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The Open-Closed Cognitive Dimension and Divergent-Convergent Abilities

Michael J. Uhes

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THE OPEN-CLOSED COGNITIVE DIMENSION AND
DIVERGENT-CONVERGENT ABILITIES

by

Michael J. Uhes

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

UTAH STATE UNIVERSITY
Logan, Utah
1968
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In bringing my total degree program to a successful completion, I offer my deepest gratitude to Dr. Glendon Casto, the chairman of my committee. I would like to thank Dr. James P. Shaver for the support and guidance he offered in the development and execution of this study. Also invaluable in the completion of this study was the aid and encouragement of my scorer, Emily.

Michael J. Uhes
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ABSTRACT

The Open-Closed Cognitive Dimension and
Divergent-Convergent Abilities

by

Michael J. Uhes, Doctor of Philosophy

Utah State University, 1968

Major Professor: Dr. Glendon Casto
Department: Psychology

The relationship between level of dogmatism and divergent-convergent abilities was investigated in a sample of high school subjects.

Rokeach's Dogmatism Scale, Form E, and tests of divergent and convergent ability were administered to all subjects. On the basis of their performance on the Dogmatism Scale, three experimental groups were formed: high, medium, and low dogmatics.

An analysis of the data showed dogmatism to be negatively correlated with originality, flexibility, composite divergent and composite convergent scores. Fluency was the only ability not negatively correlated with dogmatism. High dogmatic subjects performed convergent operations better than they performed divergent operations, while low dogmatic subjects performed both operations equally well.

(86 pages)
CHAPTER I

INTRODUCTION

Historically, considerations of the roles that beliefs play in our thinking have been left almost exclusively to philosophers and theologians. In addition, early study usually focused upon the qualitative evaluation of beliefs; i.e., were they consonant with a particular view of the world (Brehier, 1963). However, within the last three decades the emerging behavioral sciences have applied research techniques and scientific analysis to the study of beliefs in order to impartially describe and predict their relationship to a wide range of cognitive variables.

The orderly arrangement of findings based upon behavioral observation and research techniques led to the development of the constructs of authoritarianism, ethnocentrism, and social discrimination. The defining characteristics of these constructs were the content of one's beliefs; i.e., "what" an individual believed. This emphasis on content tended to draw attention away from the ways in which an individual puts his various specific beliefs together into a total belief structure; i.e., "how" an individual believed. However, research has shown ways of structuring beliefs not only to exist (Rokeach, 1952), but to remain consistent within an individual. This resistance to change beliefs becomes apparent as we note how outmoded ideological trends persist in the face of contradictory facts and changed social conditions.

Recently, research has begun to focus on the question of "how" a person believes. Some studies have focused on the openness or closedness of a belief system and how this is related to one's ability to function...
intellectually. "Openness and closedness" are used here to describe the permeability of an individual's belief system to new information. The development of theories dealing with open and closed thinking place emphasis not on the content of what a person believes, but rather on the structure of the person's beliefs. The relative permeability of the structure of a belief system cuts across specific content; that is, the openness or closedness of a belief system is not restricted to any one aspect of a person's thought.

While the study of beliefs has moved from considerations of specific content to the overall structure of a belief system, the study of intellect has moved from the general to the specific. Early research on this facet of man generally viewed intellectual functioning from a global view; i.e., intellect is a unitary trait. Only recently has the structure of intellect been seen as the product of a number of cognitive abilities, each relatively independent of the other. In reviewing the development of theory regarding intelligence, Guilford (1967, p. vii) provides the following summary:

Most attempts to provide a comprehensive and systematic theoretical foundation to a theory of intelligence have been abortive because of a lack of sufficient information and because of persistent adherence to the belief in Spearman's 'g.'

Within the broad framework of this theoretical background, the present study developed. A statement of the specific problem for this study follows.

**Problem Statement**

Rokeach (1960) proposed the existence of a personality dimension characterized by the openness or closedness of an individual's belief system; he named this dimension "dogmatism." There appears to be some
support for the validity of the construct and the instrument developed to measure it (Rokeach, McGovney, and Denny, 1955; Rokeach and Fruchter, 1956; Fruchter, Rokeach and Novak, 1958). This research will be reviewed later.

Employing Rokeach's test instrument, researchers have found a close relationship between one's level of dogmatism and subsequent success at performing a wide variety of cognitive tasks. However, considerable confusion exists regarding exactly what kinds of cognitive tasks are most clearly related to level of dogmatism. This point will be discussed further in Chapter II.

Some writers (e.g., Nunnally, 1967) find Guilford's (1959) theoretical view of the structure of intellect illuminating in the sense of clearly describing what abilities are involved in performing cognitive tasks. Guilford (1960, 1967) has hypothesized the existence of 120 separate intellectual abilities. To date (Hoepfner, Kazero, and Guilford, 1966), 91 abilities have been factorially isolated.

The problem which is the basis for this study is, then, that we presently have evidence that the openness of a belief system is related to one's ability to perform cognitive tasks; however, given Guilford's clearcut model of the structure of intellect, we have very little information as to the exact nature of the tasks involved.
CHAPTER II
REVIEW OF RELATED RESEARCH

Two major areas of research are related to this study. The first deals with various theories of beliefs and the nature of belief structure. The second with the more specific question of the manner in which belief structure is related to one's ability to perform cognitive operations.

The Authoritarian Personality

There were, undoubtedly, many contributing streams of research and theory in the evolution of the construct of dogmatism. Fromm (1941) and Maslow (1943) were among the earliest contributors to the study of beliefs; however, the study of dogmatism evolved in large part, from the early theory and research on the authoritarian personality.

The American Jewish Committee in May, 1944, invited a group of American scholars of various backgrounds and disciplines to a conference on racial and religious prejudice. One outcome of the meeting was the development of a research program which would enlist scientific method in understanding these problems. The study, which began at a time when anti-Semitism, especially in Nazi Germany, was of great concern to social scientists as well as laymen, widened over a five-year period into an exploration of the relation between personality, political ideology, and social discrimination (Adorno, et al., 1950).

Adorno, et al. (1950) derived and defined a number of personality variables, which when taken together, describe what came to be called the
"Authoritarian Personality." These variables are listed below, together with a brief definition of each:

a. Conventionalism. Rigid adherence to conventional, middle class values.

b. Authoritarian submission. Submissive, uncritical attitude toward idealized moral authorities of the ingroup.

c. Authoritarian aggression. Tendency to be on the lookout for, and to condemn, reject, and punish people who violate conventional values.

d. Anti-intraception. Opposition to the subjective, the imaginative, the tender-minded.

e. Superstition and stereotype. The belief in mystical determinants of the individual's fate; the disposition to think in rigid categories.

f. Power and 'toughness.' Preoccupation with the dominance-submission, strong-weak, leader-follower dimension; identification with power figures; overemphasize upon the conventionalized attributes of the ego; exaggerated assertion of strength and toughness.

g. Destructiveness and cynicism. Generalized hostility, vilification of the human.

h. Projectivity. The disposition to believe that wild and dangerous things go on in the world; the projection outwards of unconscious emotional impulses.

i. Sex. Exaggerated concern with sexual 'goings-on.'

(Adorno, et al., 1950, p. 228)

With the above definitions in mind, the authors originally developed the F-Scale, sometimes referred to as the Authoritarian Personality Scale, in order to provide an index of receptiveness to antidemocratic propaganda. One might say, therefore, that the F-Scale attempted to measure the potentially antidemocratic personality.

However, various studies (summarized in Allport, 1961) have demonstrated that high scores on the F-Scale are associated to a marked degree with racial and ethnic prejudice, and with other forms of hostile
and autocratic social conduct. Christie and Jahoda (1954) noted that scores derived from the scale had been used in studies of prejudice, leadership, rigidity, adjustment, and group behavior. Furthermore, the F-Scale has been found to correlate with intelligence, xenophobia, family ideology, anxiety, and cooperation in experimentation to name but a few of the multitude of variables to which it has been related (Titus and Hollander, 1957). It is on the basis of research findings that the F-Scale has come to be used as an indirect measure of prejudice and underlying personality predispositions toward a fascist outlook on life.

In attempting to clearly describe the authoritarian personality, Christie and Cook (1958) have provided one of the most comprehensive summaries of the research on the F-Scale to date. The amazingly large number of research studies and the heterogeneous nature of the research required that their summarization be divided into various categories; social sophistication and the F-Scale, political attitudes, authoritarian ideology and child rearing, interpersonal behavior, prejudice, and psychopathology. The main points in their summary were as follows:

1. There is a high positive relationship between scores on the F-Scale and social sophistication; social sophistication being variously defined as liberality of social outlook, occupation, level of education, and socioeconomic level.

2. The F-Scale is a measure of politically right authoritarianism; e.g., adherents of the Communist Party make low scores, while Fascists make high scores.

3. There is general support for the hypothesized relationship between strict practices in child rearing and subsequent authoritarian and intolerant beliefs.

4. Low scorers on the F-Scale have greater perceptiveness of others than high scorers. High scorers, interestingly, are highly unfitted for the exercise of authority and are ineffective in solving conflict situations.
5. It may be possible to have any degree of mental illness without showing authoritarian attitudes, but it may not be possible to manifest an extreme degree of authoritarianism without being psychologically maladjusted. (Christie and Cook, 1958, p. 176-185)

Following Christie and Cook's (1958) comprehensive summary of the literature, additional research using the F-Scale has been conducted on a variety of topics. For example, Alper, Levin, and Klein (1964) found that subjects scoring high in authoritarianism were more moralistically conventional in value judgements than subjects scoring low in authoritarianism. They also tend to be more punitive interpersonally (Roberts and Jesson, 1958) while strongly embracing Christian fundamentalism (Frymier, 1959; Rhodes, 1960).

In summary, the research on the authoritarian personality describes a rather paradoxical individual. He appears to be rather poorly socialized in many respects, while being highly socialized in terms of seeking approval from those he sees as above him in an authoritative hierarchy. He is sadistic in his relationships to those below him in such a hierarchy, while being masochistic to those above him. While strongly admiring the qualities he perceives in leaders, he apparently possesses few leadership qualities himself. Finally, while strongly verbalizing a consistent and certainly unique set of values, he does not have these values deeply internalized in the sense that he can comfortably give them up if authority so dictates (Weima, 1965).

**Dogmatism: The Open and Closed Mind**

As noted above, the theory and research on the authoritarian personality were central in the development of the construct of dogmatism. However, there were other antecedent streams of thought instrumental in
the evolution of the construct. Following are examples of the kinds of thought which influenced Rokeach.

Bell (1963) has described the radical right of the 1960's as a movement that fears not only Communism but "modernity" and that in its equation of liberalism with Communism, it evidences closed and intolerant thinking to a marked degree. A similar criticism of extreme leftist movements was made by Hoffer (1951) in his analysis of Marxist doctrine. He expressed the view that civilization has not yet fully recovered from the transition from the tribal or closed society, with its submission to superstition, to the open society, which helps set free the critical capacities of man; and that Marxist doctrine would have civilization remain a closed society.

