3.36**	-2.12*	-2.02*	-.71	.00	
6.	16- to 18- year-olds	-2.61*	-1.50	-1.38	-.22	.38	.00

F — SIGNIFICANT AT .01 LEVEL

TABLE 54F

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Number of Asymmetrical Figures Liked (Asym.)

	Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1.	8- to 9- year-olds	.00					
2.	10- to 11- year-olds	1.85	.00				
3.	11- to 12- year-olds	-2.02*	-4.50**	.00			
4.	13- to 14- year-olds	-2.49*	-4.90**	-.70	.00		
5.	15- to 16- year-olds	-1.91	-3.12**	-.86	-.51	.00	
6.	16- to 18- year-olds	-2.55*	-4.09**	-1.33	-.89	-.16	.00

F — SIGNIFICANT AT .001 LEVEL

TABLE 54G

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Description: One theme or both themes

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	1.43	.00				
3. 11- to 12- year-olds	.88	-1.00	.00			
4. 13- to 14- year-olds	.86	-1.00	-.03	.00		
5. 15- to 16- year-olds	1.43	.00	1.00	1.00	.00	
6. 16- to 18- year-olds	1.43	.00	1.00	1.00	.00	.00

F — NON SIGNIFICANT

TABLE 54H

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Description: Incomplete-complete

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	.67	.00				
3. 11- to 12- year-olds	2.06*	1.33	.00			
4. 13- to 14- year-olds	2.13*	1.41	.09	.00		
5. 15- to 16- year-olds	3.55**	2.90**	1.91	1.82	.00	
6. 16- to 18- year-olds	4.37**	3.68**	2.73**	2.61*	.39	.00

F — SIGNIFICANT AT .001 LEVEL

TABLE 54I

Complexity Preference and Impression Formation in Total Sample of Children (N=231): T-values between the Mean of Each Group and Every Other Group

Inference

Groups	1 N=36	2 N=38	3 N=56	4 N=54	5 N=19	6 N=28
1. 8- to 9- year-olds	.00					
2. 10- to 11- year-olds	2.62*	.00				
3. 11- to 12- year-olds	4.08**	1.31	.00			
4. 13- to 14- year-olds	9.14**	5.46**	4.02**	.00		
5. 15- to 16- year-olds	10.97**	7.50**	6.13**	2.43*	.00	
6. 16- to 18- year-olds	9.10**	6.34**	5.15**	1.78	-.40	.00

F — SIGNIFICANT AT .001 LEVEL

Description: One theme or both themes

No significant inter-group differences emerge on the first description score.

Description: Incomplete-complete

The 11- to 12- year-olds, the 13- to 14- year-olds, the 15- to 16- year-olds, and the 16- to 18- year-olds submit a significantly larger number of complete descriptions than do the 8- to 9- year-olds. The 15- to 16- year-olds and the 16- to 18- year-olds score significantly higher than the 10- to 11- year-olds on this second description variable. Finally, the 16- to 18- year-old subjects also score significantly higher than both the 11- to 12- year-old and 13- to 14- year-old subjects.

Disregarding significance levels, the interesting feature of the patterning of group deviations is that all older subgroups score higher than a younger subgroup. Therefore, the configuration of scores by age is consistent with a developmental trend.

Inference

The 10- to 11- year-olds, the 11- to 12- year-olds, the 13- to 14- year-olds, the 15- to 16- year-olds, and the 16- to 18- year-olds are significantly more likely to include inference in their responses to the impression formation task than are the 8- to 9- year-olds. In other words, all older subgroups score higher thán the youngest subgroup on the inference variable. Similarly, all older subgroups score higher than the 10- to 11- year-olds; and with the exception of the 11- to 12- year-olds, significantly higher. Again, all older subgroups score significantly higher than the 11- to 12- year-olds. The 15- to 16- year-olds make significantly greater use of inference than do the 13- to 14- year-olds. The 16- to 18- year-olds also score higher than the 13- to 14- year-old subgroup, but not significantly so. The 16- to 18- year-old subjects score marginally lower than the 15- to 16- year-olds. Only this one nonsignificant difference is not in the expected direction.

The developmental trend on the inference variable is more clear-cut than the developmental trend on the incomplete-complete description variable in that almost all the inter-group deviations are significant. It appears that inferential activity increases steadily to age 15-16 and then remains fairly stable through age 18. Table 55 comprises a breakdown of the various subgroups according to the inference scoring categories, and thus provides a more exact picture of the changes with age in inferential behavior.

Inspection of Table 55 shows that generally, with development, there is a reduction in the number of children who confine their responses to a description of the actions portrayed by John in the film. Similarly, although none of the 8- to 9- year-olds write a response classified as simplified, from 10-11 onwards the incidence of simplified inference decreases quite systematically with age. That is, as children become older, they are less likely to use inference in such a manner as to negate the conflict implicit in John's behavior. In contrast, the percentage of subjects' responses falling within the local inference category tends to rise to age 15-16; however, there is a decline for the 16- to 18- year-olds. With respect to general inference, there is a regular increment by developmental subgroup in the percentage of subjects satisfying this scoring criterion. Overall, a tenable proposition seems to be that the implementation of inference, in terms of these combined categories, increases to age 15-16, at which point, it levels off.

General Summary

The findings of Part II of the subset analysis corroborate the two points raised after the presentation of the Part I results. First of

TABLE 55

Incidence of the Categories of Inferential Activity

by Age Subgroup

Subgroups	Description Only	Inference: Simplified	Inference: Local	Inference: General		
1. 8- to 9- year-olds	34	0	2	0	= Total:	36Ss
	94.4%		5.6%		=	100%
2. 10- to 11- year-olds	26	5	5	2	= Total:	38Ss
	68.4%	13.2%	13.2%	5.2%	=	100%
3. 11- to 12- year-olds	35	5	6	10	= Total:	56Ss
	62.5%	8.9%	10.7%	17.9%	=	100%
4. 13- to 14- year-olds	13	7	14	20	= Total:	54Ss
	24.1%	13.0%	25.9%	37.0%	=	100%
5. 15- to 16- year-olds	1	1	7	10	= Total:	19Ss
	5.3%	5.3%	36.8%	52.6%	=	100%
6. 16- to 18- year-olds	5	1	4	18	= Total:	28Ss
	17.8%	3.6%	14.3%	64.3%	=	100%

all, between the ages 8 and 18, there is no developmental trend discernible in complexity preference. Secondly, there is evidence of age-related changes on 2 of the impression formation variables. Specifically, there is some intimation of a developmental trend in scores on the incomplete-complete description variable such that as children become older they are more inclined to make fine discriminations. At the same time, the data evince a definite developmental trend on the inference variable; and as can be seen from Table 55, the increase with age is due to the greater number of subjects meeting the local and general inference criteria.

Correlational Analysis by Age Subgroup

In interpreting the children's data, the intention has been to answer the three questions posed at the beginning of the Results section:

1. Does impression formation ability improve with age?
2. Does this ability show any relation to complexity preference?
3. Will the relation between impression formation and complexity preference increase with age?

In the strictest sense, impression formation ability refers to the inference score, which is an index of integration. With reference to the first question, the correlation matrix for the 231 children reveals a significant positive correlation of .59 ($p<.01$) between age and the inference variable. However, there is another finding of interest: a significant positive correlation of .27 ($p<.01$) between age and the incomplete-complete description variable, which implicates the ability to differentiate precisely. The subset analysis reinforces the picture of developmental progression on these 2 impression formation variables.

Concerning the second question, there is no significant correlation disclosed between any of the complexity preference scores and any of the impression formation scores for the 231 children. Nevertheless, because of the developmental changes on the incomplete-complete description variable and on the inference variable, it seems appropriate to ask whether the low-order relations between complexity preference and impression formation hold for all age levels. Or to rephrase it in the form of the third question above: Will positive relations emerge with increasing age? So the examination of the correlational results by developmental subgroup will be addressed towards the third question.

For the purposes of the present chapter, the correlations of greatest relevance are those between the 3 principal complexity preference measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$, and the inference variable. The intercorrelations among the complexity preference measures for the various age levels were thoroughly considered in Chapter V. Consequently, only the correlations of the 3 impression formation scores with the complexity preference scores, and the correlations among the 3 impression formation scores are reproduced in the tables. Tables 56, 57, 58, 59, 60, and 61 comprise the data for the respective age subgroups: 1. the 8- to 9- year-olds, 2. the 10- to 11- year-olds, 3. the 11- to 12- year-olds, 4. the 13- to 14- year-olds, 5. the 15- to 16- year-olds, and 6. the 16- to 18- year-olds.

For the 8- to 9- year-old subgroup, Asym. is significantly correlated ($p<.05$) with the second description variable; that is, children who like a larger number of the asymmetrical figures tend to submit complete responses. At this age level, preference for complexity on Berlyne's figures is positively correlated ($p<.05$) with the inference variable.

As all members of the 10- to 11- year-old subgroup distinguish the two major film themes, they all score 2 on the first description variable (see Table 49). In such instances of zero variance, the correlation coefficient is indeterminate and the value .00 is inserted in the computer outprint. No significant correlation arises between the 2 impression formation scores, description: incomplete-complete and inference, which do show inter-subject variation, nor between these scores and complexity preference.

For the 11- to 12- year-old subjects, the Polygon $\bar{X}$ is positively related ($p<.01$) to the first description variable. In other words, children with high Polygon $\bar{X}$ scores are more likely to articulate the good and the bad film themes. At this age level, the incomplete-complete description variable is negatively related ($p<.05$) to the inference variable.

For the 13- to 14- year-old subgroup, there is a significant positive correlation ($p<.05$) between sex and the inference score, indicating that girls of this age are more likely to include inference in their impression formations than are the boys. There is a significant negative correlation ($p<.05$) between the incomplete-complete description score and the use of inference.

All the 15- to 16- year-olds obtain a 2 on the first description variable (see Table 52). The 2 impression formation variables on which there are differences among the subjects, description: incomplete-complete and inference, do not relate to any of the complexity preference variables, nor to each other.

All the 16- to 18- year-old subjects also score 2 on the first description variable (see Table 53). At this age level, there is a significant positive correlation ($p<.05$) between the RA and the second description variable: individuals who prefer complexity on the former measure tend to write complete responses.

Summary of Findings

As already mentioned, the intercorrelation data for the entire children's sample of 231 subjects offer no support for the predicted link

TABLE 56

8- to 9- year-olds (N=36):

Correlations of 3 Impression

Formation Scores with All Variables

		8	9	10
1.	sex	.24	.00	-.24
2.	RA	-.16	.16	.28
3.	Berlyne's figures	-.13	.08	.37*
4.	$\bar{X}$	-.19	.11	.11
5.	S.D.	-.03	.18	.21
6.	sym.	.21	-.25	-.21
7.	asym.	-.02	.33*	.19
8.	one theme or both themes	1.00	.24	.06
9.	incomplete-complete		1.00	.24
10.	inference			1.00

** significant at .01 level .42

* significant at .05 level .33

TABLE 57

10- to 11- year-olds (N=38):

Correlations of 3 Impression

Formation Scores with All Variables

		8	9	10
1.	sex	.00	-.05	.19
2.	RA	.00	.02	-.12
3.	Berlyne's figures	.00	.12	.07
4.	$\bar{X}$	.00	-.14	.20
5.	S.D.	.00	-.28	-.09
6.	sym.	.00	-.02	-.09
7.	asym.	.00	-.09	.06
8.	one theme or both	1.00	.00	.00
9.	incomplete-complete		1.00	-.19
10.	inference			1.00

** significant at .01 level .42

* significant at .05 level .33

TABLE 58

11- to 12- year-olds (N=56):

Correlations of 3 Impression

Formation Scores with All Variables

		8	9	10
1.	sex	-.12	.23	-.03
2.	RA	.18	.06	-.09
3.	Berlyne's figures	.01	-.09	-.09
4.	$\bar{X}$	.37**	.12	.08
5.	S.D.	.11	.22	-.12
6.	sym.	-.16	.01	-.01
7.	asym.	.06	.12	.08
8.	one theme or both	1.00	.21	.09
9.	incomplete-complete		1.00	-.28*
10.	inference			1.00

** significant at .01 level .35

* significant at .05 level .27

TABLE 59

13- to 14- year-olds (N=54):

Correlations of 3 Impression

Formation Scores with All Variables

		8	9	10
1.	sex	-.18	-.12	.32*
2.	RA	.09	.20	-.03
3.	Berlyne's figures	-.05	.19	.01
4.	$\bar{X}$	.07	.24	.10
5.	S.D.	.00	.15	.03
6.	sym.	.15	-.13	-.03
7.	asym.	.10	.04	.02
8.	one theme or both	1.00	.22	.09
9.	incomplete-complete		1.00	-.27*
10.	inference			1.00

** significant at .01 level .35

* significant at .05 level .27

TABLE 60

15- to 16- year-olds (N=19):
Correlations of 3 Impression
Formation Scores with All Variables

		8	9	10
1.	sex	.00	.14	.03
2.	RA	.00	.30	.01
3.	Berlyne's figures	.00	.24	-.19
4.	$\bar{X}$	.00	-.31	-.16
5.	S.D.	.00	-.01	-.08
6.	sym.	.00	.13	.04
7.	asym.	.00	.07	.07
8.	one theme or both	1.00	.00	.00
9.	incomplete-complete		1.00	-.06
10.	inference			1.00

** significant at .01 level .55

* significant at .05 level .43

TABLE 61

16- to 18- year-olds (N=28):

Correlations of 3 Impression

Formation Scores with All Variables

		8	9	10
1.	sex	.00	.11	-.05
2.	RA	.00	.39*	.00
3.	Berlyne's figures	.00	-.02	.11
4.	$\bar{X}$	.00	.09	.05
5.	S.D.	.00	-.16	-.03
6.	sym.	.00	-.16	-.10
7.	asym.	.00	.04	.25
8.	one theme or both	1.00	.00	.00
9.	incomplete-complete		1.00	.18
10.	inference			1.00

** significant at .01 level .46

* significant at .05 level .36

between complexity preference and impression formation. Furthermore, the age division reveals no developmental trend in the pattern of correlations between the two sets of scores. In fact, only three discontinuous correlations occur: one ($p<.05$) for the 8- to 9- year-olds between Berlyne's figures and the inference variable; one ($p<.01$) for the 11- to 12- year-olds between the Polygon $\bar{X}$ and the first description variable, description: one theme or both themes; and one ($p<.05$) for the 16- to 18- year-olds between the RA and the second description variable, description: incomplete-complete. On this basis, the unavoidable conclusion is that for the 231 children who took part in the study, there is no relation between complexity preference and impression formation ability. The implications of this outcome will be discussed when the correlational results for all the subjects, that is, for the 64 parents as well, have been presented.