Perhaps the sharpest example of the proposal that closed thinking is evidenced by the Left as well as the Right, was noted in a speech by Adlai Stevenson on Communist forms of government:

> Every society, I suppose—including ours—has individuals who hunger for conflict, who seem to get a positive joy out of having an enemy to hate and destroy and will doubtless miss the cold war when it finally ends. Indeed it is a rare individual who has in him none whatever of this warrior urge! But a closed society goes one fatal step further. It elevates the closed mind into an official requirement; it ordains struggle and conflict as the highest and permanent duty of the citizen; and it brands all those whom it cannot control as actual foes. (Stevenson, 1962, p. 553)

An inquiry (Popper, 1945) into the nature of mass movements has pointed out that the individuals who populate the Left and the Right have many characteristics in common. For example, Hoffer (1951) noted that individuals who are "ripe" for such movements may be drawn just as easily to one extreme cause as to another, even though the two positions may be in direct opposition in terms of political ideology.
The tendency for such a person to defect from one extreme position to another extreme position that is in violent competition with the first has not been an uncommon occurrence. Hitler considered his German Communist enemies to be a source for potential Nazi party members: "The petit-bourgeois Social-Democrat and the trade-union boss will never make a National Socialist but the Communist always will" (Rauschning, 1940, p. 234). On the other hand, the Nazi has also been seen as a source for future Communist recruits (Voigt, 1938). The important factor appeared to be the necessity for having followers who would be absolute in their commitment to an ideological cause.

That closed thinking is not unique to particular political ideologies was noted by Bode (1937) in his explanation of the difficulties faced by individuals in the United States who are ostracized because they happen to live in certain communities where the people adhere to narrow cultural patterns. An illustration of the relationship between narrow cultural patterns and closed thinking was suggested in Silver's (1963, p. 5-6) account of racial problems in his native State of Mississippi:

There are parallels between the 1850's and the 1950's which remind us that Mississippi has been on the defensive against inexorable change for more than a century, and that by the time of the Civil War it had developed a closed society with an orthodoxy accepted by nearly everybody in the state. The all-pervading doctrine, then and now, has been white supremacy whether achieved through slavery or segregation, rationalized by a professed belief in states' rights and bolstered by religious fundamentalism. In such a society a never-ceasing propagation of the "true faith" must go on relentlessly, with a constantly reiterated demand for loyalty to the united front, requiring that non-conformists and dissenters from the code be silenced, or, in a crisis, driven from the community. Violence and the threat of violence have confirmed and enforced the image of unanimity.

It was the above type of speculation, along with validated short-comings of the F-Scale (Barker, 1958; Shils, 1954; Christie and Cook, 1958), that contributed to Rokeach's initial concern about the open and
closed mind (1952), and which led eventually to the formulation of his theory on dogmatism and the publication of a summary of his studies dealing with open and closed thinking (Rokeach, 1960).

The formulation of Rokeach's theory of dogmatism was preceded by his own studies of narrow-mindedness and rigidity (1951). This preliminary work on narrow-mindedness, prejudice, concreteness of thinking, and reification in thinking, led to his early efforts to isolate and measure "the dogmatic personality" (1952).

In establishing the construct of dogmatism, Rokeach (1960) asserted the basic assumption that despite differences in ideological content, certain uniformities would exist in minds structured dogmatically. He suggested that dogmatism in the religious sphere could be seen in individuals who were dogmatically Catholic and individuals who were dogmatically anti-Catholic; similarly, there would be dogmatic theists and dogmatic atheists. In the political sphere, according to his construct, one should be able to observe a lack of permeability to new information in individuals who were dogmatically conservative and in individuals who were dogmatically liberal. Dogmatism, according to Rokeach, is not necessarily restricted to religious and political spheres, but can also be observed in the humanities, in social sciences, and in philosophy. In psychology, for example, it should be possible to observe dogmatic Freudians and dogmatic anti-Freudians.

The consideration of dogmatism as not being restricted to any particular philosophy, religion, political ideology, or scientific point of view was the primary factor behind Rokeach's (1960) efforts to systematically formulate the notion of the permeability of a person's beliefs quite apart from their specific content, and in such a way that
the permeability could be measured. Rokeach (1956) differentiated between "formal" content and "substantive" content. Closely related to his concept of structural organization of beliefs was the idea of formal content. Two persons could differ widely in the substantive content of their political or religious beliefs, but they could still be similar not only in permeability of structure, but also in formal content. That is, they could both adhere to the belief that there is an Absolute Authority, A True Bible, and a True Cause; while differing in specific substantive content; e.g., Buddha versus Christ as the Absolute Authority, King James versus Rheims Douai as the True Bible.

According to Rokeach (1956), three sets of variables were subsumed under the construct of dogmatism; closed cognitive systems, general authoritarianism, and general intolerance. The first variable involved the analysis of structural properties; the other two variables involved an analysis of formal content.

The following three dimensions were thought to best describe the structural properties of a belief system, independent of formal or substantive content: (1) organization along a central-peripheral dimension, (2) organization along a belief-disbelief dimension, and (3) organization along a time perspective dimension. With regards to the first of these dimensions, central-peripheral, Rokeach (1960, p. 62) assumed that the more closed the system, the more will the world be seen as threatening, the greater will be the belief in absolute authority, and the more will peripheral beliefs (those derived from formal content) be related to each other by virtue of their common origin in authority, rather than by virtue of intrinsic connections. The second dimension, belief-disbelief, assumes a system to be closed to the extent that:
there is a high magnitude of rejection of all disbelief subsystems, an isolation of beliefs, a high discrepancy in degree of differentiation between belief and disbelief systems, and little differentiation within the disbelief system. (Rokeach, 1960, p. 61)

The third dimension thought to characterize the permeability of a belief system, time perspective, was founded on the assumption that the evaluation of information on its own merits requires an orientation in the "here and now." If information is to be assessed on its own merits, there is little need for an overconcern with the remote future or the remote past. Thus, a system is assumed to be closed to the extent that an individual is concerned with the remote future:

... a narrow, future-oriented time perspective, rather than a more balanced conception of past, present, and immediate future in relation to each other, is seen to be a defining characteristic of closed systems (Rokeach, 1960, p. 64)

These three dimensions served as the basis for development of statements used in the Dogmatism Scale. Construction of the scale will be discussed in detail in Chapter III.

Since the original development of the Dogmatism Scale, research on the construct has been mainly concerned with investigating its relationship with other behavioral indices. For example, in investigating the relationship between dogmatism and age, Anderson (1962) administered an abbreviated form of the dogmatism scale to 290 eighth grade students and groups of varying size in grades 10, 11, and 12. The author found a significant decline in dogmatism with increases in age. Similar research, using cross-sectional sampling techniques, that is, comparing freshmen against seniors instead of the same people against themselves as freshmen and seniors, has found dogmatism to be negatively correlated with level
of education, with the authors concluding that education decreases the level of dogmatism (Pannes, 1963; Frumkin, 1961; Kamenske, 1966).

With the limited explanatory power of cross-sectional designs, it seems the above relationships could be more firmly established in a longitudinal study. However, it should be noted that the above findings enjoy popular currency.

Anderson (1962) attempted to determine if the sex of the respondent was related to level of dogmatism. Positing child rearing patterns as a possible determinant of heightened dogmatism in females, he found sex differences to be nonsignificant, although, when equated for intelligence, females were more dogmatic than males. It should be pointed out, however, that Rokeach (1960), Pannes (1963), and Rabkin (1966) all found little or no relationship between sex and level of dogmatism. On the basis of the present information, the support for a theoretical relationship between sex and dogmatism must be considered equivocal.

Curious as to the relationship between social class and dogmatism, Frumkin (1961) administered the Dogmatism Scale, Form E, and the Hollingshead-Redlich Index of Social Position to 135 high school students. He found dogmatism to be negatively correlated with socio-economic background. In interpreting his findings, the author yielded to the temptation of imputing causality where only general positive relationships had been observed. He summarized his findings by stating that low socio-economic status had the effect of:

... maintaining dogmatism in disprivileged groups by preventing the development of the attitudes and opportunities necessary to achieve the critical intelligence needed to reduce dogmatism and achieve some measure of objectivity. (Frumkin, 1961, p. 402)
Presumably, such conclusions were based in part upon previous cross-sectional studies on the relationship between education and level of dogmatism. A similarly "loose" interpretation of correlational data was Block's (1955) determination that restrictive child rearing practices (as often found in lower socio-economic groups) were the major determinant of dogmatism in later life.

Employing specially devised Guttman scales, Terhune (1963) found dogmatism to be positively correlated with patriotic and nationalistic beliefs in both American and non-American students. These findings might be partially explained by the following studies. While investigating the effect of preparatory involvement on goal evaluation in open and closed belief systems, Wrenn (1962) found that dogmatic individuals value the reinforcement of group thinking more than open-minded persons. Similarly, Harvey (1963) found that persons who find it easy to conform to existing group patterns are apt to be more closed in their thinking than persons who find it more difficult to accept group conformity.

The seeming lack of independence in thinking found in studies such as Wrenn (1962) and Harvey (1963) is reflected in the dogmatic person's tastes in music (Mikol, 1958), art (Frumkin, 1960), and also in his interpretation of political activities (McCarthy and Johnson, 1962).

The pervasiveness of being "closed" to new information is pointed out in a study by Kaplan (1963). Hypothesizing that dogmatism involved a lack of self-awareness not only in esthetic tastes, but also in physical perception of the world, he investigated the dogmatic individual's ability to perform sensory discriminations. Subjects were examined on their ability to make olfactory, gustatory, tactile, visual, and auditory discriminations. He found that high dogmatics exhibited lowered sensory
acuity on five of the six measures. The visual discrimination task was the only dimension the two groups could not be differentiated on; and even on this task the mean differences were in the predicted direction, close to the .05 level of significance. The author concluded that the high dogmatic was alienated from his own experiences and that such alienation made it very difficult for the closed-minded person to objectify his environment.

This conclusion is similar to the generally held notion that individuals with closed belief systems are not as "open" to experience as those with open belief systems. The above notion finds empirical support in a study by Zagona and Kelly (1966). They found high dogmatics less affectively accepting of new experiences, while being unable to integrate experiences requiring the systesis of new material with old.

In attempting to interpret the above findings, one might readily posit the hypothesis that alienation from experience and inability to deal with new experiences simple reflects intellectual differences between high and low dogmatics.

Belief Structure and Cognitive Abilities

In discussing the relationship of dogmatism to cognitive variables, Rokeach cites an unpublished thesis by Ehrlick (1955) in which the correlation between dogmatism and intelligence was found to be -.01. Similarly, employing the ACE tests, Rokeach (1960, p. 222) found the relationship between dogmatism and intelligence to be nonsignificant. Christensen (1963) also found aptitude, as measured by the ACE tests, to be independent of dogmatism. However, in another study Rokeach (1960, p. 262) did find a significant difference in intellectual abilities
between groups of high and low dogmatics. Taking note of the divergence of findings, Zagona and Zurcher (1965) measured the verbal ability of groups of high and low dogmatics and found the groups constituted different populations in verbal ability (t-ratio significant beyond the .001 level).

In the light of the equivocal findings on the relationship between intelligence and dogmatism, it seems reasonable to turn to investigations of learning ability in order to more clearly understand what variables are operating in the cognitive functioning of the dogmatic individual.

Rokeach (1960, p. 36) originally thought that cognitive isolation, i.e., a severing of potential communication between systems of beliefs and disbeliefs, was associated with increased dogmatism. Taking note of this, Adams and Vidulich (1962) attempted to determine if belief-congruent associations were more easily learned by low dogmatic persons than high dogmatic persons. In order to test Rokeach's original hypothesis they had subjects, divided into high and low dogmatics on the basis of Rokeach's Dogmatism scale, Form E, learn two paired-associate lists of noun stimulus and adjective response words on a two-second exposure interval memory drum. One list contained fifteen belief-congruent word pairs, e.g., physician-ethical, Negro-ignorant, preacher-honest, the other list contained fifteen belief-incongruent word pairs, e.g., mom-wanton, liberty-bad, Communists-humane. Surprisingly, high scores on the Dogmatism Scale were shown to be related, not only to inferior learning of belief-incongruent paired associate lists, but also to inferior learning on belief-congruent paired associate lists. The authors concluded that not only is the high dogmatic inferior in learning incongruent material, but he may well be inferior in any type of complex learning.
One of the earlier researchers on this facet of dogmatism, Frumkin (1961), found a negative relationship between dogmatism scores and grades in a sociology class. At roughly the same time, Ehrlich (1961) made an exploratory study of the relationship between dogmatism and degree of learning as measured by a sociology test. After equating students for aptitude on the basis of the Ohio State Psychological Examination, he found degree of dogmatism and success in learning to be negatively related. He interpreted these findings as being consonant with Rokeach's postulated "closed cognitive structure."

Christensen (1963) replicated Ehrlich's (1961) study with one major difference. In addition to controlling for aptitude for school achievement, as determined by ACE scores, he had the subjects tested by both essay and multiple choice tests on a learning task in a psychology course. Aside from finding that aptitude and dogmatism were independent, he found no evidence that dogmatism was related to classroom learning or ability to synthesize and analyze.

Attempting to resolve the diverse findings of Ehrlich, Frumkin, and Christensen, Costin (1965) also examined the relationship between dogmatism and learning ability. The Rokeach Dogmatism Scale, Form E, and a 75-item multiple choice psychology test were administered at the beginning and end of a semester to 67 students of an introductory psychology class. An estimate of verbal reasoning (SCAT) was also obtained on the subjects. The results showed that all correlations between dogmatism and post-course achievement were negative, but not significant. With SCAT scores held constant the partial r between dogmatism and postcourse achievement was -.15, also nonsignificant. The author concluded that perhaps the diverse findings might best be explained by examining the nature of the
material the subject is to learn; i.e., dogmatism may be significantly related to some types of learning while not being related to other types. Some oblique support for this proposition is provided in a study by Rebhun (1966). In examining the relationship between dogmatism and anxiety, he found a positive correlation between the two variables. He suggested that high dogmatism may have impaired intellectual functioning when anxiety was generated in the learning situation. He further suggested that anxiety may result from a conflict between the need to achieve and the need to exclude new information.

Perhaps the most extensive study of dogmatism and cognitive functioning was done by Zagona and Zurcher (1965). They administered Rokeach's Dogmatism Scale to 517 freshmen students in the elementary psychology course at the University of Arizona. The 30 highest scorers and the 30 lowest scorers were assigned to special discussion sections. Both long-term observations and objective tests were employed in the measurement of the cognitive variables of the two groups.

The most striking results of this study were those resulting from the semester-long classroom observations. Intellectual lethargy characterized the atmosphere of the high-dogmatic classroom. An unwillingness to relate to the subject matter, the instructor, and the other students was noted, as was a hesitancy or fear to respond to the instructor's urging for participation in class discussion. The atmosphere of the low-dogmatic classroom was precisely the opposite. An air of free discussion permeated all topics; debates, once started, were difficult to stop, and class enthusiasm and curiosity were at a maximum. Experimentally organized discussion and debating sessions between the two groups also yielded striking differences.
Quantitatively, the authors found the two groups differed significantly not only in learning ability, but also in verbal scores on the College Qualification Tests and Mednick's (1962) test of remote-associations, a purported measure of creativity.

Although the above research findings on the relationship between level of dogmatism and intellectual abilities are not easy to interpret, there does appear to be a consistent relationship between dogmatism and cognitive abilities. Confusion in the research findings seems to be a product of how various researchers have operationally defined "cognitive abilities." That is to say, psychological literature does not agree on how to best estimate cognitive ability. (For a full discussion of this matter see Guilford, 1967, pp. 2-21). To one researcher this cognitive ability may best be reflected by the ability to learn; in this instance we find a reasonably consistent negative relationship between dogmatism and cognitive ability. When one uses scores on tests of aptitude for achievement as an indices of cognitive ability, the inconsistent findings make a summary interpretation difficult.

The Structure of Intellect

It was the above confusion as to what constitutes cognitive abilities that lead this writer to turn to Guilford's (1959) model of the structure of intellect in order to experimentally amplify differences in cognitive abilities between high and low dogmatics.

During the past two decades, Guilford and his collaborators have used the factor analytic method to determine the content of a wide range of ability tests. He has found it unnecessary to assume a general factor of intelligence, but has posited instead a large number of factors. In
addition, he has devised a scheme which simultaneously incorporates all
the known primary factors of cognitive behavior. Each of the primary
factors in cognitive functioning can be thought of as possessing a
combination of three dimensions: one referring to the content of the
material dealt with, a second to the operations performed on the material,
and a third to the products achieved by the operations. The model can
be represented by a three-dimensional rectangular solid as shown in
Figure 1.

It was the second of these dimensions, cognitive operations, where
differences in level of dogmatism seemed to be most clearly indicated.

Guilford and Hoepfner (1966, p. 3) defines cognitive operations as
the "... major kinds of intellectual activities or processes; things
that the organism does with the raw materials of information, information
being defined as 'that which the organism discriminates'." That dogmatism
might be related to the above activities was pointed out in a study by
Moore (1961). In examining the relationship between dogmatism and the
conditioning of verbal behavior, he found the low dogmatic conditioned
more readily than the high dogmatic. He interpreted this to mean that
the high dogmatic is not as able to make profitable discriminations among
the raw information he receives from his environment.

Similarly, Costin (1965) and others (Adams and Vidulich, 1962) have
pointed out that the crucial variable in the dogmatic person's ability
to function cognitively may be the manner in which he must deal with in-
coming information.

This notion received strong support from a study done by Kemp (1960).
In examining the critical thinking abilities of high and low dogmatics,
he found low dogmatics more successful than the high.
Figure 1. A cubical model representing the structure of intellect.
(Guilford, 1959, p. 470)
The high dogmatics had the greater percentage of errors in those problems which require the study of several factors or criteria for decision and the deferring of a conclusion until each factor has been judiciously considered. (Kemp, 1960, p. 318)

The author concluded that a low tolerance for uncertainty impells the high dogmatic toward "closure" before consideration can be given to each piece of contributing evidence. This conclusion was subsequently validated by Long and Ziller (1965) who found a strong negative correlation between dogmatism and four measures of ability to reserve judgment.

Operating on the premise that Guilford's (1959) scheme of cognitive operations describes the major fashions in which people perform intellectual activities, the next question which comes to mind is: What cognitive operations are most likely reflected in the noted differences between high and low dogmatics?

A summary of the research (Golann, 1963) indicated that the operations which would most likely reflect these differences are the divergent and convergent operations. Guilford and Hoepfner (1966) defined divergent and convergent operations as follows:

Divergent Production. Generation of information from given information, where the emphasis is upon variety and quantity of output from the same source. Likely to involve what has been called transfer. This operation is most clearly involved in aptitudes of creative potential.

Convergent Production. Generation of information from given information where the emphasis is upon achieving unique or conventionally accepted best outcomes. It is likely the given (cue) information fully determines the response. (Guilford and Hoepfner, 1966, p. 3)

The major body of research dealing with the operations defined as divergent refer to this type of production as "creative production."

It should be noted that Guilford (e.g., 1965, p. 15) uses divergent
ability and creativity interchangeably: "It can be said that the divergent production abilities are the most direct contributors to creativity." He emphasizes convergent production abilities in the production of conventionally accepted responses. Similarly, Thorndike (1963) stated that "divergent-thinking" and "creative-thinking" are legitimate equivalents. Others, however, do not view creative production in the same fashion (Medniek, 1962).

As was noted above (Wrenn, 1962; Terhune, 1963; Harvey, 1963), the highly dogmatic individual tends to accept group conformity, and to value reinforcement by group thinking. This embracing of prescribed views of the world appears dissonant with research findings on necessary conditions for creative production. For example, Ghiselin (1952) described creativity as proceeding from a feeling of dissatisfaction with the established order and reaching fulfillment in the attainment of a new order. Similarly, Taylor (1964) reports a study by Barron in which he found a positive correlation (r = .70) between independence of judgment and ratings of creativity.

Rokeach (1960) found attitudinal rigidity to constitute a separate, yet related, factor to dogmatism. Relating this to creative operations, Fleming and Weintraub (1962) found a negative correlation (r = -.41) between attitudinal rigidity and a battery of verbal and non-verbal tests of creativity. A further study by Dauw and Pugh (1966) on the relationship between creativity and religious preferences, found that an inordinately small percentage of creative students (1.5%) had attended Catholic schools. The authors suggested that "perhaps this inhibition of creativity was associated with more authoritarian or dogmatic teaching techniques" (Dauw and Pugh, 1966, p. 35). That a high level of dogmatism
may be incompatible with creative production abilities was pointed out in Zagona and Zurcher's (1965) study. They found that groups of students scoring high and low on Rokeach's scale constituted different populations in regards to their ability to form remote associations; an ability thought to be related to creative production (Mednick, 1962).

In concluding his review of the psychological literature relating to the study of creativity, Golann (1963) stated what he considers important in providing a functional understanding of creativity. Specifically, in:

... such an approach our criterion variables might be tolerance for or seeking of ambiguity, openness to experience ... internal frames of evaluation of independence of judgment to name but a few theoretically based descriptive concepts which appear again and again in the literature and deserve further investigation. (Golann, 1963, p. 561)

Taking note of Golann's reasoning, Jacoby (1967) examined the relationship between open-mindedness and creativity. Upon administering Rokeach's Dogmatism Scale and the Remote Associations Test to 24 subjects, he found a negative correlation coefficient of -.248. Though in the predicted direction, the results did not reach statistical significance (p = .12). However, taking note of the rather small sample N and the direction of the finding, the author noted that "the results are suggestive and it appears that further research into the relationship between dogmatism and creativity is warranted." (Jacoby, 1967, p. 822)

Objectives

The objectives of this study were to examine the relationships between dogmatism and ability to perform convergent and divergent operations. Three abilities involved in divergent operations. They are: spontaneous
flexibility, the ability to produce a variety of class ideas in connection with an object or other unit of thought; ideational fluency, the ability to produce a number of responses; and originality, the ability to produce remotely associated, clever, or uncommon responses. Guilford (1967) pointed out in a personal communication that the best method of estimating divergent-convergent production abilities is to administer those tests which are heavily loaded on these factors, while keeping the products and contents of the productions constant (see Figure 1). Following this logic, estimates of convergent abilities which parallel the divergent abilities in products and constants, were examined.