One other outcome of the correlational analysis by developmental subgroup deserves some comment: it bears on the issue of differentiation and integration. Schroder, Driver, and Streufert (1967) maintain that differentiation and integration are fairly separate information-processing characteristics such that extent of differentiation is not a "key aspect" of integrative complexity. For the 231 children and for the 6 age subgroups, the correlations between the first description variable, a measure of gross differentiation, and the inference variable are either .00 or very low. A zero-order correlation typically signifies independence. However, in this case, the correlations are not particularly meaningful as all but 4 of the 231 children articulate the two major film themes, and thus obtain a 2 on the first description variable. Inspection of the individual scoring protocols showed that none of the responses of the 4 children, who do not score 2, fall within the local or the general inference category. So differentiation, in terms of recognition of the two major film themes, precedes an integration attempt.

In contrast, scores on the incomplete-complete description variable, like scores on the inference variable, increase with age. For the total sample of 231 children, there is a zero-order correlation between the incomplete-complete description variable, which implicates fineness of discrimination, and inference. On the whole, the data for the 6 developmental subgroups are in agreement: 4 of the correlations between the 2 variables are nonsignificant; the 2 which are significant, -.28 for the 11- to 12- year-olds, and -.27 for the 13- to 14- year-olds, are negative. Therefore, it can be said that fineness of discrimination is not a prerequisite for integration. In general, it is arguable that the disposition to make precise differentiations and the disposition to integrate are independent.

Birth Order Effects

In research with university undergraduates, Eisenman (1967a, 1967c; Taylor and Eisenman, 1968) reports a sex X birth order interaction: first-born males prefer more complexity than later-born males; later-born females prefer more complexity than first-born females. Because of the distinct birth order effects by sex, the birth order variable was investigated by dividing the children into male and female samples. Following Eisenman (1967c, 1968a; Taylor and Eisenman, 1968), only children were placed in the first-born category.

Comparison between the Male and Female Samples

Before proceeding to the intercorrelation results for the separate samples, it seems worthwhile to determine whether the two groups differ from one another. The means and standard deviations on all variables for the 104 males are itemized in Table 62; and those for the 127 females are itemized in Table 63. The T-values between the means of the samples

TABLE 62

Birth Order Analysis: 104 Males

Variables Included in the Data Analysis
with Identifying Numbers, Means, and
Standard Deviations for each of the Measures

			mean	standard deviation
1.	age		12.21	2.37
2.	birth order:	first-born 1 later-born 2	1.63	.48
3.	RA		28.54	11.21
4.	Berlyne's figures		5.34	2.82
5.	$\bar{X}$		12.41	3.09
6.	S.D.		5.79	1.67
7.	sym.		1.97	.84
8.	asym.		8.88	3.50
9.	description:	good or bad 1 good and bad 2	1.98	.14
10.	description:	incomplete 1 complete 2	1.68	.47
11.	inference:	simplified 1 local 2 general 3	1.11	1.24

TABLE 63

Birth Order Analysis: 127 Females

Variables Included in the Data Analysis
with Identifying Numbers, Means, and
Standard Deviations for each of the Measures

			mean	standard deviation
1.	age		12.39	2.70
2.	birth order:	first-born 1 later-born 2	1.57	.50
3.	RA		28.77	10.26
4.	Berlyne's figures		5.52	4.02
5.	$\bar{X}$		12.85	1.99
6.	S.D.		6.18	.94
7.	sym.		2.22	.77
8.	asym.		10.43	6.88
9.	description:	good or bad 1 good and bad 2	1.98	.12
10.	description:	incomplete 1 complete 2	1.72	.45
11.	inference:	simplified 1 local 2 general 3	1.26	1.32

on the complexity preference and the impression formation variables appear in Table 64.

As can be seen from Table 64, there is no significant divergence between the male and female samples on any of the 3 principal complexity preference measures, that is, the RA, Berlyne's figures, and the Polygon $\bar{X}$; nor on any of the 3 impression formation measures. However, the girls like a significantly greater number ($p<.05$) of both the symmetrical and the asymmetrical figures than do the boys. Girls also tend to have a wider complexity-choice range as indicated by their significantly higher ($p<.05$) Polygon S.D.

Intercorrelation Data

Males

The correlation matrix for the sample of 104 males is reproduced in Table 65.

Birth Order

The first outcome to be noted is that no significant correlation occurs between birth order, the second variable, and any of the other variables.

Age

Preference for complexity on one of the principal measures, the Polygon $\bar{X}$, is negatively related ($-.22$ $p<.05$) to age. The Polygon S.D. is negatively related ($p<.01$) to age as well. There is a decrease with development in both the number of symmetrical ($p<.05$) and the number of asymmetrical ($p<.01$) figures liked by the boys.

With regard to impression formation, a significant positive correlation ($p<.01$) is revealed between age and the first description variable. This finding is explained by remarking that 2 of the 8- to 9- year-old boys do not articulate the major film themes; all the rest of the boys

TABLE 64

T-values between the Means of the Separate Samples of Males and Females

	Means		T-values
	Females N=127	Males N=104	
RA	28.77	28.54	.16
Berlyne's figures	5.52	5.34	.41
$\overline{X}$	12.85	12.41	1.24
S.D.	6.18	5.79	2.11*
sym.	2.22	1.97	2.33*
asym.	10.43	8.88	2.21*
one theme or both themes	1.98	1.98	.20
incomplete-complete	1.72	1.68	.56
inference: simplified 1, local 2, general 3	1.26	1.11	.91

** = significant at .01 level

* = significant at .05 level

TABLE 65

Birth Order Analysis: Correlation Matrix for 104 Males

		1	2	3	4	5	6	7	8	9	10	11
1.	age	1.00										
2.	birth order	.15	1.00									
3.	RA	-.11	.08	1.00								
4.	Berlyne's figures	-.19	-.10	.52**	1.00							
5.	$\bar{X}$	-.22*	.05	.31**	.35**	1.00						
6.	S.D.	-.27**	.03	.10	.23*	.70**	1.00					
7.	sym.	-.23*	-.10	-.26**	-.21*	.07	.31**	1.00				
8.	asym.	-.46**	-.02	.13	.29**	.42**	.59**	.16	1.00			
9.	one theme or both	.25**	.04	-.07	-.08	-.06	-.02	.00	-.06	1.00		
10.	incomplete-complete	.21*	.04	.12	.07	.06	.01	-.17	-.06	.21*	1.00	
11.	inference	.55**	-.05	.01	.00	-.05	-.17	-.21*	-.19	.12	.02	1.00

** significant at .01 level .25

* significant at .05 level .20

do so. Thus, the correlation does not really reflect a trend. Age is also positively correlated with the incomplete-complete description variable ($p<.05$) and the inference variable ($p<.01$).

Complexity Preference

Preference for complexity on the RA is positively related to preference for complexity on Berlyne's figures (.52 $p<.01$) and preference for complexity on the Polygon $\bar{X}$ (.31 $p<.01$). In addition, scores on Berlyne's figures are positively related to those on the Polygon $\bar{X}$ (.35 $p<.01$). Finally, there is a significant positive correlation of .70 ($p<.01$) between the Polygon $\bar{X}$ and the Polygon S.D.

Symmetry—Asymmetry

There is a significant negative correlation between Sym. and both the RA ($p<.01$) and Berlyne's figures ($p<.05$); and a significant positive correlation between Asym. and both Berlyne's figures ($p<.01$) and the Polygon $\bar{X}$ ($p<.01$). The Polygon S.D. is positively related to Sym. ($p<.01$) and Asym. ($p<.01$).

Impression formation

A significant negative correlation ($p<.05$) arises between the inference variable and the number of symmetrical figures liked. The positive correlation ($p<.05$) between the first and the second description scores is expected as a subject must distinguish the two film themes before he can meet the complete requirement.

Females

The correlation matrix for the sample of 127 females is presented in Table 66.

Birth Order

Corresponding to the outcome for the males, there is no significant correlation disclosed between birth order and any of the other variables

TABLE 66

Birth Order Analysis: Correlation Matrix for 127 Females

	1	2	3	4	5	6	7	8	9	10	11
1. age	1.00										
2. birth order	.08	1.00									
3. RA	.28**	.05	1.00								
4. Berlyne's figures	.08	.15	.44**	1.00							
5. $\bar{X}$	.13	-.16	.29**	.03	1.00						
6. S.D.	.16	-.11	-.03	-.15	.28**	1.00					
7. sym.	-.32**	.08	-.37**	-.34**	-.47**	.17	1.00				
8. asym.	.03	.07	.19	.80**	-.05	-.20*	-.30**	1.00			
9. one theme or both	-.01	.02	.16	.00	.20*	.07	.04	.05	1.00		
10. incomplete-complete	.32**	.01	.22*	.04	.05	.09	-.14	.06	.20*	1.00	
11. inference	.62**	-.04	.07	-.01	.12	.05	-.21*	.03	.07	.06	1.00

** significant at .01 level .25

* significant at .05 level .20

for the females.

Age

Preference for complexity on one of the principal measures, the RA, shows a significant positive relation (.28 $p<.01$) to age. Similar to the boys, girls, as they become older, are inclined to like significantly fewer ($p<.01$) of the symmetrical figures. However, unlike the boys, their liking for asymmetrical figures does not diminish with increasing age.

Concerning the impression formation variables, there is a correlation of -.01 between age and the first description score. Out of the 127 girls, only one 11- to 12- year-old and one 13- to 14- year-old do not differentiate the two major film themes. On the other hand, congruent with the results for the boys, age is positively related to both the incomplete-complete description variable ($p<.01$) and the inference variable ($p<.01$).

Complexity Preference

There is a significant positive correlation of .44 ($p<.01$) between the RA and Berlyne's figures; a significant positive correlation of .29 ($p<.01$) between the RA and the Polygon $\bar{X}$. But, for the girls, there is no significant correlation between Berlyne's figures and the Polygon $\bar{X}$. The Polygon $\bar{X}$ is positively correlated (.28 $p<.01$) with the Polygon S.D.

Symmetry—Asymmetry

For the female sample, a significant negative correlation of -.30 ($p<.01$) emerges between Sym. and Asym. Surveying the 3 principal complexity preference scores, Sym. is negatively related to the RA ($p<.01$), Berlyne's figures ($p<.01$), and the Polygon $\bar{X}$ ($p<.01$); Asym. is positively related ($p<.01$) to Berlyne's figures. There is a significant negative correlation ($p<.05$) between Asym. and the Polygon S.D.

Impression Formation

Complexity preference on the RA is positively related ($p<.05$) to the incomplete-complete description variable. Apart from this outcome, the correlations parallel those for the male sample: a significant negative correlation ($p<.05$) between the number of symmetrical figures liked and the inference variable; and a significant positive correlation ($p<.05$) between the first and the second description variables.

Summary

The main object in separating the children into a male and a female sample was to examine whether birth order would have the kind of influence on complexity preference described by Eisenman (1967a, 1967c; Taylor and Eisenman, 1968). The data for both the male and female samples evince no birth order effects on either complexity preference or impression formation. With regard to complexity preference, the failure to replicate Eisenman's findings may be due to the disparity in age composition between his samples and the present one: his subjects were all university students; the subjects in this study cover the age span 8 to 18.

Yet the within-sex analysis does reveal three sets of correlations which bear on developmental changes. Firstly, for the boys, preference for complexity on the Polygon $\bar{X}$ decreases significantly ($p<.01$) with increasing age; while for the girls, preference for complexity on the RA increases significantly ($p<.01$) with development. The possibility of discrete developmental trends by sex in complexity preference will be considered in the next section, which comprises a division of each sample into a younger and an older subgroup.

The second set of correlations clarifies the sex differences, liable to changes with age, in scores on Sym. and Asym. The comparison between the means of the male and female samples showed that girls like more of both the symmetrical and the asymmetrical figures. With increasing age, there is a significant decrement ($p<.05$) in the number of symmetrical figures liked by the boys; and an even larger decrement ($p<.01$) for the girls. So younger females account for the greater acceptance of symmetry. This statement is substantiated by data from Chapter V: relative to males, females at the younger age levels, 6 to 7, 8 to 9, and 11 to 12, expressed preference for significantly more of the symmetrical figures. Again, in Chapter V, it was seen that relative to males, females at the older age levels, 15 to 16, and 16 to 18, were more acceptant of asymmetry. This outcome arises because, with development, males tend to like a smaller number ($p<.01$) of the asymmetrical figures; whereas, females remain stable ($r=.03$) in their preference.

The third set of correlations suggests that for males and females, the developmental trend in impression formation is much the same. That is, as they become older, both boys and girls are inclined to score higher on the incomplete-complete description variable and on the inference variable. In addition, it should be pointed out that for each sample, there is a zero-order correlation between the incomplete-complete description variable, which reflects fineness of differentiation, and the inference variable, which is more a measure of integration.

One other result is noteworthy. For the male sample, there were significant intercorrelations among the 3 principal complexity preference measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$. For the female sample, the RA correlated significantly with Berlyne's figures and the Polygon $\bar{X}$; however, there was a zero-order correlation between Berlyne's figures and the Polygon $\bar{X}$. Thus, the RA is evidently the criterion measure for complexity preference in females: a girl who scores highly on this measure is likely to prefer complexity on the other 2; the same cannot be said of Berlyne's figures or the Polygon $\bar{X}$. Such a finding leads back to the meaning of complexity, especially as applied to the figures making up the Revised Art Scale. The basic question persists: What exactly constitutes a complex stimulus?