**Hypotheses**

The following specific hypotheses were tested. Whenever previous research gave reason, hypotheses were stated in the predicted direction, otherwise they were stated in the null form:

1. There will be a negative correlation between dogmatism scores and originality scores.
2. There will be a negative correlation between dogmatism scores and spontaneous flexibility scores.
3. There will not be a significant correlation between scores on the dogmatism scale and ideational fluency scores.
4. There will be a negative correlation between dogmatism scores and the composite divergent abilities scores.
5. Groups of high and low dogmatics will have significantly different mean originality scores.
6. Groups of high and low dogmatics will have significantly different mean spontaneous flexibility scores.
7. Groups of high and low dogmatics will not have significantly different mean ideational fluency scores.

8. Groups of high and low dogmatics will have significantly different mean divergent ability scores.

9. There will not be a significant correlation between dogmatism scores and the composite convergent abilities scores.

10. Groups of high and low dogmatics will have significantly different mean convergent abilities scores.

11. Groups of high dogmatics will have higher mean standard scores on tests of convergent abilities than on tests of divergent abilities.

12. Groups of low dogmatics will not have higher mean standard scores on tests of convergent abilities than on tests of divergent abilities.
CHAPTER III
PROCEDURE

Subjects

Three hundred sixteen high school students, 165 male, 151 female, participated in the initial phase of the experiment. The sample was the eleventh grade class at Roy Senior High School, Roy, Utah. The students, for the most part, came from urban middle-class backgrounds, notable for the homogeneity of its religious affiliation. Although ongoing research (Shaver and Richards, 1968) indicates that individuals from this background tend to score higher on Rokeach's dogmatism scale than other groups, it was not thought to be relevant to this study as our main concern was within group differences.

The total sample was administered Rokeach's Dogmatism Scale, Form E, and Ss' scores were used as a screening device to identify the experimental groups. The mean scores and standard deviations, as well as mean scores and standard deviations from a previous research study with high school Ss, are reported in Table 1.

Table 1. Means and standard deviations of high school populations on Rokeach's Dogmatism Scale

<table>
<thead>
<tr>
<th>Population</th>
<th>( \bar{X} )</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roy High School, Roy, Utah</td>
<td>176.27</td>
<td>22.85</td>
</tr>
<tr>
<td>Kemp &amp; Kohler (1965)</td>
<td>165.75</td>
<td>21.86</td>
</tr>
</tbody>
</table>
Subjects were placed in the high dogmatic group if their scores fell in the top 10 percent of the sample population, and in the low dogmatic group if they fell in the bottom 10 percent of the distribution. A further group of those subjects in the middle 10 percent of the dogmatism distribution was comprised for an extension of the study as previous research had focused only on high and low dogmatics. Means and standard deviations of the experimental groups are reported in Table 2.

Table 2. Distribution statistics for experimental groups

<table>
<thead>
<tr>
<th>Condition</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>211.06</td>
<td>5.12</td>
<td>30</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>171.80</td>
<td>2.52</td>
<td>30</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>126.80</td>
<td>9.592</td>
<td>30</td>
</tr>
</tbody>
</table>

Having defined the experimental groups on the basis of dogmatism scores, two estimates of convergent abilities were obtained. Guilford (1967) pointed out in a personal communication that the best method of estimating divergent-convergent production abilities is to administer those tests which are heavily loaded on these factors, while keeping the products and contents of the productions constant (see Figure 1).

With this rationale in mind, the following group tests were administered:

1. Alternate Uses Test (Divergent Operations)
2. Consequences Test (Divergent Operations)
The tests of divergent operations were chosen because of the availability of validity estimates; the tests of convergent operations were then fixed by the need to keep the products (transformations and classes) and content (semantic), constant.

Sex

Sex of the respondent was not controlled for in setting up the experimental groups. As has been pointed out in Chapter II, the results of research on the relationship between dogmatism and sex is equivocal. It also has been established that sex of the respondent is not related to performance on tests of divergent abilities. Wilson, Christensen, Merrifield, and Guilford (1960) found the means for boys and girls on the Alternate Uses test so nearly identical as to accept the hypothesis that they came from the same population. Christensen, Merrifield and Guilford (1962) found similar results regarding performance on the Consequences Test (see Table 3).

<table>
<thead>
<tr>
<th>Population</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ninth Grade:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>229</td>
<td>24.1</td>
<td>8.7</td>
<td>4.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Girls</td>
<td>228</td>
<td>26.7</td>
<td>8.0</td>
<td>4.0</td>
<td>3.1</td>
</tr>
</tbody>
</table>

*Christensen, Merrifield and Guilford, 1962, p. 7.
Intelligence

An estimate of intelligence, the G factor from the General Aptitude Test Battery (GATB) (1947), was available on all subjects. As the findings on the relationship between dogmatism and intelligence were not clear, an analysis of variance was performed on the experimental groups' GATB "g" factor scores. Research in the field of creativity, i.e., divergent production, has shown that within a relatively homogeneous intellectual group, there is a negligible relationship between creativity (test performance) and intelligence. Torrance (1962) found that if giftedness in children had been based alone on WISC scores, 70 percent of the 20 percent most creative children would not have been considered gifted. Parnes and Meadow (1963) found no significant relationship between measured IQ and creativity. They also found that a course in creative problem solving was equally helpful to those with high and low intelligence. Taylor and Holland (1962), in a review of creativity research, reported a correlation of .20 to .40 was found between verbal measures of intelligence and creative test performance in a variety of populations. Taylor (1963) concluded that if an intelligence test were used as the basis for selecting creative talent, 67 percent of persons with the highest scores on creativity tests would be missed. "If intelligence and creativity were completely unrelated, 80 percent would be missed, but due to a slight relationship, only 67 percent of the top-scoring 'creative' people are missed." (Taylor, 1963, p. 366) Getzels and Jackson (1962) found intelligence to be an important factor in creative test performance up to an intellectual level of 115. However, Christensen, Merrifield, and Guilford (1962) reported a negligible relationship between
intelligence and one of the instruments used in this study, the Consequences Test. The diversity of research findings on this relationship is summarized in Table 4.

In a recent factorial analysis of divergent thinking and intelligence, Maduas (1967) examined the relationships between verbal and non-verbal divergent abilities, and verbal and quantitative estimates of intelligence. With a population of 609 high school students, the median inter-correlation between the intelligence and divergent thinking measures was .05. A factor analysis of the inter-correlations yielded three distinct factors; a verbal divergent thinking factor, a non-verbal divergent thinking factor, and an intelligence factor. The author concluded that "... knowledge of IQ seems to be of little help if one is faced with a 'formful' of clever boys for the one among them with the lowest IQ is almost as likely to be creative as the one with the highest." (Maduas, 1967, p. 234)

Because of the wide range of research findings, i.e., correlation coefficients ranging from -.15 to .73 with high school subjects—and the heterogeneous intellectual composition of our population, it was decided to determine whether or not high and low groups of dogmatics would have different mean scores on the GATB.

Measure of the Open and Closed Belief System

Dogmatism Scale, Form E

This scale was developed by Rokeach to measure individual differences in the openness or closedness of belief systems. The Dogmatism Scale was constructed in a deductive fashion. That is to say, defining characteristics of open and closed belief systems were outlined, and then items
Table 4. Some representative correlations between traditional intelligence-test scores and assessments of creative potential and performance

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Type of Subjects</th>
<th>Intelligence Test</th>
<th>Creative Assessment</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torrance (1962)</td>
<td>Elementary grades</td>
<td>Stanford-Binet</td>
<td>DP-test composite(^b)</td>
<td>.16; .17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Otis</td>
<td></td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kuhlman-Anderson</td>
<td></td>
<td>.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>California TMM</td>
<td></td>
<td>.24</td>
</tr>
<tr>
<td>Yamamoto (1964)</td>
<td>High school</td>
<td>Lorge-Thorndike</td>
<td>DP-test composite</td>
<td>.30</td>
</tr>
<tr>
<td>Torrance (1962)</td>
<td>Graduate students</td>
<td>Miller Analogies</td>
<td>DP-test composite</td>
<td>-.02; .11</td>
</tr>
<tr>
<td>Torrance (1962)</td>
<td>Graduate students</td>
<td>Ohio State PE</td>
<td>DP-test composite</td>
<td>.10</td>
</tr>
<tr>
<td>D. Taylor (1960)</td>
<td>Engineers</td>
<td>Terman Concept Mastery</td>
<td>Ratings</td>
<td>.20; .07</td>
</tr>
<tr>
<td>MacKinnon (1961)</td>
<td>Architects</td>
<td>Terman Concept Mastery</td>
<td>Ratings</td>
<td>-.08</td>
</tr>
<tr>
<td></td>
<td>Scientists</td>
<td></td>
<td></td>
<td>-.07</td>
</tr>
<tr>
<td>Ripple, et al. (1962)</td>
<td>Seventh grade</td>
<td>Otis</td>
<td>DP-test scores</td>
<td>.11; -.73</td>
</tr>
<tr>
<td>Razik (1963)</td>
<td>College</td>
<td>Ohio State PE</td>
<td>DP-test scores</td>
<td>.04; -.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>((\bar{x} = .32))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guilford (1966)</td>
<td>Ninth grade</td>
<td>California TMM</td>
<td>45 DP-test scores</td>
<td>-.04; -.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>((\bar{x} = .32))</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-Z Verbal Comprehension</td>
<td></td>
<td>-.15; -.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>((\bar{x} = .21))</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Guilford, 1967, p. 167.
\(^b\) DDP stands for divergent production.
were constructed to tap these characteristics. In item construction, the following characteristics were taken as indicative of a closed belief system.

1. Isolation within and between belief and disbelief systems; coexistence of contradictions within the belief system.

2. Little differentiation between disbelief subsystems.

3. Specific beliefs that:
   a. the world is a hostile place;
   b. the future is uncertain and threatening;
   c. the self is fundamentally unworthy and inadequate to cope with this friendless world, and that the way to overcome such feelings is by a self-aggrandizing and self-righteous identification with a cause.

4. A concern with power and status.

5. Compulsive self-proselytization about the justness of causes.

6. Viewing authority as being absolute, and rejecting those who disagree with one's belief system.

7. Expression of a time perspective where the present is rejected for either the past or the future. (Rokeach, 1960, pp. 73-80)

The test consists of forty statements to which the respondent indicates the degree of his agreement or disagreement. Most of the items were constructed by the author (Rokeach, 1960), but a few were taken from Hoffer (1951), Berger (1952) and the Minnesota Multiphasic Personality Inventory (Hathaway and McKinley, 1943). Strong agreement with each statement is taken as an indicator of a closed belief system, while strong disagreement with an item indicates openness in the belief system.