Comparison between the Younger and Older Subgroups

With the mixed samples of children, 284 in Chapter V and 231 in this chapter, age has not been correlated with any of the 3 principal complexity preference measures. Consequently, it seemed that there was no regular developmental trend in complexity preference. The subset analyses offered support for this interpretation by demonstrating that, between the ages of 8 and 18, little significant variation in complexity preference was manifest on the 3 principal measures. But with the single-sex samples, some conflicting data emerged. Specifically, for males, age was negatively related ($p<.05$) to one of the principal measures: with development, boys prefer less complexity on the Polygon $\bar{X}$. Whereas, age was positively related ($p<.01$) to another principal measure for females: as girls become older, they are inclined to prefer more complexity on the RA.

With a view to studying these within-sex age differences in greater detail, the male and female samples were each divided into two subgroups: a younger subgroup made up of the 8- to 9- year-olds, the 10- to 11- year-olds, and the 11- to 12- year-olds; and an older subgroup formed of the 13- to 14- year-olds, the 15- to 16- year-olds, and the 16- to 18- year-olds. T-values were calculated between the means of the two groups on all variables.

Males

Table 67 contains the results for the male subgroups.

Compared with the older boys, the younger boys have a significantly

TABLE 67

Age Division for Males: T-values between the Means of the Younger and Older Groups

	Means		Standard Deviations		T-values
	Younger Group N=55	Older Group N=49	Younger Group	Older Group	
1. age	10.34	14.32	1.20	1.37	15.51**
2. birth order	1.60	1.67	.49	.47	.77
3. RA	29.62	27.33	9.91	12.40	1.02
4. Berlyne's figures	5.67	4.96	2.99	2.56	1.30
5. $\overline{X}$	12.92	11.84	1.96	3.91	1.74
6. S.D.	6.17	5.37	.77	2.21	2.41*
7. sym.	2.09	1.84	.75	.91	1.53
8. asym.	10.16	7.43	2.92	3.55	4.22**
9. one theme or both	1.96	2.00	.19	.00	1.43
10. incomplete-complete	1.58	1.80	.49	.40	2.41*
11. inference	.55	1.74	.99	1.19	4.54**

** = significant at .01 level

* = significant at .05 level

higher ($p<.05$) Polygon S.D., and like a significantly greater number ($p<.01$) of the asymmetrical figures. Consistent with the developmental trends in impression formation, the younger boys score significantly lower than the older ones on the incomplete-complete description variable ($p<.05$) and on the inference variable ($p<.01$).

In the present context, the finding of special interest is that the younger and older groups do not deviate significantly from one another on any of the 3 principal complexity preference measures, the RA, Berlyne's figures, or the Polygon $\bar{X}$. Nevertheless, it is worth observing that all differences are in the same direction, and favour the younger subgroup.

Females

The data for the female subgroups are set out in Table 68.

The younger girls like a significantly larger number ($p<.01$) of the symmetrical figures than the older ones. Similar to the outcome for the boys, the older girls score significantly higher on both the incomplete-complete description variable ($p<.05$) and the inference variable ($p<.01$) than do the younger girls.

With reference to age-related changes in complexity preference, the older subgroup scores significantly higher ($p<.05$) than the younger subgroup on the RA. The group differences on Berlyne's figures and the Polygon $\bar{X}$ are not significant; however, although marginal, they are in the same direction.

General Summary

The correlational matrices for the separate male and female samples disclosed no birth order effects on either complexity preference or impression formation. On the other hand, the finding that for boys, age was negatively correlated ($p<.05$) with the Polygon $\bar{X}$, while for girls,

TABLE 68

Age Division for Females: T-values between the Means of the Younger and Older Groups

		Means		Standard Deviations		T-values
		Younger Group N=74	Older Group N=53	Younger Group	Older Group	
1.	age	10.41	15.16	1.18	1.55	18.61**
2.	birth order	1.51	1.64	.50	.48	1.45
3.	RA	26.74	31.60	9.10	11.09	2.60*
4.	Berlyne's figures	5.34	5.77	2.48	5.48	.54
5.	$\bar{X}$	12.74	13.00	2.05	1.89	.75
6.	S.D.	6.10	6.29	1.03	.77	1.14
7.	sym.	2.43	1.93	.52	.95	3.50**
8.	asym.	10.12	10.85	2.62	10.17	.50
9.	one theme or both	1.99	1.98	.12	.14	.23
10.	incomplete-complete	1.64	1.83	.48	.38	2.54*
11.	inference	.54	2.26	1.00	1.03	9.32**

** = significant at .01 level

* = significant at .05 level

age was positively correlated ($p<.01$) with the RA, raised the issue of within-sex developmental trends in complexity preference. Besides these two correlations, the evidence on the affirmative side comprises the one significant result which arose when the samples were broken down into younger and older subgroups: that is, the older girls express greater ($p<.05$) preference for complexity on the RA than the younger ones. The evidence on the negative side is more weighty. First of all, there is no significant deviation between the total male and female samples on the RA or on the other 2 principal measures. Then, for the mixed samples, there is not much significant divergence by subgroup on the RA. Yet the possibility cannot be ignored that the slight tendency for males, as they become older, to score lower on the RA, and the significant tendency for females to score higher may be cancelling one another. However, females significantly exceed ($p<.05$) males on this measure only at the 16- to 18- year-old level. Therefore, on the basis of the present research, it still seems reasonable to argue that there is more evidence of inter-individual differences than of developmental trends by sex.

Nevertheless, a study by Bartol and Pielstick (1972), which bears on the issue of age differences by sex, will be briefly reviewed. Fifteen students from each of three developmental levels, second-graders aged 6 to 7, sixth-graders of 11 to 12, and university undergraduates from an introductory psychology course, served as subjects. The researchers were concerned with developmental changes in the length of time spent "looking at" the ambiguous and unambiguous figures of 10 pairs of stimuli. As they emphasize, ambiguity is a collative variable, but it cannot be equated with complexity. Furthermore, looking time does not seem to be an index of preference. So there is not really close agreement between Bartol and Pielstick's study and the present study, but one outcome is relevant: their data suggest that the optimal period for visual exploration among males may be around age 12, whereas for females, it may be in late adolescence. The point to be drawn is that it is perhaps important to take account of age X sex interactions in the attempt to understand the collative variables. An approach for charting the course of developmental changes is to form children into subgroups at each age level as was done with the mixed samples. It might prove profitable to implement this approach with larger single-sex samples.

The Art Class

One supplementary procedure was carried out with the art students. That is, their teacher, who was also head of the art department at Thornhill Comprehensive School, rated them first on a 7-point original-unoriginal scale according to their art production, and then on 11 other adjective scales. The following explanation headed the rating instructions he was given: "The purpose of this study is to attempt to determine the personality characteristics relevant to design preference by having each student rated on a series of descriptive scales. Please judge the students one at a time, on each of the set of scales in order." The actual instructions were modelled on those in The Measurement of Meaning (Osgood, Suci, and Tannenbaum, 1957, pp. 82-84).

Seven-point scales are equally spaced numerically, but the question arises as to whether they are equally spaced psychologically. In this context, it is worth noting Osgood, Suci, and Tannenbaum's report of "... fairly satisfying evidence that 7-step scales, defined by the linguistic quantifiers, 'extremely,' 'quite,' and 'slightly,' do yield nearly equal units in the process of judgment" (p.327). The 12 adjective scales used in this research are listed in Table 69.

Semantic Differential Data

Table 70 comprises the correlational outcomes for the 19 art students.

TABLE 69

Semantic Differential Scales
Used with the Art Class

	Scale Score 1	7
Adjectives:	original	unoriginal
	sociable	unsociable
	active	passive
	impulsive	deliberate
	indiscriminate	critical
	complex	simple
	stable	changeable
	rational	intuitive
	eccentric	conservative
	curious	indifferent
	organized	unorganized
	relaxed	tense

TABLE 70

Complexity Preference, Impression Formation, and Semantic Differential Ratings: Correlation Results for Fifth Form Art Class (N=19)

		1	2	3	4	5	6	7	8	9	10	11	12
1.	age	1.00	.27	.13	.27	.16	.15	-.19	.20	.00	-.06	-.19	.29
2.	sex		1.00	.04	-.25	.34	.42	.11	.59**	.00	.14	.03	-.04
3.	RA			1.00	.35	.01	.12	-.07	.19	.00	.30	.01	.11
4.	Berlyne's figures				1.00	-.24	-.42	-.24	-.12	.00	.24	-.19	.16
5.	$\overline{X}$					1.00	.63**	.34	.37	.00	-.31	-.16	.14
6.	S.D.						1.00	.67**	.62**	.00	-.01	-.08	.16
7.	sym.							1.00	.31	.00	.13	.04	.02
8.	asym.								1.00	.00	.07	.07	.32
9.	one theme or both									1.00	.00	.00	.00
10.	incomplete-complete										1.00	.06	.39
11.	inference											1.00	-.16
12.	original-unoriginal 1-7												1.00

** significant at .01 level .55

* significant at .05 level .43

TABLE 70 continued

	12	13	14	15	16	17	18	19	20	21	22	23
1. age	.29	.56**	.37	.17	-.16	.18	-.14	-.17	.20	.15	-.05	.02
2. sex	-.04	-.37	-.27	.40	.20	.23	-.46*	-.55**	.30	-.37	-.42	-.20
3. RA	.11	.18	.11	.19	.04	.15	-.05	-.16	.11	.11	-.23	.01
4. Berlyne's figures	.16	.49*	.28	.19	.09	.06	.15	.43*	-.24	.18	.26	.51*
5. $\overline{X}$	.14	-.02	-.02	.40	.03	.34	-.56**	-.35	.64**	.03	-.03	-.18
6. S.D.	.16	.02	.13	.20	-.08	-.02	-.23	-.20	.24	.16	.04	-.02
7. sym.	.02	-.15	.17	.23	-.08	.13	-.32	-.14	.25	.22	.14	.04
8. asym.	.32	-.18	.05	.37	-.03	.24	-.27	-.31	.18	.01	-.13	.11
9. one theme or both	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10. incomplete-complete	.39	.18	.32	-.25	-.26	-.24	.24	.30	-.15	.27	.17	.25
11. inference	-.16	-.15	-.23	-.21	.10	-.14	.06	-.22	-.15	-.36	-.23	-.28
12. original-unoriginal 1-7	1.00	.54*	.80**	-.41	-.84**	.05	.27	.40	.04	.78**	.60**	.43*

NOTE

1-7
12. original-unoriginal
13. sociable-unsociable
14. active-passive
15. impulsive-deliberate

1-7
16. indiscriminate-critical
17. complex-simple
18. stable-changeable
19. rational-intuitive

1-7
20. eccentric-conservative
21. curious-indifferent
22. organized-unorganized
23. relaxed-tense

The intercorrelations among the first 11 variables have already been discussed, but are reproduced here for convenience. However, the focus in this section will be upon the correlations of the 12 adjective scales with these 11 variables, and the correlations between the originality rating and all other adjectives.

There is no significant relation between the original-unoriginal scale and any of the complexity preference or impression formation variables. On the other hand, a configuration of traits emerges as applicable to the student rated original. Specifically, the more original individual is seen as more sociable ($p<.05$), more active ($p<.01$), more critical ($p<.01$), more curious ($p<.01$), more organized ($p<.01$), and more relaxed ($p<.05$).

No such clear-cut patterning of traits occurs for complexity preference. Most important, none of the adjectives distinguish individuals who express liking for complexity on the RA. Subjects with high scores on Berlyne's figures are rated more unsociable ($p<.05$), more intuitive ($p<.05$), and more tense ($p<.05$). A high Polygon $\bar{X}$ score is associated with a rating of stable ($p<.01$) and conservative ($p<.01$).

Only three other significant correlations with the adjective scales are revealed: older subjects are rated more unsociable ($p<.01$); and girls are considered to be more stable ($p<.05$) and more rational ($p<.01$) than boys.

Summary

The finding of particular interest is that the originality rating, made on the basis of the subjects' art work, does not relate to the RA. This is consistent with the view that self-actualizing creativity and creative productivity are largely independent, and certainly independent in the sense that creative productivity is not a precondition for self-actualization. Creative productivity is the prerogative of a few individuals; while self-actualization is regarded as a potential for all individuals. The latter type of creativity would seem to be the referent of Anderson's (1959) proposal: "Why not take any generation of small children, already creative, and find out how to cultivate them?" (p.267).

There is a distinctive patterning of traits for the original individual: 6 of the 11 adjective scales correlate quite highly with the originality rating. In contrast, few of the adjective scales relate to the complexity preference variables, and none relate to the impression formation variables. Two interpretations are feasible: the adjectives selected may not be pertinent to complexity preference; or the originality rating may be unduly influencing judgment. With respect to the latter position, an art teacher probably has developed a conception of the original person which might well have a "halo" effect, such that he judges on the remaining scales not so much in terms of the person concerned, as in terms of his own originality rating of the person.

Perhaps a better method for discovering personality correlates of simplicity—complexity preference would be to implement a form of adjective check list (e.g. Gough, 1960) instead of a few preselected adjectives, and have subjects indicate adjectives descriptive of themselves. Personality correlates of the RA for postgraduate students (Barron, 1952) and for talented adolescents (Cashdan and Welsh, 1966) have been investigated in this manner, but research has yet to be done with "children and adults in general." A practicable age range for such a study might be 11-12 to adulthood. The question arises as to whether developmental continuities would appear in the personality correlates of individuals scoring either high or low on the RA, or uniformly high or low on the RA, Berlyne's figures, and the Polygon $\bar{X}$.

Adults

The impression formation task chosen for the adults and the task chosen for the children approximate one another theoretically in that a high score on each implicates an attempt to integrate conflicting information. However, because the forms and scoring procedures were distinct, the adults'data were analyzed separately.

All 64 adults completed both the complexity preference tests and the impression formation task. Thus, the makeup of the adult sample is the same as in Chapter V. And inspection of Table 71, which itemizes the 8 variables submitted for analysis, shows that the impression formation variable is the sole addition to the ones listed in Chapter V. The express purpose of the present chapter is to examine the relation between complexity preference and impression formation ability. Therefore, to avoid repetitiveness, the only other outcomes considered in detail will be those which bear on the children's results disclosed in this chapter.

Intercorrelation Data

Pearson product-moment correlation coefficients were computed between each score and every other score for the adults' data. The resultant correlation matrix is reproduced in Table 72.

The correlations among the first 7 variables were thoroughly discussed in Chapter V. Nevertheless, besides pointing out that sex has no significant influence on the abstractness of the adults' impressions, it should also be reemphasized that no significant relation occurs between sex and any of the 3 principal complexity preference measures, the RA, Berlyne's figures, or the Polygon $\bar{X}$. So although there is some slight intimation of within-sex developmental differences in complexity preference, these differences seem to have equalized out by adulthood.

TABLE 71

Complexity Preference and Impression Formation:
Adult Sample

Variables Included in the Data Analysis with Identifying Numbers, Means, and Standard Deviations for each of the Measures

		mean	standard deviation
1.	sex MALE 1 FEMALE 2	1.52	.50
2.	RA	21.05	11.07
3.	Berlyne's figures	4.09	2.42
4.	$\bar{X}$	11.25	2.57
5.	S.D.	5.77	1.16
6.	sym.	2.05	.87
7.	asym.	9.42	2.23
8.	Impression formation: concrete 1 abstract 2	1.27	.44

TABLE 72

Complexity Preference and Impression Formation:

Correlation Matrix for 64 Adults

		1	2	3	4	5	6	7	8
1.	sex MALE 1 FEMALE 2	1.00							
2.	RA	.02	1.00						
3.	Berlyne's figures	-.04	.69**	1.00					
4.	$\bar{X}$	-.05	.50**	.34**	1.00				
5.	S.D.	-.07	.16	.14	.62**	1.00			
6.	sym.	-.02	-.31*	-.27*	-.37**	-.12	1.00		
7.	asym.	.20	-.08	.01	.20	.26*	-.28*	1.00	
8.	concrete-abstract	.02	.25*	.24	.01	.07	-.07	.00	1.00

** significant at .01 level .33

* significant at .05 level .25

It will be remembered that the adults evince greater consistency in their complexity preference on the 3 principal measures than the children. Specifically, in the adults' matrix, the intercorrelations have higher absolute values than those in the matrix for the 284 children or the 231 children. To reiterate, there is a significant positive correlation of .69 ($p<.01$) between the RA and Berlyne's figures; a significant positive correlation of .50 ($p<.01$) between the RA and the Polygon $\bar{X}$; and a significant positive correlation of .34 ($p<.01$) between Berlyne's figures and the Polygon $\bar{X}$. Yet, congruent with the outcome for the children, the highest correlation is between the RA and Berlyne's figures.

However, the finding of most interest in the present context is that a positive correlation of .25, significant at the .05 level, emerges between the RA and abstractness of impression formation. Furthermore, the positive correlation of .24 between Berlyne's figures and the impression formation variable approaches significance at the .05 level.

Factor Analysis Data

The 8x8 matrix of intercorrelations was factor analyzed: 4 principal components, accounting for 75.6% of the total variance, were extracted and rotated to the varimax criterion. In interpreting the factors, attention will be concentrated upon loadings of .30 and upwards.

Principal Component Factor Analysis

Table 73 reports the unrotated factor loadings along with the percentage of total and common variance accounted for by each factor. Factor I is a general complexity factor, which accounts for a sizeable proportion, 42.5%, of the identified variance. The pattern of loadings on this factor remains very much the same as in Chapter V: all the complexity preference scores contribute high loadings, the RA .78, Berlyne's figures .72, the Polygon $\bar{X}$ .80, and the Polygon S.D. .57; while Sym.

TABLE 73

Complexity Preference and Impression Formation:

Principal Components Factor Analysis for 64 Adults

	I	II	III	IV	
1. sex	-.01	.24	.78	.00	
2. RA	.78	-.43	.09	-.15	
3. Berlyne's figures	.72	-.44	.12	-.12	
4. $\bar{X}$	.80	.27	-.29	-.03	
5. S.D.	.57	.47	-.40	.39	
6. sym.	-.57	-.18	-.24	.41	
7. asym.	.26	.71	.35	.09	
8. Impression formation: concrete-abstract	.29	-.38	.32	.74	
Percentage of Total Variance	32.1	17.8	14.3	11.4	
Total variance extracted, 75.6%					
Percentage of Common Variance	42.5	23.5	18.9	15.1	= 100%

loads −.57 in the opposite direction. But the outcome to be noted is that the impression formation variable contributes a positive loading of .29 to the general complexity factor.

Varimax Rotation Factor Analysis

Table 74 comprises the factor loadings and percentage of total and common variance accounted for by each of the rotated factors. The varimax solution divides the large general complexity factor into 2 complexity factors

Factor I

Score	Loading
RA	.88
Berlyne's figures	.83
Polygon $\bar{X}$	.48
Sym.	−.57

The first complexity factor accounts for 34.2% of the identified variance. For both adults and children, the common features of this factor, throughout the research, have been: very high loadings from the RA and Berlyne's figures; and a smaller loading in the opposite direction from Sym.

Factor II

Score	Loading
Polygon $\bar{X}$	.74
Polygon S.D.	.92
Asym.	.43

This second complexity factor accounts for 27.9% of the common variance. Again, throughout the research, it has had certain defining properties. That is, the Polygon $\bar{X}$ and the Polygon S.D. load highly on it; while Asym. loads to a lesser extent.

TABLE 74

Complexity Preference and Impression Formation: Varimax Rotation Factor Analysis for 64 Adults

	I	II	III	IV	
1. sex	.02	-.24	.77	.12	
2. RA	.88	.11	-.08	.17	
3. Berlyne's figures	.83	.07	-.06	.20	
4. $\bar{X}$	.48	.74	.02	-.11	
5. S.D.	.03	.92	.00	.11	
6. sym.	-.57	-.18	-.38	.28	
7. asym.	-.08	.43	.72	-.07	
8. Impression formation: concrete-abstract	.18	.04	.06	.92	
Percentage of Total Variance	25.9	21.1	15.7	12.9	
Total variance extracted, 75.6%					
Percentage of Common Variance	34.2	27.9	20.8	17.1	= 100%

Factor III

Score	Loading
Sex	.77
Sym.	-.38
Asym.	.72

Factor III, which accounts for 20.8% of the common variance, is a sex-typing factor indicating that females are disposed to like a smaller number of the symmetrical figures, and a larger number of the asymmetrical ones.

By examining this factor, the probable course of the age changes by sex on Sym. and Asym. can be traced. To elucidate, with the 231 children, comparison between the means of the separate male and female samples demonstrated that, overall, girls score higher on both Sym. ($p<.05$) and Asym. ($p<.05$) than the boys. From their respective correlation matrices, it was seen that with increasing age, Sym. declined ($p<.05$) for boys, and declined at an even greater rate ($p<.01$) for girls. The adults' sex-typing factor suggests that this trend may continue, so that in adulthood, females are less acceptant of symmetry than males.

On the other hand, the boys' scores on Asym. decrease ($p<.01$) with development, whereas the girls' scores stay fairly stable ($r=.03$). And relative to boys, girls at the older age levels, 15 to 16 and 16 to 18, are more acceptant of asymmetry. In the case of the adults, their sex-typing factor implies that females are more acceptant of asymmetry at this age level as well. It may be that females' scores on Asym. fluctuate little from childhood to adulthood.

Factor IV

Score	Loading
Impression Formation	.92

Factor IV, accounting for 17.1% of the identified variance, is clearly an impression formation factor as only the impression formation variable loads over .30 on it.

General Summary

A consideration of the adults' data in conjunction with those for the children follows. The concern is with the relation between complexity preference and impression formation.

To review the developmental results, for the 231 children, there are nonsignificant correlations between impression formation ability, manifest on the inference variable, and each of the 3 principal complexity preference measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$. However, for the 64 adults, the correlation between impression formation ability and the RA (.25) is significant at the .05 level, and the one between impression formation ability and Berlyne's figures (.24) is nearly significant at the .05 level. In addition, the adults' impression formation variable loads .29 on the first component, which is a large general complexity factor. The question arises as to why impression formation shows some relation to complexity preference for adults but not for children.

Such an outcome could be construed as support for the position put forward in Chapter II. Briefly, it was proposed that preference for complexity in children does not necessarily reflect the ability to process or structure complexity; rather, it may denote a greater potential to come to be able to do so. But this interpretation does not seem to be applicable to the sum of the findings. To elaborate, for the 231 children, there is a significant positive correlation ($p<.01$) between age and the inference variable; that is, impression formation ability improves with age. Yet, the correlational data for the respective subgroups of children provide no evidence of an increasing positive correlation between complexity preference and inference.

Another explanation of the discontinuity between the children's and the adults' results, which merits attention, is that the impression formation tasks, although analogous in theory, are not so in practice. Comparing the two, it is arguable that the adults' test is the more valid, in the sense of measuring what it is supposed to measure. Specifically, Streufert and Driver (1967) discovered concreteness—abstractness in terms of the adults' test to have a significant effect ($p<.01$) on the integrative simplicity—complexity of perception in an ongoing information-processing situation, the Tactical Game Task (see Chapter IV, pp. 136-138).

Even though the relation between complexity preference and impression formation for adults does not appear to be a close one, this general area of research warrants further pursuit. On the basis of the present study, three lines of investigation are suggested. First of all, it might prove interesting to examine the correlation, for adults, between the form of the test already implemented and the film technique devised by Gollin (1954). Secondly, it should be feasible to extend the use of the adults' test form downwards to ages 16-18, 15-16, and perhaps 13-14. Thirdly, bearing in mind the verbal criticism stressed in the introduction to this chapter, it might be advisable to employ a nonverbal task, suitable for use with a large age range, such as 6 years to adulthood, and amenable to structural scoring criteria (e.g. Anastasi and Schaefer, 1971).

Conclusions

The major portion of the data of the study has now been covered. Therefore, this section will comprise a revision of the Interim Conclusions of Chapter V in the light of the complexity preference outcomes disclosed in the present chapter, as well as a discussion of the impression formation outcomes.

Beginning with complexity preference, for the 231 children and for the 64 adults, the three principal measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$, intercorrelate significantly with one another. When the children are divided into male and female samples, this set of significant intercorrelations is repeated for the 104 boys. For the 127 girls, the RA is significantly related to Berlyne's figures and the Polygon $\bar{X}$; but scores on Berlyne's figures are not significantly related to Polygon $\bar{X}$ scores. Nevertheless, regarding the RA as the criterion measure, because of its empirical links to self-actualizing creativity (Golann, 1962. See Chapter I, pp.36-37), the picture remains largely unchanged. On the whole, there is uniformity of simplicity—complexity preference across the three principal measures. It seems worthwhile to reaffirm that the correlation between the RA and Berlyne's figures is always the highest; and in the breakdown of the children into developmental subgroups, it was seen to be the most persistent.

With the 231 children, as with the 284 children, the subset analysis reveals little significant variation, between the ages of 8 and 18, in complexity preference on the three principal measures. In other words, there is no developmental trend in complexity preference. This statement must be qualified somewhat due to the correlational results for the single-sex samples: for the boys, age is negatively correlated ($p<.05$) with the Polygon $\bar{X}$; for the girls, age is positively correlated ($p<.01$) with the RA. Examining all the pertinent data, it was argued that there is still more evidence of inter-individual differences than of within-sex developmental trends in the present research. A suggestion advanced was that the possibility of a "peak" complexity preference age for each sex be investigated.

The main object in separating the 231 children into single-sex samples was to determine whether, as Eisenman reports, first-born males prefer more complexity than later-born males, whereas later-born females prefer more complexity than first-born females. Perhaps because of the age discrepancy between his university samples and this sample of 8- to 18- year-olds, no birth order effects on complexity preference occurred. However, apart from the distinct correlations by sex between age and complexity preference, which are detailed above, the within-sex analysis also showed age changes by sex on Sym. and Asym. To recapitulate, with development, there is a decrease ($p<.05$) in the boys' scores on Sym., and an even greater decrease ($p<.01$) in the girls' scores. In contrast, while the boys' scores on Asym. decline ($p<.01$), the girls' scores remain stable. On the basis of the adults' sex-typing factor, the course of the scores into adulthood was speculated upon. Yet, in order to chart the actual course of these scores, and more important, to clarify the issue of within-sex developmental trends or "peak" ages by sex in complexity preference, larger single-sex samples, spanning an extensive age range, are required. One approach, found useful with the mixed samples in the present research, would be to subdivide these male and female samples into groups at every age level.

Turning to impression formation, for the 231 children, there is a significant positive correlation between age and the second description variable, description: incomplete-complete, which reflects fineness of differentiation; and a significant positive correlation between age and the inference variable, which is more an index of integration. The subset analysis by age subgroup confirms the regular developmental increments on these two impression formation scores. Again, for the 231 children, there is a zero-order correlation between the incomplete-complete description variable and inference. This accords with Schroder, Driver, and

Streufert's (1967) contention that degree of differentiation, and integration are fairly independent aspects of information processing.

Sex has no significant effect on any of the impression formation variables for the 231 children. Furthermore, the pattern of correlations, which arose for the mixed sample, recurs for the separate male and female samples: age is significantly related to the second description variable and the inference variable; the two impression formation scores do not relate to each other. Considering the various developmental subgroups, the only divergence by sex in impression formation appears at the 13- to 14- year-old level: girls of this age demonstrate a greater tendency ($p<.05$) to include inference in their responses to the film than do the boys. Overall, a tenable proposition seems to be that for boys and girls, the developmental trends in impression formation are very similar.

Congruent with the outcome for the 231 children, there is no deviation by sex in the adults' impression formation. However, the most salient finding, from the point of view of the present chapter, is that for the 231 children, there is no relation between complexity preference and impression formation ability, as indicated by the inference score; whereas, for the 64 adults, complexity preference on the RA and Berlyne's figures relates to impression formation ability. It should be mentioned that one significant correlation between complexity preference on Berlyne's figures and inference does arise for the children, at the 8- to 9- year-old level. But only two of the 8- to 9- year-old subjects use inference, local inference; and so they are responsible for this result. No strong conclusions, concerning the relation between complexity preference and the structuring or integration of perception, seem justified until further research is conducted. Three directions such research could take were specified.