In reviewing the reliability of the dogmatism scale, Lhupe and Wolfer (1966) reported reliabilities ranging from .69 to .86. Rokeach (1960) reported reliabilities from .70 to .90 in populations of young
adults. These results indicate that subjects do respond rather consistently and predictably to the highly diversified statements used in the Dogmatism Scale.

The validity of the Dogmatism Scale is somewhat less firmly established. Early attempts were made to determine whether a new construct, dogmatism, had actually been isolated. Rokeach, McGovney and Denny (1955) were able to factorially discriminate dogmatism from rigidity as measured by the Gough-Sanford Rigidity Scale. A factor analysis was conducted by Rokeach and Fruchter (1956), using a sample of 207 college students, on scales representing the following ten variables: anxiety, paranoia, self-rejection, dogmatism, authoritarianism, rigidity, ethnocentrism, liberalism-conservatism, left opinionation, and right opinionation. Conclusions from the analysis indicated that dogmatism was loaded on an authoritarian factor, but was independent of the left-right dimension. This finding was confirmed by obtaining the responses of an actual left-wing political group, as well as a right-wing political group (Barker, 1958). The author concluded that the dogmatism scale is a valid measure of general authoritarianism. Dogmatism was also discriminable from rigidity and ethnocentrism. Another factorial study by Fruchter, Rokeach and Novak (1958), using a Midwestern university student sample, produced similar results. Rokeach (1960) found that when peer ratings are used to construct groups of high and low dogmatics, the groups differ sharply in mean dogmatism scores.

Further studies on the correlates of dogmatism lend some support to the validity of the construct and the instrument designed to measure it. Kemp (1960, 1963) found students low in dogmatism more successful in critical thinking than students high in dogmatism. Mikol (1958)
found high dogmatics less accepting of "new" music. Similarly, Frumkin (1961) found high dogmatics less accepting of modern painting. Fidelman (1962) and Richard (1962) found that level of dogmatism was negatively correlated with accuracy in perceiving and understanding others. These studies lend support to the hypotheses that the Dogmatism scale measures one's openness to new information.

Tests of Divergent Thinking

The two measures of divergent operations used in the present study were the Alternate Uses Test (Wilson, Christensen, Merrifield, and Guilford, 1960) and the Consequences Test (Christensen, Merrifield, and Guilford, 1962). The Consequences Test measures one's ability to perform divergent operations on semantic material and to produce transformations; transformations being defined as "... changes, revisions, redefinitions, or modifications, by which any product of information in one state goes over into another state." (Guilford, 1967, p. 64). The Alternate Uses Test measures one's ability to perform divergent operations on semantic material and to produce classes; classes being defined as "... conceptions underlying sets of items of information grouped by virtue of their common properties." (Guilford and Hoepfner, 1966, p. 4).

The tests were designed for group administration. They are timed and have a detailed introduction giving examples of the kind of test items and appropriate responses. Neither of the tests demands specialized knowledge or training on the part of the respondent.
Consequences Test

The Consequences Test consists of 10 items, each of which asked the S to state up to twenty possible results of an improbable, or at least not commonly considered, occurrence. For example: "What would be the results if people no longer needed or wanted sleep?" Each item presented four acceptable answers as examples of appropriate responses. For the above item the sample consequences were: (1) Get more work done; (2) Alarm clocks not necessary; (3) No need for lullaby song books; (4) Sleeping pills no longer used. Each item was on a separate page and the examinees were given two minutes to respond to each item.

Scoring the respondent's responses on the Consequences Test yielded two scores; one for Originality, a second for Ideational Fluency. Originality is defined by Guilford (1959) as the unusualness of response, remoteness of association, and cleverness. In order to produce remote consequences, it is assumed the S must reappraise the situation in different ways. A remote response must evidence the consideration of consequences which are distant, temporally or geographically, or some fairly specific way of adjusting to the changed situation. For example, the following answers would be scored remote to the question "What would be the results if it appeared certain that the entire surface of the earth would be covered with water except for a few of the highest mountain peaks?" (A) No more Hopi rain dances; (B) Olympics would have only one meet, swimming; (C) Eagle farms would replace chicken farms.

Ideational fluency is defined by Christensen, Merrifield, and Guilford (1962) as the ability to produce rapidly a variety of units of semantic content, or the divergent production of semantic units. A high score for ideational fluency indicates a facility for bringing ideas out
of memory storage to meet the demands of the situation. Any relevant response (relevant being defined liberally) not scored for being remote, and not a repetition of a previous answer is scored for ideational fluency. The following answers to the above question would be scored as obvious: (A) People would drown; (B) Food shortage; (C) Rush to the mountains.

The originality score is the total of all the responses scored as remote, and the ideational fluency score is the total of all the responses scored as obvious. A third score obtained by summing the total remote and obvious scores and the score for spontaneous flexibility (from the Alternate Uses Test), was obtained as an overall estimate of divergent ability.

With alternate forms, Christensen, Merrifield and Guilford (1962) reported a split half reliability coefficient of .87 for the obvious score and .67 for the remote score for ninth graders. For several young adult male populations, coefficients of .86 for the obvious and .82 for the remote score have been obtained (Christensen, Merrifield and Guilford, 1962).

Christensen, Merrifield and Guilford (1962) reported factor loadings of .62 for the obvious scores on the ideational fluency factor, and .42 for the remote scores on the originality factor for a young adult male population. They further point out that such loadings are the best estimate one can make of construct validity. "The authors regard factorial validity, given by the correlation between a test and its common orthogonal factors, to be the best type of construct validity." (Christensen, Merrifield and Guilford, 1962, p. 4)
Indirect support for the validity of the Consequences Test has been provided by the following studies. Gerry, Devlau, and Chorness (1957) reported a significant increase in original responses to the Consequences Test in a pre-post test designed to measure the effectiveness of a workshop on creative expression. In a study designed to investigate the effects of various methods of training in creativity, Nicholson (1959) found that the experimental group improved significantly in the production of remote responses on the Consequences Test. Drevdahl (1956) reported that the Consequences Test was able to differentiate significantly between creative and non-creative groups as independently defined by judges' ratings. The ratings were based both on the judges' own definitions of creativity and the definition that:

Creativity is the capacity of a person to produce compositions or ideas which are essentially novel and previously unknown to the producer. . . It may involve forming new patterns and combinations of information derived from past experiences, transplanting of old relationships in new situations; it must be purposeful and goal directed. (Drevdahl, 1956, p. 23)

Zaccaria, Chorness, Gerry, and Borg (1956) reported significant correlations between ideational fluency and originality, and a creative activities score derived from biographical inventories. Drevdahl (1956) found a correlation of .33 between the consequences remote score and instructors' ratings of originality of Ss in arts and sciences. Guilford, as reported by Drevdahl (1956) found a correlation of .37 between ideation fluency and success, as measured by pay raises for engineers designing aircraft. Barron (1963) found a significant correlation of .36 between scores on the Consequences Test and staff ratings of creativity of the individual studied. He further found the scores on the Consequences Test were correlated .59 with a composite measure of originality based on eight different measures.
Thus, as a measure of divergent abilities, some support for the validity of the originality and fluency measures of the Consequences Test exists.

Alternate Uses Test

The Alternate Uses test consists of nine items. Each item presents the S with a well known object and its common use. The examinee is asked to give as many as six uses other than the commonly stated one for the object. The Ss are given twelve minutes to complete the entire test. Alternate Uses is a revised and improved form of the test, Unusual Uses, which was designed as a measure of a hypothesized factor of flexibility of thinking (Guilford, Merrifield, and Cox, 1961).

In several analyses (Wilson, Christensen, Merrifield, and Guilford, 1960), Unusual Uses had its heaviest loadings on the factor called "spontaneous flexibility." The essential feature of spontaneous flexibility is that it represents the ability to produce a variety of classes of ideas even though a change of use category is demanded with every response (Guilford, 1967, p. 145). Spontaneous flexibility is this ability to change sets in a situation in which the direction of the change is restricted by the stimuli. Each new and different use of an object belongs in a different class of ideas. An acceptable response must be possible, different from the given use, and specific. For example, the object might be a newspaper, and the common use stated as reading. Acceptable additional uses might read:

a. Start a fire
b. Wrap garbage
c. Swat flies
d. Stuffing to pack boxes

e. Line drawers or shelves

f. Make up a kidnap note

Unacceptable answers might be:

a. Find something in want ads; not different from the given use

b. Wrap fresh fish; same as b above, no real change in use

c. Stimulation; too general

Using samples of young adults, Wilson, Christensen, Merrifield and Guilford (1960) reported reliabilities ranging from .68 to .81. With four samples of ninth grade students (Guilford, Merrifield, and Cox, 1961), the estimates were from .62 to .85. In a more recent study, Guilford and Hoepfner (1966) reported Kuder-Richardson estimates of reliability of .81 for 271 male and female, junior and senior students at a high school in a middle-class urban area.

In adult samples, the test's factor loadings on spontaneous flexibility have been .51 and .52 (Wilson, Christensen, Merrifield, and Guilford, 1960). On the basis of a factor analysis of divergent abilities in senior high school Ss, Guilford and Hoepfner (1966) considered the Alternate Uses Test to have the highest factor loadings on the factor of spontaneous flexibility.

Indirect support for the validity of the Alternate Uses Test is provided by several studies. Maltzman, Simon, Raskin, and Licht (1959) studied the effect of the amount of training with free association materials on the performance of tests of originality. An earlier form of the Alternate Uses Test, the Unusual Uses Test, was found to differentiate between the control and experimental groups. Barron (1963) reported a
correlation of .30 between Unusual Uses and staff ratings of creativity. In Barron's (1963) study, a correlation of .60 was found between the Unusual Uses measure and a composite originality measure based on eight additional tests. Drevdahl (1956) found a significant correlation between instructor's ratings of Ss' creativity and nine of Guilford's tests, among them, Unusual Uses.

In a review of creativity criteria, Taylor and Holland (1962) point to the tentative nature of all measures of creative ability. Thorndike (1963) points out that the construct of creativity itself must be regarded as being quite tentative; that is to say, creativity may actually be a misnomer, because spontaneous flexibility, originality, and fluency are all highly independent abilities. Guilford's tests have the advantage of having been widely used, and of all being loaded on the factor of divergent production ability. Although their validity is not as well established as might be desired, e.g., factor loadings as low as .42, other tests of divergent ability have not been found to be more valid.

**Tests of Convergent Thinking**

**Gestalt Transformations Test**

This test is a measure of one's ability to perform convergent operations on semantic material and to produce transformations (see Figure 1). With our selection of the Consequences Test (divergent operations on semantic material producing transformations) the use of Gestalt Transformations became a logical choice.

The Gestalt Transformation Test consists of twenty items. Each item presents the S with a problem which may be solved by using a part of one
of the five objects given as choices. The items present the S with a situation in which some kind of change in information is needed to achieve a goal and only one particular transformation will do. For example: the subject is presented with the problem of "starting a fire" and given the following five objects to use in solving the problem:
(a) a fountain pen; (b) an onion; (c) a pocket watch; (d) a light bulb; (e) a bowling ball. The correct answer would be "c" as the crystal from a pocket watch could be used as a magnifying glass to start a fire. The Ss are given ten minutes to complete the test.