Since there does appear to be consistency in preference for simplicity—complexity on the three principal measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$, another line of investigation which should be continued is that relevant to the personality correlates of simplicity—complexity preference. The rating of the art students on semantic differential scales was not instrumental in revealing personality correlates, but it was suggestive of an approach to this kind of research. Briefly, the design, as outlined, is to have "children and adults in general" choose traits descriptive of themselves from an adjective check list. An interesting division of the subjects might be a form of low, medium, high grouping on the basis of all three principal measures, similar to the ones generated by the cluster analyses in Chapter V. Low and high scorers are typically selected and then contrasted. But medium scorers constitute the largest proportion of the sample, and they should therefore probably be studied as a group in their own right.

CHAPTER VII.

Parents and Their Children

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Parents and Their Children

Introduction

A hypothesis developed in Chapter IV was that preference for complexity would be positively correlated with impression formation ability. Therefore, the research plan was to examine how parents' complexity preference and impression formation ability would relate to their children's complexity preference and impression formation ability. However, in Chapter VI, for the 231 children aged 8 to 18, there was no evidence of a relation between complexity preference and impression formation ability. For the 64 adults, there was some evidence of a positive relation between preference for complexity on the RA and Berlyne's figures, but the relation was not especially strong. Consequently, the emphasis in this chapter will be upon the correlations between the parents' complexity preference scores and those of their children.

To summarize the argument for expecting positive correlations, preference for simplicity—complexity is regarded as a reflection of an underlying simplicity—complexity dimension of personality. The finding of consistency of simplicity—complexity preference offers support for such a view. Parents who vary along a simple—complex dimension might very well interact with their children in distinctive ways. For example, the complex parent might be more likely to provide a complex environment and to encourage his child to deal with this sort of environment. Perhaps through a habituation mechanism, the child would learn to prefer complexity. The basic question at issue is: Do general home atmosphere and parent-child interactions affect simplicity—complexity preference? The particular question towards which this chapter is oriented is: Does a parent's preference for simplicity—complexity have any relation to his child's preference for simplicity—complexity?

Method

Subjects

As already specified, the children from two schools, Chester Road Junior School and Thornhill Comprehensive School, in the same catchment area, were given a note-form to take home to their parents. Sixty-four parents, thirty-one couples and two mothers, agreed to participate in the research. In approaching the data of the present chapter, the focus is the family unit. A family unit is defined as a mother, a father, and a child. So the two mothers were excluded from the study, as were the parents of one child who did not complete the film task. This left thirty couples, but one couple had two children tested. Thus, the present sample comprises 31 family units. The 31 children ranged in age from 8 to 18.

Materials

All subjects completed both the three complexity preference tests, the RA, Berlyne's figures, the Random Polygon measure, and the impression formation task, either the one suitable for children or the one for adults. The characteristics, the administration, and the scoring of these various tests have been explicitly described in Chapter V and Chapter VI.

Results and Discussion

The names and identifying numbers of the 28 variables involved in the subsequent analyses are detailed in Table 75. It should be noted that birth order information was included for the children.

Intercorrelational Analysis

In a first attempt to understand the data, correlation coefficients were computed between each score and every other score. The correlation matrix appears in Table 76. For ease of comprehension, this table will be considered in subsections, and reference will be made to Table 76A, 76B, or 76C.

TABLE 75

Parents and Their Children

Variables Included in the Data Analysis with Identifying Numbers, Means, and Standard Deviations for Each of the Measures

			mean	standard deviation
children:	1.	age	11.73	2.69
	2.	sex 1 MALE 2 FEMALE	1.58	.49
	3.	RA	29.26	11.05
	4.	Berlyne's figures	6.00	3.22
	5.	$\bar{X}$	12.52	2.16
	6.	S.D.	6.18	1.23
	7.	sym.	2.19	.64
	8.	asym.	9.29	2.41
	9.	birth order 1 first-born 2 later-born	1.74	.44
	10.	one theme or both	2.00	.00
	11.	imcomplete-complete	1.68	.47
	12.	inference	.99	1.27
fathers:	13.	sex	1.00	.00
	14.	RA	20.03	9.45
	15.	Berlyne's figures	4.10	2.22
	16.	$\bar{X}$	11.18	2.62
	17.	S.D.	5.85	1.14
	18.	sym.	2.10	.86
	19.	asym.	9.00	2.20
	20.	impression formation	1.26	.44
mothers:	21.	sex	2.00	.00
	22.	RA	22.39	11.54
	23.	Berlyne's figures	4.16	2.50
	24.	$\bar{X}$	10.97	2.38
	25.	S.D.	5.60	1.15
	26.	sym.	2.00	.88
	27.	asym.	9.90	2.08
	28.	impression formation	1.55	1.60

TABLE 76A

Correlation Matrix for Parents and Their Children: 31 Family Units

			children's scores 1	2	3	4	5	6	7	8	9	10	11	12
children's scores:	1.	age	1.00											
	2.	sex	-.04	1.00										
	3.	RA	.14	.07	1.00									
	4.	Berlyne's figures	-.12	.10	.67**	1.00								
	5.	$\bar{X}$	.12	-.01	.19	.22	1.00							
	6.	S.D.	.17	.09	.06	.28	.54**	1.00						
	7.	sym.	-.21	.36*	-.26	-.12	-.17	.27	1.00					
	8.	asym.	-.24	.18	.38*	.43*	.39*	.09	-.31	1.00				
	9.	birth order 1 first-born 2 later-born	.27	-.05	-.15	-.34	.14	-.13	-.28	.10	1.00			
	10.	one theme or both	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.00		
	11.	incomplete-complete	.11	-.17	.37*	.26	.34	.19	-.11	.05	.22	.00	1.00	
	12.	inference	.56**	.21	-.15	-.45**	.15	.04	.09	-.32	.20	.00	-.14	1.00
fathers' scores:	13.	sex	.00											
	14.	RA	.08	-.19	-.06	.03	-.07	.39*	.16	-.28	.04	.00	.00	-.22
	15.	Berlyne's figures	-.05	-.08	-.07	.08	.01	.29	.26	-.15	.03	.00	.06	-.26
	16.	$\bar{X}$	.06	-.10	.12	.01	-.20	.14	-.07	-.14	.13	.00	.18	-.31
	17.	S.D.	-.01	-.31	.26	-.01	-.02	-.01	-.20	.12	.05	.00	.11	-.30
	18.	sym.	.13	.10	.06	.15	.62**	.11	-.21	.41*	.15	.00	.08	.18
	19.	asym.	-.03	.09	.14	.04	-.04	-.03	.09	.01	.13	.00	.03	-.03
	20.	impression formation	.01	.05	.27	.23	.10	.31	.05	.23	.01	.00	.09	.03
mothers' scores:	21.	sex	.00											
	22.	RA	-.30	.13	-.38*	-.36*	-.20	-.20	.25	.16	.31	.00	-.23	.02
	23.	Berlyne's figures	-.33	-.05	-.32	-.39*	-.13	-.30	.10	.09	.36*	.00	-.20	-.02
	24.	$\bar{X}$	.07	-.01	.00	.03	-.04	-.23	.00	.19	.31	.00	.24	-.05
	25.	S.D.	.05	-.15	.22	.17	.06	-.14	-.12	.35*	.10	.00	.25	-.23
	26.	sym.	.31	.22	-.06	.07	.45**	.36*	-.06	.06	.00	.00	-.08	.23
	27.	asym.	-.23	-.29	.27	.40*	.05	.18	.01	.11	-.24	.00	.46**	-.43*
	28.	impression formation	.03	.17	.13	.12	.00	.24	-.01	-.12	.11	.00	.11	-.06

** significant at .01 level .45

* significant at .05 level .35

TABLE 76B

			fathers' scores							
			13	14	15	16	17	18	19	20
fathers' scores:	13.	sex	1.00							
	14.	RA	.00	1.00						
	15.	Berlyne's figures	.00	.63**	1.00					
	16.	$\bar{X}$	.00	.60**	.31	1.00				
	17.	S.D.	.00	.17	.23	.57**	1.00			
	18.	sym.	.00	-.42*	-.16	-.43*	-.10	1.00		
	19.	asym.	.00	.02	.26	.33	.25	-.14	1.00	
	20.	impression formation	.00	.16	.21	.17	.01	-.24	-.03	1.00
mothers' scores:	21.	sex								
	22.	RA	.00	.00	.03	.03	-.03	-.12	.22	-.05
	23.	Berlyne's figures	.00	.01	-.04	-.07	-.10	-.01	-.06	-.01
	24.	$\bar{X}$	.00	-.19	-.30	.05	-.18	-.07	.20	-.18
	25.	S.D.	.00	-.16	-.26	.15	.31	-.02	.23	.01
	26.	sym.	.00	.18	.08	.25	.12	.34	.00	-.17
	27.	asym.	.00	.03	.01	.01	.16	-.18	-.07	.24
	28.	impression formation	.00	.18	-.11	.42*	.11	-.04	-.24	-.06

** significant at .01 level .45

* significant at .05 level .35

TABLE 76C

			mothers' scores							
			21	22	23	24	25	26	27	28
mothers' scores:	21.	sex	1.00							
	22.	RA	.00	1.00						
	23.	Berlyne's figures	.00	.69**	1.00					
	24.	$\bar{X}$	.00	.42*	.30	1.00				
	25.	S.D.	.00	.25	.12	.70**	1.00			
	26.	sym.	.00	-.22	-.35*	-.23	-.13	1.00		
	27.	asym.	.00	-.08	-.15	.17	.36*	-.47**	1.00	
	28.	impression formation	.00	-.13	-.01	-.18	-.22	.29	.09	1.00

** significant at .01 level .45

* significant at .05 level .35

Correlations among the Children's Scores

See Table 76A

Age

The significant positive correlation (.56 $p<.01$) between age and the inference variable denotes that impression formation ability improves with development.

Sex

There is a significant positive correlation between sex and Sym. ($p<.05$); that is, girls like more of the symmetrical figures than do the boys.

Complexity Preference

Preference for complexity on the RA is significantly correlated (.67 $p<.01$) with preference for complexity on Berlyne's figures. The Polygon $\bar{X}$ is significantly correlated (.54 $p<.01$) with the Polygon S.D.

Symmetry—Asymmetry

Asym. is positively related ($p<.05$) to all 3 principal complexity preference measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$.

Impression Formation

There is a significant positive correlation ($p<.05$) between the incomplete-complete description variable and the RA. A significant negative correlation ($p<.01$) occurs between impression formation ability manifest on the inference variable and preference for complexity on Berlyne's figures.

Correlations among the Fathers' Scores

See Table 76B

Complexity Preference

There is a significant positive correlation of .63 ($p<.01$) between the RA and Berlyne's figures; and a significant positive correlation of

.60 ($p<.01$) between the RA and the Polygon $\bar{X}$. However, there is no significant correlation between Berlyne's figures and the Polygon $\bar{X}$. The Polygon $\bar{X}$ is significantly related (.57 $p<.01$) to the Polygon S.D.

Symmetry—Asymmetry

Sym. shows a significant negative relation ($p<.05$) to both the RA and the Polygon $\bar{X}$.

Correlations among the Mothers' Scores

See Table 76C

Complexity Preference

Paralleling the outcomes for the fathers, for the mothers, there is a significant positive correlation (.67 $p<.01$) between the RA and Berlyne's figures; and a significant positive correlation (.42 $p<.05$) between the RA and the Polygon $\bar{X}$. Again, scores on Berlyne's figures are not significantly related to Polygon $\bar{X}$ scores. The Polygon $\bar{X}$ is significantly related (.70 $p<.01$) to the Polygon S.D.

Symmetry—Asymmetry

There is a significant negative correlation ($p<.01$) between Sym. and Asym. Sym. is negatively related ($p<.05$) to Berlyne's figures. Asym. is positively related ($p<.05$) to the Polygon S.D.

Correlations between Fathers' and Children's Scores

See Table 76A

Only three significant results emerge for the fathers and their children: 1. a positive correlation, significant at the .05 level, between the fathers' RA and the children's Polygon S.D.; 2. a positive correlation ($p<.01$) between the number of symmetrical figures liked by the fathers and the children's Polygon $\bar{X}$; and 3. a positive correlation ($p<.05$) between the fathers' scores on Sym. and the children's scores on Asym.

Correlations between Mothers' and Children's Scores

See Table 76A

There are more correlations between the mothers' and the children's scores; but the direction of some of the relations is unexpected. To elaborate: the mothers' preference for complexity on the RA is negatively related to the children's preference for complexity on both the RA ($p<.05$) and Berlyne's figures ($p<.05$); the mothers' scores on Berlyne's figures are also negatively related ($p<.05$) to the children's scores on this measure.

As was found for the correlations between the fathers' and the children's scores, there is no coherent pattern discernible in the rest of the correlations between the mothers' and the children's scores. To continue, there is a significant positive correlation ($p<.05$) between the mothers' scores on Berlyne's figures and the children's birth order. The mothers' Polygon S.D. is positively correlated ($p<.05$) with the number of asymmetrical figures liked by the children. The mothers' scores on Sym. are positively related to both the children's Polygon $\bar{X}$ ($p<.01$) and their Polygon S.D. ($p<.05$). Significant positive correlations arise between the mothers' Asym. scores and the children's preference for complexity on Berlyne's figures ($p<.05$) and their scores on the second description variable, description: incomplete-complete ($p<.01$). Finally, the number of asymmetrical figures liked by the mothers is negatively related ($p<.05$) to the children's inference scores.

Correlations between Mothers' and Fathers' Scores

See Table 76B

The sole significant correlation revealed is a positive one ($p<.05$) between the mothers' impression formation ability and the fathers' Polygon $\bar{X}$.