At first thought, the factorial intersection of convergent operations with transformations might appear to be incongruous, the one suggesting a kind of rigidity, the other a flexibility. However, factor analysis revealed such a conjoining of the two factors to exist (Guilford, 1967). When the matter is put in terms other than flexibility and rigidity, the convergent production of transformations seems more reasonable. There are situations in which some kind of change in information is needed in order to achieve a certain goal and no other change will do. With the Consequences Test, the transformations are divergently produced as the way is open and breadth of search is desirable. But, when the conditions are so restricted that only one particular transformation will do, we have convergent production. Such is the task provided by the Gestalt Transformation Test (Guilford, 1967).

A Kuder-Richardson estimate of reliability of .72 was obtained with junior and senior students at a high school in an urban middle-class area (Merrifield, Guilford, Christensen, and Frick, 1960).

The validity of the Gestalt Transformation Test has been barely tested using the factor analytic model. Guilford (1967) reported only
"moderate" factor loadings on the convergent-semantic-transformation factor.

Though it was readily apparent that the Gestalt Transformation Test is a new test in the experimental stage of development, it was employed in this study because it provided a measure of an individual's divergent and convergent abilities with products and contents held constant.

Word Group Naming Test

Each of the 16 items on the Word Group Naming Test presents the respondent with five words that are all alike in some way. The S is to provide a name for each group of five words. The items present the S with a situation which calls for him to converge upon an appropriate name or summarizing word for the given information. For example, given the five words, volcano, oven, Africa, fire, and sun, the S must provide a term which names the unifying property of the five words. Acceptable responses for the above example might be hot things, or warm things. Ss had six minutes to complete this test. Just as the Gestalt Transformations Test provided a task similar to the Consequences Test, varying only the type of cognitive operation, the Word Group Naming Test provides a task which allows only the type of operation to vary from the Alternate Uses Test. Just as the Alternate Uses Test calls upon the S to diverge and find many uses for a single object, the Word Group Naming Test calls upon the subject to employ semantic units in a convergent fashion by finding a single unifying characteristic for several words.

Guilford (1967) claimed a "strong" factorial loading for this test on the convergent-semantic-units factor, although the exact loading was not reported. In a population of high school juniors and seniors, male and female, a Kuder-Richardson reliability estimate of .61 was obtained.
As with the Gestalt Transformation Test, the Word Group Naming Test is an experimental test. However, when used in conjunction with the Alternate Uses Test, it does provide a measure of divergent and convergent abilities with contents held constant.

Scoring

The Dogmatism Scale, Gestalt Transformations and Word Group Naming tests are objectively scored with no interpretation called for. Scores on the Dogmatism Scale were obtained after weighting answers from 1 for strongly disagreeing with an item to 7 for strongly agreeing with an item. An S's score is the sum of the weightings for the forty items. The scores for the Word Group Naming and Gestalt Transformations tests are the total of acceptable answers. A total score for convergent production ability was obtained by summing the totals on both the Word Group Naming and Gestalt Transformations tests.

The Alternate Uses and Consequences tests, on the other hand, necessitate scorer judgments. Principles and explicit examples of appropriate scoring are given for each item in the tests (Wilson, Christensen, Merrifield, and Guilford, 1960; Christensen, Merrifield, and Guilford, 1962).

In order to establish interscorer reliability, two judges scored the two tests for a sample of 25 Ss. Using the Pearson product-moment correlation coefficient, the interscorer reliability on the Alternate Uses Test was .98. For the originality score on the Consequences Test, the interscorer reliability was .79, while for the fluency score on the Consequences Test, it was .95. These correlations were considered sufficiently high to indicate reliable scoring.
A composite divergent abilities score was also obtained. The weightings used to obtain the composite score were a weighting of one for ideational fluency, two for originality, and two for spontaneous flexibility (Deak, 1966). These scores cover three of the six factors of verbal or semantic divergent production and are thought to provide a reasonable estimate of divergent abilities.

Statistical Techniques

When hypotheses were so stated that a measure of relationship between two variables was desired, the Pearson product-moment correlation coefficient was used (Edwards, 1962, p. 147). When hypotheses were so stated that we wished to estimate differences between groups, the analysis of variance was used (Edwards, 1962, p. 321). When a significant F was obtained, comparisons between groups was done according to a method outlined by Scheffe (1953). Scheffe's method is generally regarded as being more rigorous than other multiple comparison methods, and it leads to fewer significant results. However, it also leads to fewer Type I errors (Ferguson, 1966). In two instances (Hypotheses 11 and 12) a single group of subjects was studied under two separate conditions. In these instances, the significance of the difference between the correlated group means was computed according to a method outlined by Ferguson (1966, pp. 169-171).

Summary of Experimental Procedure

The following is the experimental sequence:

1. Three hundred sixteen senior high school students, 151 female, 165 male, were administered Rokeach's Dogmatism Scale, Form E. Two hundred
seventeen of our Ss were drawn from the morning social studies sections. This portion of our sample was assigned to this section by computer, and there was no reason to suspect that any systematic affect relevant to this study operated in the computerized assignments.

2. Dogmatism scores and two estimates of convergent ability and two estimates of divergent ability were obtained on the original population.

3. On the basis of scores on the Dogmatism Scale, three experimental groups were identified from our total sample population:
   a. High Dogmatic (N = 30)
   b. Medium Dogmatic (N = 30)
   c. Low Dogmatic (N = 30)

4. Pearson product-moment correlation coefficients were obtained on the subjects':
   a. Dogmatism scores and originality scores.
   b. Dogmatism scores and spontaneous flexibility scores.
   c. Dogmatism scores and ideational fluency scores.
   d. Dogmatism scores and composite divergent ability scores.
   e. Dogmatism scores and composite convergent ability scores.

5. Analysis of variance was performed on the following group scores to determine if the means were significantly different:
   a. High, medium, and low dogmatics' originality scores.
   b. High, medium, and low dogmatics' spontaneous flexibility scores.
   c. High, medium and low dogmatics' ideational fluency scores.
   d. High, medium and low dogmatics' composite divergent ability scores.
   e. High, medium, and low dogmatics' composite convergent ability scores.
f. High, medium, and low dogmatics' "g" factor scores from the GATB.

6. T-tests were performed on the following group scores to determine if the group scored differently on the two measures:

a. High dogmatics composite convergent and composite divergent scores.

b. Low dogmatics composite convergent and composite divergent scores.
CHAPTER IV

RESULTS

A coefficient of internal consistency was obtained on each of the measures used in the study. The measures were so scored that from each test we obtained two scores: one for the even numbered items and one for the odd numbered items. A Pearson product-moment correlation coefficient was then computed between these two sets of scores. As our obtained reliability coefficient was the equivalent of one of a test of half the size of our original test, each obtained correlation coefficient was corrected by means of the Spearman-Brown prophecy formula (Edwards, 1962, p. 177). The means, standard deviations, and corrected reliability coefficients of each of the measures are reported in Table 5.

Table 5. Distribution statistics of the experimental tests

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequences Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Score</td>
<td>184</td>
<td>5.04</td>
<td>3.93</td>
<td>.68</td>
</tr>
<tr>
<td>Obvious Score</td>
<td>184</td>
<td>28.12</td>
<td>10.76</td>
<td>.83</td>
</tr>
<tr>
<td>Alternate Uses Test</td>
<td>184</td>
<td>13.86</td>
<td>6.37</td>
<td>.77</td>
</tr>
<tr>
<td>Word Group Naming Test</td>
<td>184</td>
<td>7.62</td>
<td>3.19</td>
<td>.76</td>
</tr>
<tr>
<td>Gestalt Transformations Test</td>
<td>184</td>
<td>7.81</td>
<td>3.11</td>
<td>.64</td>
</tr>
<tr>
<td>Dogmatism Scale, Form E</td>
<td>184</td>
<td>169.35</td>
<td>26.25</td>
<td>.79</td>
</tr>
</tbody>
</table>
The above reliability coefficients are consonant with previously obtained estimates. While it would be desirable to employ instruments having higher reliabilities, correlations from .64 to .83 are thought to be sufficiently high to use in differentiating among groups (Garrett, 1964).

### Intelligence

Because of the lack of consistency in previous research findings on the relationship between level of dogmatism and intelligence, an analysis of variance was performed on the "g" factor scores, from the GATB, for the experimental groups. A correlation coefficient between level of dogmatism and "g" factor scores was computed for the total sample. The results are presented in Tables 6, 7, and 8.

Table 6. Distribution statistics for experimental groups on "g" factor scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>25</td>
<td>103.12</td>
<td>12.96</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>25</td>
<td>107.88</td>
<td>12.16</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>25</td>
<td>111.80</td>
<td>16.98</td>
</tr>
</tbody>
</table>
Table 7. Analysis of variance for the data in Table 6

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>944.72</td>
<td>472.36</td>
<td>2.34  N.S.</td>
</tr>
<tr>
<td>Within Groups</td>
<td>72</td>
<td>14,501.28</td>
<td>201.40</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>74</td>
<td>15,446.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>df = 2/72</td>
<td>F</td>
<td>P &lt; .05</td>
<td>f = 4.92</td>
<td>P &lt; .01</td>
</tr>
</tbody>
</table>

Table 8. Pearson Product-Moment correlation coefficients between level of dogmatism and "g" factor scores

| Level of Dogmatism | "g" factor | -.131 N.S. |

As our obtained F of 2.34 and r of -.131 are not significant, we must conclude that our experimental groups and total sample are homogeneous with regards to their GATB scores. As a result of this finding, and Madaus' (1967) finding regarding the independence of intellectual measures and divergent abilities, it was decided not to control further for level of intelligence as measured by the GATB.

Level of Dogmatism and Divergent Abilities

In order to gain the most comprehensive picture possible of the relationship between level of dogmatism and divergent abilities,
hypotheses were developed and tested which allowed an assessment not only of the correlation throughout a total sample, but also an analysis of variance between the variables in two extreme samples.

Hypothesis 1 stated that there would be a negative correlation between scores on the dogmatism scale and originality scores. Hypothesis 2 stated that there would be a negative correlation between scores on the dogmatism scale and spontaneous flexibility scores. Both of these hypotheses were confirmed in a correlational analysis on 184 Ss. The results are presented in Table 9.

Table 9. Pearson Product-Moment correlation coefficients between level of dogmatism and originality and spontaneous flexibility scores

<table>
<thead>
<tr>
<th>Level of Dogmatism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Originality</td>
<td>-.293*</td>
</tr>
<tr>
<td>Spontaneous Flexibility</td>
<td>-.197*</td>
</tr>
</tbody>
</table>

Hypothesis 3 stated that there would be no correlation between scores on the dogmatism scale and ideational fluency scores. The hypothesis was retained. The data is reported in Table 10.