Summary

First of all, to review the intercorrelations among the 3 principal complexity preference measures for the separate groups of mothers, fathers, and children. For both the mothers and the fathers, there is a significant positive correlation between the RA and Berlyne's figures, and between the RA and the Polygon $\bar{X}$. But no significant correlation occurs between Berlyne's figures and the Polygon $\bar{X}$. However, designating the RA as the criterion measure, it can be said that the mothers and fathers demonstrate uniformity of simplicity—complexity preference on the 3 principal measures. It should be noted that the correlation between the RA and Berlyne's figures is the highest one for each of these two groups. Furthermore, it is the only significant correlation disclosed for the children.

Turning to the relation between parents' simplicity—complexity preference and that of their children, in the main, there is no discriminable pattern in the correlations between the parents' and the children's scores. Nevertheless, two findings deserve mention: 1. A larger number of correlations emerge between the mothers' and the children's scores than between the fathers' and the children's scores. 2. Insofar as there are significant correlations between mothers' complexity preference and children's complexity preference, these correlations are negative. This latter outcome is rather puzzling. Therefore, a cluster analysis was conducted in a further attempt to understand the data. As has already been remarked, there are many different ways in which to organize the same collection of data, and by employing a cluster analysis, some structure may be discovered in this particular collection.

Cluster Analysis

A cluster analysis (Ward, 1963; Wishart, 1969) is perhaps a more appropriate method for studying the family units. To elucidate, the cluster analysis, in grouping, takes account of overall profile similarity on the entire set of specified variables, in this case the 28 scores defining every family unit. Thus, the resultant classification is based on the mothers', the fathers', and the children's scores. The advantage of a cluster analysis is that implicit in this technique is the possibility of generating hypotheses, as opposed to merely testing them. More precisely, it may group in terms of relations among the mothers', the fathers', and the children's scores which are not evident from an inspection of the data, nor from the correlational outcomes, and so may suggest courses for future research.

The two-cluster solution furnished what looked to be the most meaningful structuring of the data. The T-values between the means of the two groups of family units on all variables are presented in Table 77.

Cluster 1, with 26 family units, constitutes 83.9% of the sample; while cluster 2, with 5 family units, contains the remaining 16.1% of the sample. As regards complexity preference, cluster 1 comprises the higher scoring children. That is, these children prefer more complexity than those in cluster 2 on each of the 3 principal measures, the RA, Berlyne's figures, and the Polygon $\bar{X}$, although only significantly more ($p<.01$) on Berlyne's figures. The children in cluster 1 also have a wider complexity-choice range as indicated by their significantly higher ($p<.05$) Polygon S.D. It should be observed that cluster 1 is made up of a fairly even mixture of first-born and later-born children; whereas, all the children in cluster 2 are later-borns. Finally, cluster 1 children are significantly more likely ($p<.05$) than cluster 2 children to submit complete descriptions of the behavior depicted by John in the film.

Compared with the 5 fathers in cluster 2, the 26 fathers in cluster 1 evince significantly greater preference for complexity on the RA ($p<.01$) and on Berlyne's figures ($p<.01$); and they score higher, but not significantly so, on the Polygon $\bar{X}$. Furthermore, cluster 1 fathers score significantly higher ($p<.01$) on the impression formation task. Yet, compared with the mothers in cluster 2, the mothers in cluster 1 express less preference for complexity on all 3 principal measures, and significantly less

TABLE 77

Cluster Analysis with Parents and Their Children: T-values between the Means of Clusters One and Two

			Means		Standard Deviations		T-values
			Cluster 1	Cluster 2	Cluster 1	Cluster 2	
			N=26	N=5	N=26	N=5	
children's scores:	1.	age	11.85	11.10	2.76	2.15	.62
	2.	sex	1.54	1.80	.50	.40	1.17
	3.	RA	30.54	22.60	10.96	8.91	1.60
	4.	Berlyne's figures	6.69	2.40	2.96	1.86	3.90**
	5.	X̄	12.95	10.27	1.52	3.30	1.60
	6.	S.D.	6.49	4.58	.86	1.59	2.35*
	7.	sym.	2.15	2.40	.60	.80	.59
	8.	asym.	9.35	9.00	2.27	3.03	.22
	9.	birth order 1 first-born 2 later-born	1.69	2.00	.46	.00	3.33**
	10.	one theme or both	2.00	2.00	.00	.00	
	11.	incomplete-complete	1.77	1.20	.42	.40	2.62*
	12.	inference	.81	1.60	1.21	1.36	1.10
fathers' scores:	13.	sex	1.00				
	14.	RA *	21.81	10.80	9.20	3.37	4.41**
	15.	Berlyne's figures	4.46	2.20	2.24	.40	4.61**
	16.	X̄	11.43	9.88	2.50	2.81	1.04
	17.	S.D.	5.91	5.52	.98	1.71	.45
	18.	sym.	2.12	2.00	.80	1.10	.20
	19.	asym.	8.89	9.60	2.15	2.33	.58
	20.	impression formation	1.31	1.00	.46	.00	3.33**
mothers' scores:	21.	sex	2.00				
	22.	RA	19.50	37.40	9.73	8.09	3.99**
	23.	Berlyne's figures	3.50	7.60	2.02	1.86	4.05**
	24.	X̄	10.65	12.60	2.11	3.00	1.25
	25.	S.D.	5.58	5.70	1.73	1.01	.22
	26.	sym.	2.15	1.20	.77	.98	1.86
	27.	asym.	10.12	8.80	2.17	.98	2.01
	28.	impression formation	1.58	1.40	1.74	.49	.42

** = significant at .01 level

* = significant at .05 level

on the RA ($p<.01$) and Berlyne's figures ($p<.01$).

The comparison between the scores of the two clusters of family units serves to delimit them. However, perhaps more interesting is the relative arrangement of the within-cluster complexity preference scores. Specifically, the higher complexity preference cluster 1 children have parents whose scores appear to be quite alike. In contrast, there is considerable disparity between the scores of the mothers and fathers of the lower scoring cluster 2 children.

Summary

The small size of the sample, and the fact that cluster 2 is composed of 5 family units make it unwise to place a great deal of weight upon the cluster analysis findings. Nevertheless, one point which should be made on the basis of these findings is that it may be important to understand and measure the effect of both parents, as an entity, upon the development of the child. Of course, this is not to imply that the examination of interrelated family patterns of simplicity—complexity preference will supply answers as to the actual genesis of simplicity—complexity preference. Such knowledge can be gained only by research which provides a test of the assumption that parental patterns of simplicity—complexity preference are directly involved in child rearing practices and that these practices influence the child's simplicity—complexity preference. For example, it might prove worthwhile to investigate whether parental interaction manifest on simplicity—complexity preference measures is implicated in the complexity of developmental stimuli afforded by the home environment, and whether this in turn affects the child's simplicity—complexity preference.

Conclusions

The complexity preference results disclosed in the present chapter with the separate groups of mothers, fathers, and children fit into the framework as formulated in the Interim Conclusions of Chapter V and the Conclusions of Chapter VI. They are most concisely covered by the statement that the correlation between the RA and Berlyne's figures is always the highest and is also the most persistent.

With respect to the relation between parents' complexity preference and that of their children, the outcomes are somewhat equivocal. The correlations of note are the negative ones between the mothers' complexity preference and the children's complexity preference. Thus, it may be that a mother's complexity preference has an adverse effect upon her child's complexity preference. Yet, the most salient result of the two-cluster solution is that the parents of the children who prefer more complexity on the three principal measures have complexity preference scores which seem to be fairly similar, while the parents of the children who prefer less complexity have divergent scores. So, the interaction between the parents in terms of complexity preference might be the more significant condition from the point of view of the child's complexity preference. Both possibilities require further study with much larger samples of family units.

CHAPTER VIII.

The Summing Up

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The Summing Up

When a study is completed, it seems worthwhile to go back and trace the connectedness in order to determine where more detailed conceptualization is indispensable, and to gain some idea of the most profitable areas for future research.

Self-Actualization

With respect to creativity, Yamamoto (1965b) observes: "The major task would appear to be in gathering as much reliable information about as many carefully defined criteria as possible" (p.289). And the central concern of this study, as expressed in the Statement of Purpose (Chapter I, p.1), was to examine a construct, preference for complexity, which is embedded in the creativity literature. The important theoretical aim of the first chapter was to emphasize a contradiction implicit in the theorizing which surrounds the concept of creativity: on the one hand, creativity is the prerogative of a talented few; on the other hand, it is regarded as a potential for all. Consequently, a distinction was made between great-achievement creativity evinced in productivity, and personal-living creativity characterized by self-actualization. Basically, self-actualization refers to the realization by each individual of his unique capacities, and so by implication, is a possibility for all individuals. It was hypothesized that preference for complexity is more closely related to the self-actualizing view of creativity.

Golann (1962) formulates a link between complexity preference on the RA and self-actualization. That is, he feels such preference indicates that the individual is attempting to experience his fullest perceptual, cognitive, and expressive potential in his interaction with his environment. Substantiating this contention, he cites his finding that the complex RA items are significantly more ambiguous, in that they are evocative of a larger number of meanings, than the simple RA items. Thus, the complex figures provide more opportunity for personal interpretations. Extending the research, he reports that 6th- and 8th-grade students with high scores on the RA express liking for activities that allow for greater self-expression; while the low RA scorers like more routine and structured activities.

In a study carried out in 1952, Barron investigated the simplicity—complexity preference of 40 male postgraduates, who were within one year of obtaining their final higher degree, 20 having been rated original and 20 unoriginal on the basis of research productivity by the faculties of their respective departments. The subjects were administered the Barron-Welsh Art Scale (BW), which correlates .85 with the Revised Art Scale (RA) of the Welsh Figure Preference Test (Welsh, 1959b). Although the distribution of scores on the BW was bimodal, such that one group of students preferred the complex figures and one group preferred the simple figures, this grouping did not overlap the high-low originality grouping. More specifically, the two types of preference occurred with equal frequency in the two classes of students. In other words, the complexity measure appears to be independent of creative productivity. Yet, Barron (1958, 1966, 1968) has shown that persons, judged creative according to productive output, tend to prefer complexity. In practice, creative productivity and self-actualization may well usually intercorrelate. But, this in no way signifies that productivity is a precondition for self-actualization, nor that every individual who produces in a creative sense does so from a self-actualizing motive.

The nature of the relationship between self-actualizing creativity and creative productivity certainly requires further elucidation. However, before the relevant work is feasible, it will be necessary to elaborate in a more precise manner what is meant by self-actualization in both behavioral and theoretical terms. As self-actualization is very much a global construct in that it may become manifest in any one, or for that matter more than one, of the individual's areas of interaction with his environment, an appropriate research approach would be to return to the clinical interview-type setting.

Complexity Preference: Construct Validity as a Measure of Self-Actualization

Regarding the RA as the criterion measure, the complexity preference outcomes revealed in the present study will be reviewed with particular consideration given to the suitability of complexity preference as an index of self-actualization. In Chapter II, it was noted that the simplicity—complexity dimension was an explanation imposed on the RA scale in the light of a factor analysis. So, two other measures comprising stimuli varying in complexity, Berlyne's Figures and the Random Polygons, were also employed. For the argument advanced was that consistency in the direction of scores on these three measures would offer support for two affiliated issues: 1. the RA does indicate differences in simplicity—complexity preference; and 2. such preference reflects an underlying simplicity—complexity dimension of personality.

Overall, there is consistency of simplicity—complexity preference across the three principal scores, the RA, Berlyne's figures, and the Polygon $\bar{X}$. To enumerate, for the 53 ESN (educationally subnormal) children dealt with in Chapter III, for the 284 normal children in Chapter V, for the 231 normal children in Chapter VI divided into a sample of 127 girls and a sample of 104 boys, and for the 64 adults, a high score on the RA is associated with a high score on Berlyne's figures, and a high Polygon $\bar{X}$ score.

Thus, it can be said that the RA is a measure which taps simplicity—complexity preference, and more important, simplicity—complexity of personality. The RA is seen to be viable for use with retarded children. Furthermore, it is not correlated with an intelligence measure, mental age, for these children. Finally, Barron's (1952) finding was replicated with the fifth-form art class: complexity preference on the RA is independent of an originality rating made on the basis of art production. In general, the RA possesses construct validity (Helmstadter, 1964). That is, the complexity preference results with the RA are compatible with the theoretical view of self-actualization developed in the first chapter. Therefore, it now seems more reasonable to propose that complexity preference, especially on this measure, can serve as an index of self-actualization.

Additional research on two levels is suggested.

I. At a fundamental level, research on what is involved in consistency of simplicity—complexity preference remains to be done. This will necessitate a determination of the properties which can lead to the designation of a stimulus as either simple or complex. It should be remarked, in this context, that the correlation between the RA and Berlyne's figures is always the highest and is also the most persistent. In the Interim Conclusions of Chapter V, it was argued that these two measures embody more of the properties covered by the term complexity. Berlyne's procedure of investigating subjects' reactions to various stimulus characteristics, both separately and conjointly, may prove instrumental for the purposes of defining complexity.

However, one finding deserves mention. With a sample of university adults, Berlyne and Lewis (1963) report an average correlation of .32 between preference for complexity on the BW and the frequency of selecting the more complex of pairs of figures from Berlyne's non-X and X complexity series to view again. The average correlation between the RA and Berlyne's figures in the present study, with a sample composed mainly of children who tend to be less consistent in their preference than adults, was .52. If the least consistent subjects, that is the youngest children, the 6- to 7- year-olds, are omitted from the calculation, the average correlation is .55. So although diversive exploration, the choice of a particular stimulus to see again, seems to bear some connection to preference, it does not appear to be equivalent to a verbal preference response.

II. The second level on which research is essential concerns the ramifications of the simplicity—complexity personality dimension. A plan proposed in the Conclusions of Chapter VI is by means of self-ratings on an adjective check list to discover the personality traits of children and adults differing in simplicity—complexity preference. Subjects could be selected according to low, medium, or high scores on the RA alone; or an alternative grouping would be a low, medium, high division taking into account scores on the three complexity preference measures, such as those afforded by the cluster analyses.

Barron maintains that complexity preference on the RA scale reflects complexity of personality: the individual who prefers complexity is predisposed to allow complexity into the structuring of his experience. If so, the question arises as to why complexity of personality does not show itself in handling the complexity implicit in the impression formation tasks. Preference for complexity may indicate that an individual is complex, but cannot be construed to denote that he is equally complex in all his areas of interaction with the environment. Although this accords with the contention that self-actualization may become manifest in one or several of the areas of the individual's life space, it raises the problem of specificity—generality of complexity of personality. The Impression Formation Tests are measures of interpersonal or social complexity (Schroder, Driver, and Streufert, 1967; Streufert and Driver, 1967). What seems to be needed, therefore, is a less area-specific approach to the study of structuring. One research plan would be again to select subjects varying in simplicity—complexity preference by either of the two procedures outlined above, and use an interview technique to determine 1. whether the individual attempts to structure complexity, and 2. the area specificity—generality of his attempt.

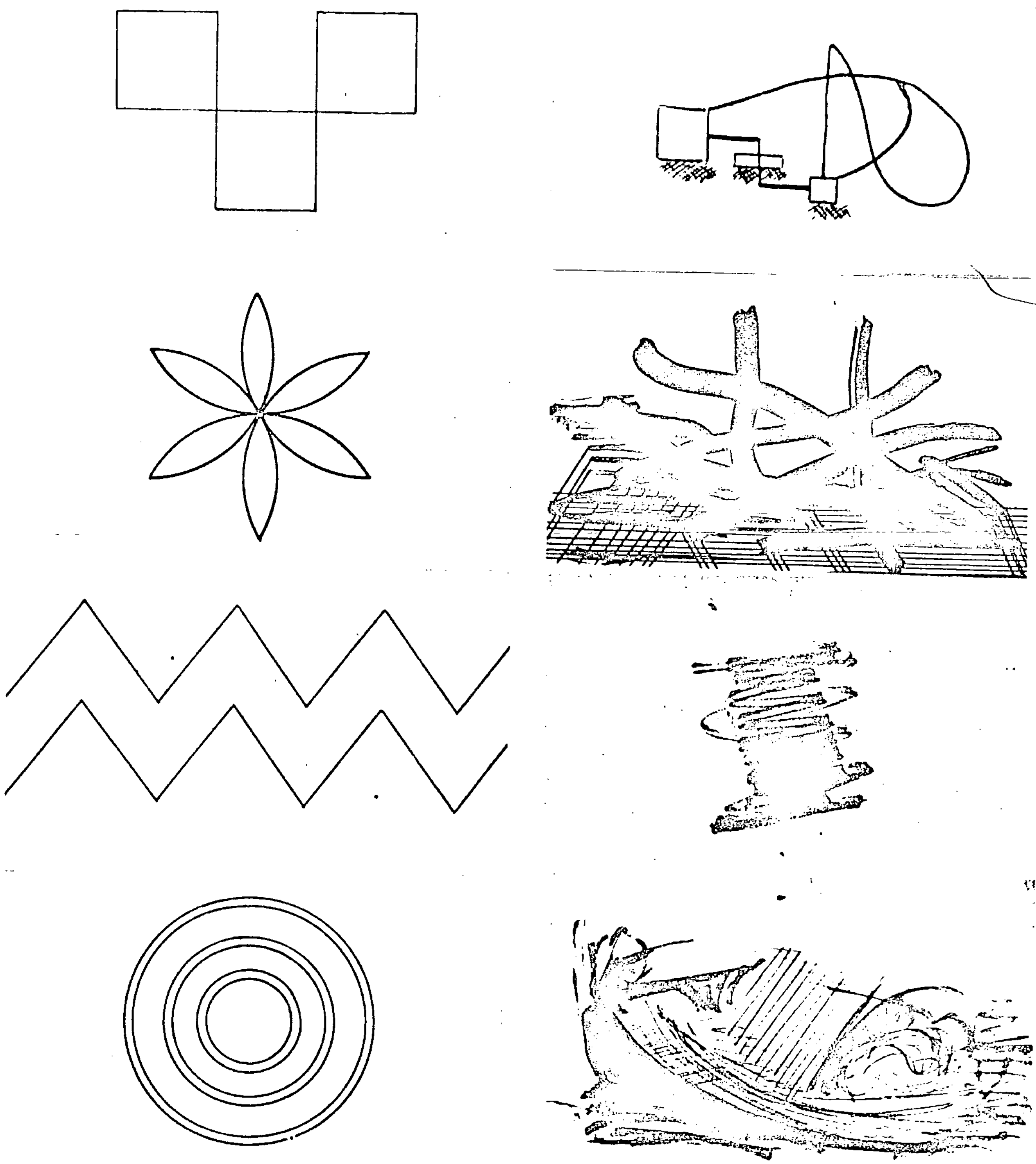
With the focus on personality, the end-point of the investigation is to ascertain whether the complex person is, in fact, self-actualizing.

APPENDIX I

Complexity Preference Tests

Revised Art Scale of the Welsh Figure Preference Test

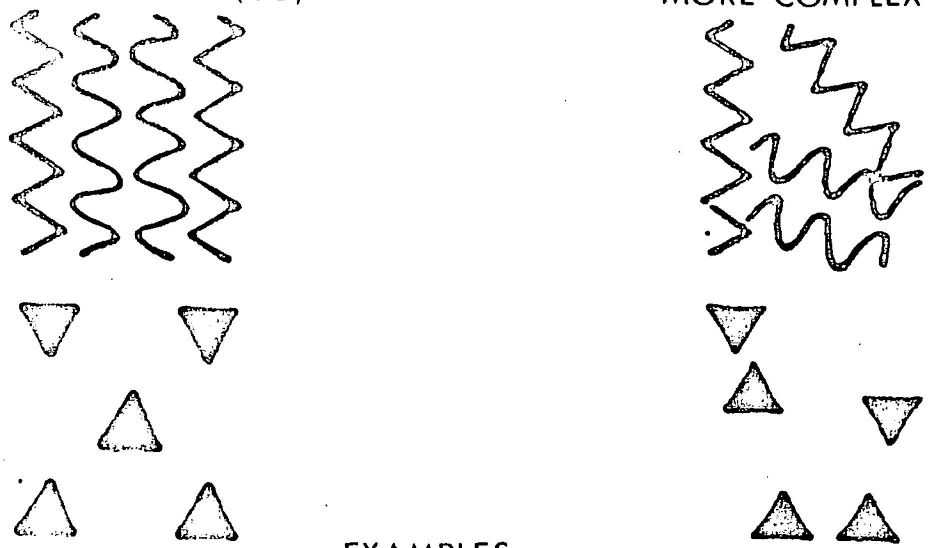
SIMPLE COMPLEX



Berlyne's Figures

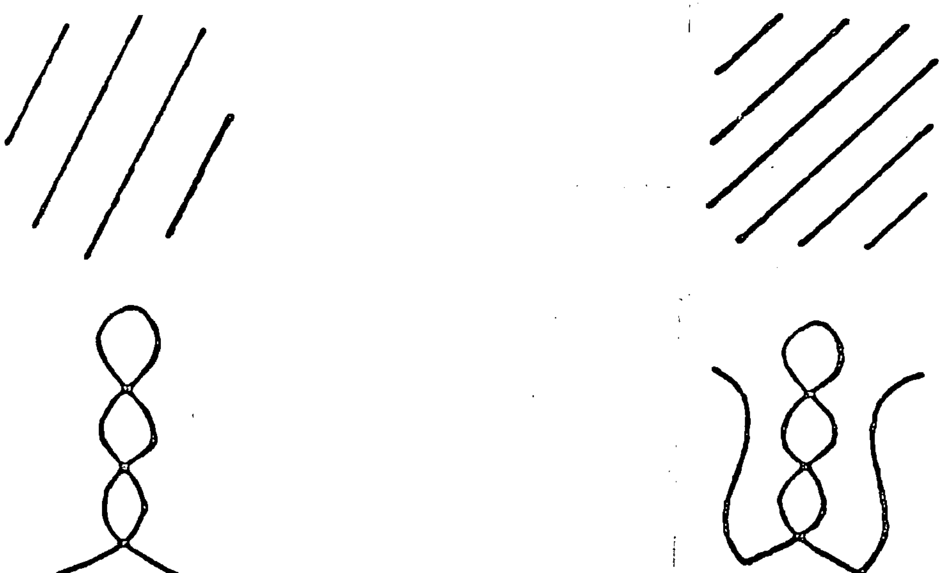
Non -X Series

LESS COMPLEX (LC) MORE COMPLEX (MC)



EXAMPLES

A. IRREGULARITY OF ARRANGEMENT.



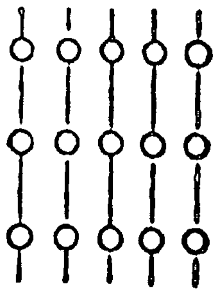
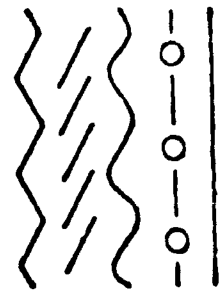
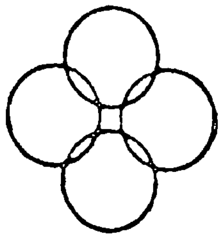
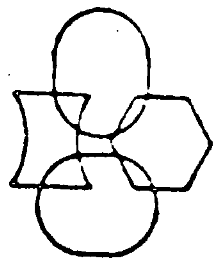
EXAMPLES

B. AMOUNT OF MATERIAL.

Berlyne's Figures

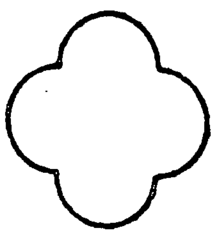
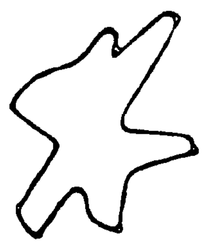
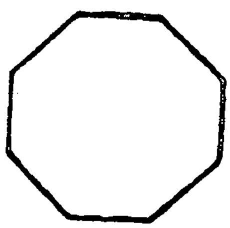
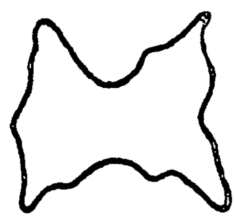
Non – X Series

LESS COMPLEX (LC) | MORE COMPLEX (MC)

EXAMPLES

C. HETEROGENEITY OF ELEMENTS.

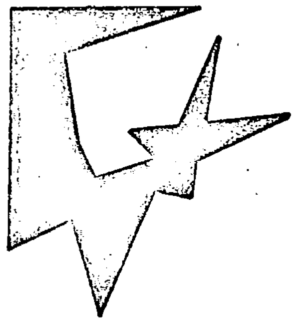
EXAMPLES

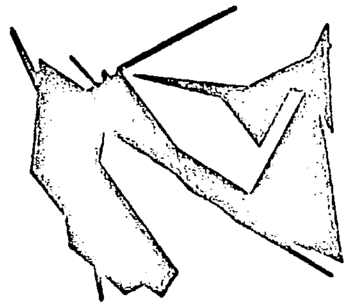
D. IRREGULARITY OF SHAPE.

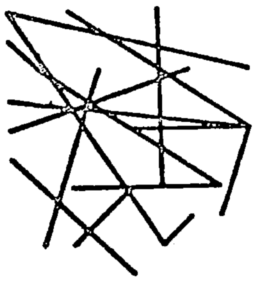
Berlyne's Figures

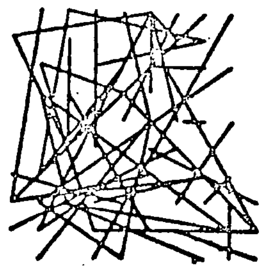
X Series

LESS COMPLEX (LC) | MORE COMPLEX (MC)



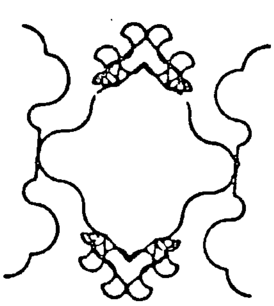


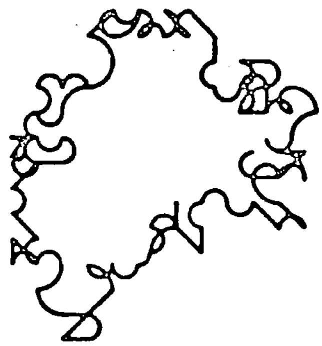


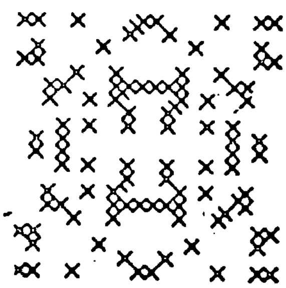


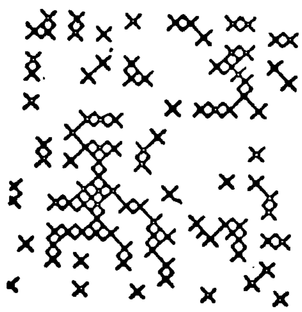
EXAMPLES

A. NUMBER OF INDEPENDANT UNITS









EXAMPLES

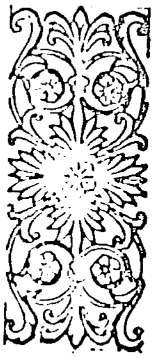
B. ASYMMETRY.