Hypothesis 4 stated that there will be a negative correlation between scores on the dogmatism scale and the composite divergent abilities scores. The hypothesis was confirmed in a correlational analysis on 184 Ss. The results are presented in Table 11.
Table 10. Pearson Product-Moment correlation coefficient between level of dogmatism and ideational fluency scores

<table>
<thead>
<tr>
<th>Dogmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideational Fluency</td>
</tr>
<tr>
<td>-.145 N.S.</td>
</tr>
</tbody>
</table>

Table 11. Pearson Product-Moment correlation coefficient between level of dogmatism and composite divergent abilities scores

<table>
<thead>
<tr>
<th>Level of Dogmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Divergent Ability</td>
</tr>
<tr>
<td>-.26**</td>
</tr>
</tbody>
</table>

**P < .01

As can be seen from the above findings, the level of dogmatism is negatively correlated with flexibility, originality, and composite divergent ability scores, while being unrelated to ideational fluency scores. This relationship was further analyzed through an examination of the experimental groups' performances on these tests.

Hypothesis 5 stated that groups of high and low dogmatics would have significantly different mean originality scores. An analysis of variance was performed on the scores of the experimental groups on this test. The results are reported in Tables 12 and 13.

Finding a significant F, a comparison of group differences, two at a time, was done according to methods developed by Scheffe (1953). The results are reported in Table 14.
### Table 12. Distribution statistics of experimental groups on originality scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>$\overline{X}$</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>30</td>
<td>3.73</td>
<td>2.827</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>30</td>
<td>5.40</td>
<td>3.458</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>30</td>
<td>9.27</td>
<td>5.860</td>
</tr>
</tbody>
</table>

### Table 13. Analysis of Variance for data in Table 11

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Sq.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>483.47</td>
<td>241.74</td>
<td>13.35**</td>
</tr>
<tr>
<td>Within Groups</td>
<td>87</td>
<td>1,574.93</td>
<td>18.10</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>89</td>
<td>2,058.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>df = 2/87</td>
<td>F  = 4.88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P < .01

### Table 14. Mean differences between experimental groups on the originality measure

<table>
<thead>
<tr>
<th></th>
<th>High Dogmatic</th>
<th>Medium Dogmatic</th>
<th>Low Dogmatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>1.67 N.S.</td>
<td></td>
<td>5.54**</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td></td>
<td>3.87**</td>
<td></td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P < .01
As can be seen from Table 14, groups of medium and high dogmatics do not have significantly different originality scores. Low dogmatics score higher than either medium or high dogmatics.

Hypothesis 6 stated that groups of high and low dogmatics will have significantly different mean spontaneous flexibility scores. An analysis of variance was performed on the scores of the experimental groups on this factor. The results are reported in Tables 15 and 16.

Finding a significant F, a comparison of group differences was done again using Scheffe's (1953) method. The results are reported in Table 17.

Table 15. Distribution statistics of experimental groups on flexibility scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>30</td>
<td>12.60</td>
<td>5.523</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>30</td>
<td>14.36</td>
<td>4.700</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>30</td>
<td>16.56</td>
<td>7.320</td>
</tr>
</tbody>
</table>

Table 16. Analysis of variance of the data in Table 14

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Sq.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>236.96</td>
<td>118.48</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>87</td>
<td>3,246.53</td>
<td>37.31</td>
<td>3.175*</td>
</tr>
<tr>
<td>TOTAL</td>
<td>89</td>
<td>3,483.49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P < .05
Table 17. Mean differences between experimental groups on the flexibility measure

<table>
<thead>
<tr>
<th></th>
<th>High Dogmatic</th>
<th>Medium Dogmatic</th>
<th>Low Dogmatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td></td>
<td>1.76 N.S.</td>
<td>3.76*</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>2.20*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td></td>
<td>2.20*</td>
<td></td>
</tr>
</tbody>
</table>

*P < .05

As can be seen in Table 17, high and medium, and low and medium dogmatics have the same mean scores on the flexibility measure, while low dogmatics score higher than high dogmatics. Thus, hypothesis 6 is retained.

Hypothesis 7 stated that high and low dogmatics would not have significantly different mean ideational fluency scores. An analysis of variance was performed on the scores of the experimental groups on this test. The results are presented in Tables 18 and 19.

Table 18. Distribution statistics of experimental groups on fluency scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>30</td>
<td>23.80</td>
<td>10.69</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>30</td>
<td>28.73</td>
<td>10.78</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>30</td>
<td>29.33</td>
<td>11.51</td>
</tr>
</tbody>
</table>
Table 19. Analysis of variance for the data in Table 17

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Sq.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>553.16</td>
<td>276.58</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>87</td>
<td>10,189.33</td>
<td>117.11</td>
<td>2.37</td>
</tr>
<tr>
<td>TOTAL</td>
<td>89</td>
<td>10,722.49</td>
<td></td>
<td>2.37 N.S.</td>
</tr>
</tbody>
</table>

As our F did not reach the .05 level of significance, the hypothesis that groups of high and low dogmatics will not have significantly different mean ideational fluency scores, is retained.

Hypothesis 8 stated that groups of high and low dogmatics would have significantly different mean divergent ability scores. An analysis of variance was performed on the composite divergent abilities scores for each of the experimental groups. The results are reported in Tables 20 and 21.

Table 20. Distribution statistics of experimental groups on composite divergent abilities scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>30</td>
<td>58.73</td>
<td>20.50</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>30</td>
<td>68.60</td>
<td>20.12</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>30</td>
<td>74.66</td>
<td>30.49</td>
</tr>
</tbody>
</table>
Table 21. Analysis of variance for the data in Table 17

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Sq.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>7,702.50</td>
<td>3,851.25</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>87</td>
<td>50,879.73</td>
<td>584.82</td>
<td>6.58**</td>
</tr>
<tr>
<td>TOTAL</td>
<td>89</td>
<td>58,582.23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P < .01, an F of 4.88 is needed to reach the .01 level of significance.

As our obtained F of 6.58 was significant, a comparison of groups, two at a time, was done (Scheffe, 1953). The results are reported in Table 22.

Table 22. Comparisons of experimental mean differences on the composite divergent abilities scores

<table>
<thead>
<tr>
<th></th>
<th>High Dogmatic</th>
<th>Medium Dogmatic</th>
<th>Low Dogmatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td></td>
<td>9.87 N.S.</td>
<td>15.93**</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td></td>
<td>6.06 N.S.</td>
<td></td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P < .01

As can be seen from Table 22, low dogmatics score higher than high dogmatics on tests of divergent abilities, while medium and high, and medium and low dogmatics do not differ.
Level of Dogmatism and Convergent Abilities

Our hypothesis regarding level of dogmatism and convergent abilities were stated and tested so as to allow not only for an assessment of the correlation between the two variables in a total sample, but also an analysis of variance in the extreme groups.

Hypothesis 9 stated that there would not be a significant correlation between dogmatism scores and the composite convergent abilities scores. The hypothesis was rejected. The results of a correlational analysis on the total sample is presented in Table 23.

Table 23. Pearson Product-Moment correlation coefficient between level of dogmatism and composite convergent abilities scores

<table>
<thead>
<tr>
<th>Level of Dogmatism</th>
<th>Composite Convergent Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-.183*</td>
</tr>
</tbody>
</table>

*P < .05

Hypothesis 10 stated that groups of high and low dogmatics would not have significantly different mean convergent abilities scores. An analysis of variance was carried out on the composite convergent ability scores of the experimental groups. The results are presented in Tables 24 and 25.

As our obtained F was significant, a comparison of the group means was done (Scheffe, 1953). The results are reported in Table 26.
### Table 24. Distribution statistics for experimental groups on composite convergent ability scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>30</td>
<td>14.86</td>
<td>5.08</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td>30</td>
<td>15.56</td>
<td>4.19</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td>30</td>
<td>18.60</td>
<td>4.20</td>
</tr>
</tbody>
</table>

### Table 25. Analysis of variance for the data in Table 23

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Sq.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2</td>
<td>236.29</td>
<td>118.15</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>87</td>
<td>1,766.03</td>
<td>20.29</td>
<td>5.82**</td>
</tr>
<tr>
<td>TOTAL</td>
<td>89</td>
<td>2,002.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P < .01, an F of 4.88 is needed to reach the .01 level of significance.

### Table 26. Comparisons of experimental mean differences on the composite convergent ability scores

<table>
<thead>
<tr>
<th></th>
<th>High Dogmatic</th>
<th>Medium Dogmatic</th>
<th>Low Dogmatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Dogmatic</td>
<td>.70 N.S.</td>
<td></td>
<td>3.74**</td>
</tr>
<tr>
<td>Medium Dogmatic</td>
<td></td>
<td></td>
<td>3.04*</td>
</tr>
<tr>
<td>Low Dogmatic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P < .05

**P < .01
As can be seen in Table 26, the mean of the medium dogmatics is not different from the mean of the high dogmatics. However, the mean of the low dogmatics was higher than that of either the medium or high dogmatics.

In order to assess the divergent and convergent abilities of both high and low dogmatics, taken separately, the following hypotheses were stated and tested.

Hypothesis 11 stated that groups of high dogmatics would perform convergent operations better than divergent operations. In order to test this hypothesis the raw composite convergent and divergent ability scores for each individual in the high dogmatic group were converted to standard scores. A t test of the differences between two means from correlated samples was computed according to a method outlined by Ferguson (1966, pp. 169-171). The results are presented in Table 27.

<table>
<thead>
<tr>
<th>Ability</th>
<th>High Dogmatic $\bar{X}$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergent</td>
<td>-.029</td>
<td></td>
</tr>
<tr>
<td>Divergent</td>
<td>-.315</td>
<td>2.193*</td>
</tr>
</tbody>
</table>

*P < .05

As can be seen in Table 27, groups of high dogmatics do perform convergent operations better than they perform divergent operations; therefore, Hypothesis 11 is retained.

Hypothesis 12 stated that groups of low dogmatics would perform convergent and divergent operations equally well. In order to test this
hypothesis, the raw composite convergent and divergent ability scores were converted to standard scores. A t-test of the differences between two means from correlated samples was again computed according to a method outlined by Ferguson (1966, pp. 169-171). The results are presented in Table 28.

Table 28. T-Test of the differences between divergent and convergent abilities of low dogmatics

<table>
<thead>
<tr>
<th>Ability</th>
<th>Low Dogmatic $\bar{X}$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergent</td>
<td>.594</td>
<td>.021 N.S.</td>
</tr>
<tr>
<td>Divergent</td>
<td>.612</td>
<td></td>
</tr>
</tbody>
</table>

As can be seen in Table 28, groups of low dogmatics perform convergent and divergent operations equally well; hypothesis 12 is retained.
CHAPTER V
DISCUSSION

As was seen in the previous chapter, significant differences were found between dogmatism and divergent and convergent abilities in almost every instance. The meaning of these findings, as well as their implications for further research will be discussed below.