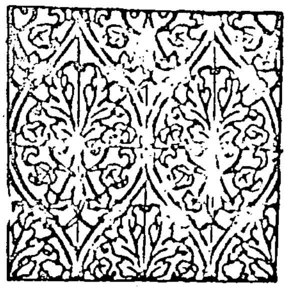
Berlyne's Figures

X Series

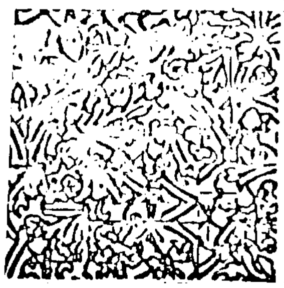
LESS COMPLEX (LC)

MORE COMPLEX (MC)





EXAMPLES

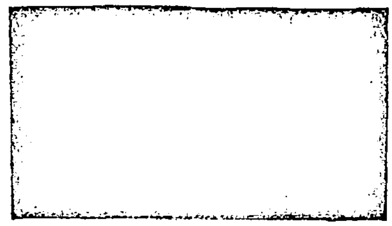


C. RANDOM REARRANGEMENT.

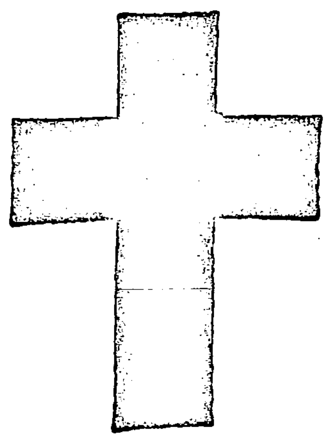
Random Polygons

SYMMETRICAL SHAPES

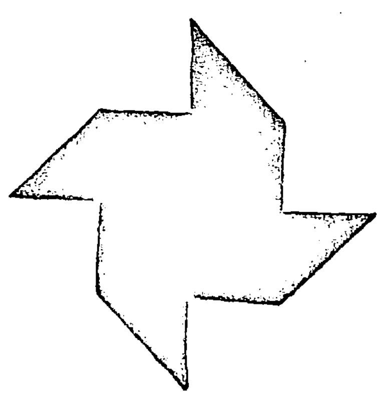
(BIRKHOFF, 1933)



4 POINT



8 POINT

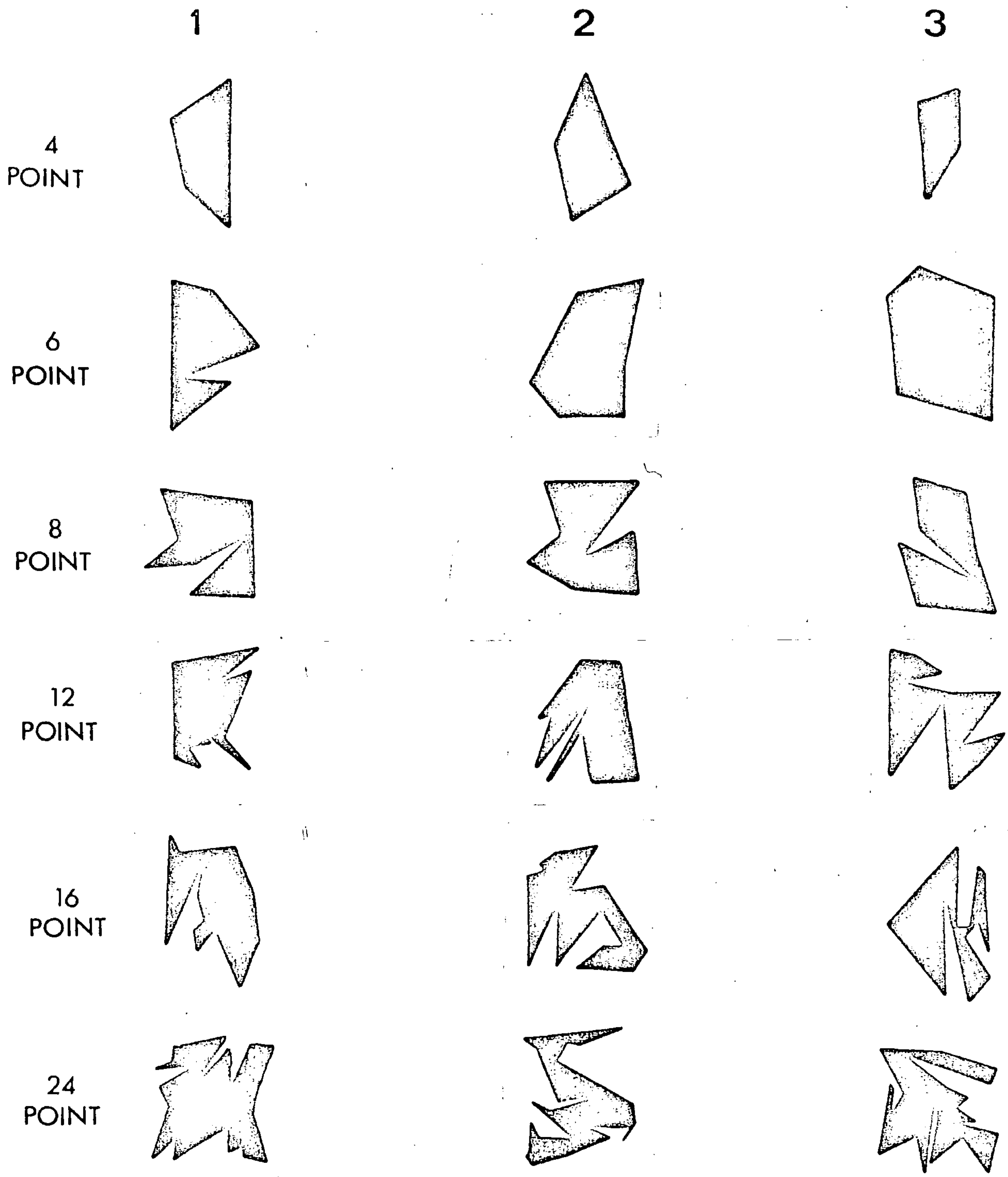


10 POINT

Random Polygons

ASYMMETRICAL SHAPES

(VANDERPLAS AND GARVIN, 1959)



APPENDIX II

Impression Formation Tests

Children: Examples

Male age 9 Chester Road Junior School

The boy in the film was called John. John saw a boy fall off his bike. John helped him up, and picked his bike up. Then the boy set off on his bike again. Then a boy said do you want a sweet. He said no and took the whole bag off him. Then he saw other boys reading comics. John kicked all the comics away.

description: both good and bad themes
incomplete

Male age 13½ (third form) Bede Grammar School

I think that John looks quite an unhappy person. He can be helpful when he tries as he did in the film by helping a boy out when he fell off his bicycle. Even though he can be helpful he can also be a bully, for instance when walking past the three boys reading magazines, he kicked the magazines away. Also when a boy offered him a sweet he knocked the sweet out of his hand and took the bag of sweets away.

description: both good and bad themes
incomplete

Female age 9½ Chester Road Junior School

The boy in the film was called John and he helped a boy who fell off his bike. Then he walked on and he saw some boys playing football. Then he saw a big boy push another boy. So he went up to him took the ball off him and gave it to the boy who got pushed. Then he walked on. Next he saw a boy with some sweets. The boy offered him some sweets. But John only pushed the boy and took the whole bag. Then he walked on. Next he came to some boys reading comics so he kicked the comics over and then he walked home.

description: both good and bad themes
complete

Female age 17 (sixth form) Thornhill Comprehensive School

First of all John walked away from the house towards us, came nearer. Then a little boy rode past and fell off his bike, John picked him up and set him off, balancing the bike for the boy. The next thing he did was, when the three boys were playing football, one of them had entered the game unwanted, so John chased him away and gave the ball back to the other two, one of which was the boy on the bike. Then he took some sweets off one of the boys who was sitting by himself on a tree stump. Then he walked through a group of little boys who were sitting on the grass, and scattered their playthings. Each incident happened with a pause in between. The boy was helpful in the first two incidents, then suddenly he became a bully.

description: both good and bad themes
complete

Female age 11 Chester Road Junior School

John was kind to the boy who fell off his bike and helped the boys who played football and helped them get their ball back. But he stole something and kicked some comics. So altogether he wasn't very nice at all.

description: both good and bad themes
complete

inference: simplified

Female age 11½ (first form) Bede Grammar School

The boy is a bully so he throws his weight around. He is greedy because he took the boys sweets. When the boy fell off his bike he was helpful to help the boy up. He does everything he wants and gets away with it. He is spiteful and does not care about anything.

description: both good and bad themes
incomplete

inference: simplified

Female age 14 (third form) Bede Grammar School

I think that John was really a rather quiet sort of person generally, but whenever he saw that anyone was in trouble, he was always quick to help them. He was certainly a willing helper and I also think that he was quite brave and fearless, because when he knocked the boy down who was spoiling the football game, he did it quickly and without hesitation. I also think that he would always help anyone who was hurt. It is possible that many of the boys in the town liked him because he was like this. He certainly looked rather solemn and determined in the film. I wish I could be like John but I don't think I ever could be.

John hated any kind of spite, and you can see this by what he does to help people. I think that if he hated spite among people, he would hate cruelty to animals as well. Although there is nothing about it in the film, I still think he would feel this way.

description: good theme only
incomplete

inference: simplified

Female age 10 Chester Road Junior School

The boy in the film was helpful at first, but I think he got a bit selfish and spoiled all the other boys games. He might have been hungry when he took the other boys sweets.

description: both good and bad themes
incomplete

inference: local

Male age 14 (third form) Thornhill Comprehensive School

The boy in the film was helpful and considerate at the beginning e.g. getting the ball off the bully, but he did not receive any thanks from the persons he helped. But near the end of the film he was offered a sweet by one of the boys but he threw it away and took the packet from the boy and walked off. And also when he saw some boys who he had helped before reading comics he kicked the comics away. The boy seemed to me to resent not being given thanks etc.

description: both good and bad themes
incomplete

inference: local

Female age 17 (sixth form) Thornhill Comprehensive School

In the opening part of the film we see a boy of about 14 years. His face wears the expression of one contemplating what to do with the day ahead. He looks fairly happy with a certain air of mischief about him. While sitting alone on a rock, a small boy on a bicycle rides by and suddenly gets into difficulties and falls off his bike. The boy seeing this, is quick to respond and goes to the aid of this small child, and sends him on his way again after helping him back upon his bike. The boy then wanders off, he seems to have no particular aim in mind, he is uncertain what to do. While wandering he comes across a group of youngsters playing ball, and who are apparently being bullyed by an older boy who is trying to take away the ball from these boys. The boy once again doesn't stop to think what to do but goes to the youngster's immediate aid, pushes the older boy away and retrieves the ball. After these two good and kind actions, the boy seems to change. While walking away a young boy offers him a sweet from his bag, but the boy pushes him away and grabs the whole bag of sweets. He then walks away and comes across a group of boys reading comic strips. He marches straight through the group kicking away their comics.

The boy it seems has helped people and then what we think is completely out of character does the opposite and bothers people by being unkind. This may be the actions of a perfectly normal boy, who after helping, decides to be purposely mischievous. Perhaps he is angry that he can't afford sweets or comics or perhaps he just feels like any other boy that he has done his share of kind(n)ess and is tired of doing all these good deeds as if he were the perfect 'good angel'. He wants a share of the fun of being mischievous. Just the reactions of a normal boy filling in the day with whatever actions come to mind, be they good or bad.

description: both good and bad themes
complete

inference: general

Male age 17 (sixth form) Thornhill Comprehensive School

The boy at first appears to be of reasonable, in fact good, character. His actions when helping the small boy who had fallen off his bike and stopping the bully from taking the children's ball were good and show what must be the good side to him.

Then he is offered some sweets and snatches the whole bag from the child, then he kicks the game the children are playing and spoils it. By doing this, he shows himself in a bad light and after this I would think he was a nasty person but with a few good points. The way he walked and looked at the camera suggest he was shy and perhaps lonely. He may have been annoyed because the other children did not ask him to play with them even after he assisted them. In considering this I would say he is moody and ranges to the extremes of emotion and this is shown in his actions.

description: both good and bad themes
complete

inference: general

Adults: Examples of the Final Impression with All 6 Adjectives

Male

He or she would be average height with horn rim glasses if worn. A little on the portly side but not slow in manner of walking. When conversing the person would be forceful in presenting his own point of view and inclined to 'browbeat' the person he was talking too verbally.

physical description
concrete

Female

My opinion of this person is not very clear. I feel most people have these characteristics but not all in one person. I just can't seem to get a clear impression. I think perhaps tall and lean in build with sharp features and a rather cruel expression.

physical description
concrete

Male

Not a very likeable person at all. Anyone with intelligence should be able to see the other sides argument and should not be envious to any great degree.

concrete

Female

Such a person would be very hard to live with. I really can't imagine a person having all these characteristics as one outweighs the other.

concrete

Male

The man we are describing with characteristics above has a wide field at his disposal and will go a long way in life. In his work being intelligent and industrious will be an advantage, but impulsive, critical, stubborn, envious can be a disadvantage.

concrete

Female

Able to converse easily but not particularly a popular sort of person. A person always wanting to be the centre of attraction. A person disliked by most people. Just one of those people you have to put up with. A person you have to tolerate.

concrete

Male

I could imagine this type of person being the deputy managing director of a successful business having failed to reach the manager's position due to some bad decisions made on impulse, rather envious of his boss but still working hard and hoping for the ultimate prize in due course.

abstract

Female

This person is very quick-witted, always "on the go", inclined to let her tongue run away with her at times. She is often too outspoken of others, at times to their detriment. She sticks to her guns and won't change her mind although she is jealous of others who get more out of life than she does herself.

abstract

Female

She will be clever enough to be a good cook, dressmaker, knitter etc., and industrious enough to be able to complete any task she sets out to do. Will enjoy unexpected visits to other peoples homes but have plenty to say concerning her visit (uncomplimentary) upon her return. Most of the things she has seen on her visit will be discussed endlessly and enviously on her return. I don't suppose she would be happy enough with her own lot to issue an invitation for her friends to visit her.

abstract

Male

Though one may dislike a person who was envious and stubborn it does not mean that they are of no value to society for intelligence and industry may well be chanelled to some use. To be critical does not mean to be unlikeable and allowance must be made for these qualities. Impulsiveness may be good or bad but with intelligence may lead to pleasing relationships and only occasional "clangers". On the whole I would be prepared to get along with this person — use them — knowing that they would use me — but I wouldn't like them unless they had other qualities such as honesty of purpose and loyalty.

abstract

Female

A person with a good background knowledge, maybe university degree who sticks to his principals even though he may be in the wrong. Not easily side tracked and very critical of his own faults. Tending to break out every now and again and go off to the wilds on his own. Envious only to a degree of wanting to improve his lot — in other words ambitious for life. A person who would want the best out of life, maybe have only one child and be very precise about his own life.

abstract

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