Intelligence

As the review of the literature pointed out, most investigations (Ehrlick, 1955; Rokeach, 1960; Christensen, 1963) of the relationship between dogmatism and intelligence have found the two variables to be independent. However, Zagona and Zurcher (1965) did find high and low dogmatics to differ; the low dogmatics scoring higher on intelligence tests. The noted differences in learning ability (Adams and Vidulich, 1962; Frumkin, 1961) and problem solving techniques (Kemp, 1960; Long and Ziller, 1965) further make one suspect that groups of high and low dogmatics constitute different intellectual populations. However, an analysis of variance of the extreme groups of high and low dogmatics in the present study, did not show a difference in intellectual ability as measured by the "g" factor from the General Aptitude Test Battery. Aside from the theoretical difficulties as to whether a "general" factor of intelligence actually exists, the "g" factor from the GATB is a reliable measure and it is considered by some psychologists to offer a "good" estimate of general intelligence (Taylor, 1963, p. 715).
An inspection of the data revealed differences in the group means with IQ scores increasing as dogmatism decreased. However, the differences failed to reach an acceptable level of significance. This trend might be accounted for by the large standard deviations of our experimental groups. For example, in our high dogmatic group we had individuals ranging in intelligence from 81 to 133. The within group variation was even more marked in our low dogmatic group with scores from as low as 79 to as high as 139. Apparently, one can be either high or low in level of dogmatism regardless of level of intelligence.

It was therefore concluded that our experimental groups were homogeneous along the dimension of "intelligence." This finding is consonant with Rokeach's (1960) original hypothesis on the independence of dogmatism and intelligence, and the research findings of Ehrlich (1955), Rokeach (1960), and Christensen (1963). It further gives our results on the relationships between level of dogmatism and divergent and convergent abilities more explanatory power than would have been the case if our groups had differed in general intelligence.

Level of Dogmatism and Divergent Abilities

The data are quite clear with regards to the relationship between level of dogmatism and divergent abilities. In every instance, save one, the two dimensions are negatively correlated.

The more dogmatic an individual, the less original he is in a problem solving situation. The more dogmatic an individual, the less he can change direction or modify his approach to a problem; i.e., the less flexible he is. The only divergent dimension not related to level of dogmatism, is ideational fluency. That is to say, level of dogmatism
is not correlated with the number of responses an individual can make in a problem solving situation. However, when responses are evaluated either for originality or flexibility, differences appear.

The differences between level of dogmatism and divergent ability are more evident in the findings on the extreme groups' performance. The experimental groups of high and low dogmatics were found to have significantly different mean originality scores. The low dogmatic group was superior to either the medium or high dogmatic group, while the medium dogmatics did not differ from the high dogmatics in originality. This finding is helpful in interpreting the magnitude of the correlation coefficient between level of dogmatism and originality which was -.29. As was seen in Tables 11 and 12, most of the between group variance was accounted for by the magnitude of the difference between the low group and the other two groups. As our obtained F of 13.86 far exceeded the .01 level of significance, it seems that the relationship between dogmatism and originality is not a linear one in our sample. Only further research on a broader population can determine if the tendency found in this study for level of dogmatism and originality to be more highly correlated in the lower levels of dogmatism than in the higher levels of dogmatism, is a general pattern.

The essence of an original response has been outlined by several authors (Ghiselin, 1952; Taylor, 1964; Guilford, 1965); the essential feature of such a response being, the pairing of remotely associated ideas. Mednick (1962, pp. 221-222) provided an example which represents the operational embodiment of original production. He described how a physicist reduced the pairing of remotely associated ideas to a method by placing in a fishbowl large numbers of slips of paper, each inscribed
with a physical fact. The physicist would then randomly draw pairs of these facts from the fishbowl, looking for new and useful combinations which otherwise might not have occurred to him.

If one assumes that original production requires such an examination of many pieces of information not commonly associated with a problem, the finding that the low dogmatic is more original than either the medium or high dogmatic is interpretable. Rokeach (1960) found high dogmatics clinging tenaciously to prescribed, conventional rules in problem solving. Investigating a wide range of behaviors, Wrenn (1962), Harvey (1963), Mikol (1956), Frumkin (1960) and McCarthy and Johnson (1962) all found high dogmatics to lack independence in thinking. In whatever fashion one views the production of original responses, one point becomes clear from our data: low dogmatics produce more original responses than high dogmatics.

The second major variable examined was spontaneous flexibility. An analysis of variance showed the low dogmatic group to be more flexible in their thinking than the high dogmatic group. The medium dogmatic group was not distinguishable from the high dogmatic group. An example of flexibility in our experimental groups follows. Given the task of listing uses other than footwear for a shoe, the high dogmatic Ss would typically produce a large number of responses such as polish them, fix them, kick people, walk on, run on, receiving a score of zero for flexibility because they had not broken away from the normal use for a shoe. Often the low dogmatic Ss would give fewer responses such as to crush bugs, tie on car after wedding, drink champagne out of, and still receive a higher score for flexibility because they had changed the use for a shoe. Apparently, the low dogmatic S is more capable of shifting direction and redefining the information he must deal with; he does not stay in a rut, but branches out into new channels of thought.
Zagona and Zurcher (1965) came very close to describing the above relationship in their semester-long classroom observations of high and low dogmatics. They noted how the group of high dogmatic students, once started on a particular task in solving a problem, found it almost impossible to shift and look at the problem from a different angle. Although he did not describe the behavior he observed in terms of spontaneous flexibility, Rokeach (1960, pp. 171-182) noted a lack of flexibility in groups of high dogmatics trying to solve the "doodle-bug" problem.

Along the dimension of ideational fluency, the analysis of variance among the experimental groups supported the finding that dogmatism and ideational fluency were not correlated. When the task at hand is the calling up of large numbers of solutions to a problem, independent of originality or flexibility, there was no difference between the performance of the high and the low dogmatic.

The use of the composite divergent abilities score was helpful in emphasizing the trends present in Ss’ performances on the measures’ component parts. We found the composite divergent abilities score negatively correlated with level of dogmatism, while in the experimental groups high and low dogmatics had significantly different mean divergent abilities scores, with the medium group not significantly differing from the high group. Thus, if one were to speak of "divergent" ability rather than the component parts, he would be justified in taking the position that the more dogmatic an individual, the less he will be able to generate information where the emphasis is upon variety and quantity of output from the same source; this operation is the one most clearly involved in measuring aptitude for creative potential (Guilford and Hoepfner, 1966, p. 3).
Because of the absence of previous research on the functioning of medium dogmatics, such a group was constructed in this study, and their performance analyzed. It should be noted at this point, that our group of medium dogmatics was not meaningfully distinguishable in our analysis of divergent abilities. In most instances, their performance was not significantly different from that of the high dogmatic. In no instance was their performance equal to that of the low dogmatic group.

Level of Dogmatism and Convergent Abilities

Convergent production has been spoken of as production by compelling inference (Guilford, 1967, p. 171); production where the input of information is sufficient to determine an answer and where the focus is upon the attainment of conventionally accepted outcomes. Given this definition, there was no reason to suspect that such production would be related to level of dogmatism, and our hypothesis was so stated. This, however, was not the case. Level of dogmatism was negatively correlated with convergent production in our total sample. In the analysis of the extreme groups' performance, it was found that low dogmatics had higher mean scores than either medium or high dogmatics on convergent production tests. The mean medium dogmatics performance was not distinguishable from the high dogmatics.

This finding is consistent with Moore's (1961) finding that the high dogmatic does not respond to verbal conditioning as readily as the low dogmatic. Assuming that verbal praise was reinforcing, Moore concluded that the high dogmatic cannot discriminate as adequately among the more obvious stimuli he receives from his environment. Similar
inadequate discriminative ability may be operating in the performance of the high dogmatic subjects on tests of convergent operations. They may not be capable of making profitable discriminations even when the focus is upon the logical and the conventional. However, on the basis of our data, we can only conclude that the high dogmatics' performance tends to be inferior to the low dogmatics' performance of cognitive operations where sufficient information is present to achieve a conventionally accepted answer.

Divergent and Convergent Abilities of High and Low Dogmatics

The difference between the high dogmatics' ability to produce divergently and convergently seemed central to a thorough description of our experimental groups. A test of the differences between the high dogmatics' performances in these two areas was computed. It was found that high dogmatic Ss tend to perform convergent operations better than they perform divergent operations. Conversely, it was found that low dogmatics perform convergent and divergent operations equally well.

Guilford's research on the structure of intellect has been mainly descriptive in nature with a minimal amount of interpretation. It is, therefore, difficult to interpret the finding that an individual performs in either a superior or inferior fashion on specific abilities, within the theoretical structure of intellect. A transformation which this writer has found useful in examining the findings is the translation of Guilford's model of intellect into the computer model: the products of intellectual operations being equivalent to output; the contents of intellect being equivalent to input; and the operations of intellect being equivalent to the computer program.
Given this model, we can restate the findings of this study in a more comprehensible fashion. With semantic input we have found low dogmatics to be better programmed than high dogmatics to output transformations and classes. The low dogmatic subject is programmed equally well to generate new information and to generate logical, deductive information. On the other hand, the highly dogmatic individual has programs which more readily output logical conventional information.

Limitations of the Study

Two methodological limitations of the present study are worthy of note.

1. It is obvious that the present study only investigated two out of sixteen defined divergent operations, and two out of fourteen defined convergent operations. Our findings do not represent the total divergent and convergent abilities of our Ss. It would be interesting to examine the relationships between level of dogmatism and divergent-convergent ability, while varying the input (content) Ss had to operate on and the output (products) they had to produce.

2. As was pointed out in Chapter III, ongoing research indicates that the sample for this study is more dogmatic than comparable groups from other geographic areas. Thus, if the present study were replicated on a different population, different results might occur. For example, in the present study a lack of linearity was found between level of dogmatism and originality. Further research on a sample which had a lower level of dogmatism, and thus more "low" dogmatic Ss, might show the relationship to actually be linear. Similarly, we found no meaningful
distinctions between the medium dogmatics and the high dogmatics. However, given the level of dogmatism for the total sample, the medium dogmatics are actually high dogmatics in almost any other geographical area. Thus, to conclude that medium dogmatics do not significantly differ from high dogmatics in divergent and convergent ability, is a tenuous conclusion at best.

**Implications**

1. The overriding implication of this study is to offer further support for the much debated notion that personality factors are correlated with intellectual abilities (see Mednick and Mednick, 1964; Guilford, 1965).

2. As McKeachie (1961) has pointed out, we have very little sure knowledge about what dimensions of personality are related to the learning situation. The findings regarding the intellectual abilities of our experimental groups seem to have implications for researchers investigating the interaction between student personality and teaching style; and for educators concerned with building curriculum most effective for differing cognitive styles.

3. Those interested in the psychotherapeutic process (Rogers, 1961; Frank, 1961) have stressed the need for the therapist to see the world as the patient does. Grasping the phenomenological field of the patient is seen as a first step in the therapeutic process. Descriptions of this ability (Rogers, 1961) closely resemble what has been described in this study as spontaneous flexibility. Thus, the findings from this study seem to have implications for those involved in selecting applicants for
clinical training (Kemp, 1961) as well as implications as to a personality dimension which is negatively correlated with this seemingly crucial ability for conducting successful psychotherapy.
CHAPTER VI
SUMMARY

The present investigation was designed to examine the relationships between level of dogmatism and divergent-convergent abilities, as well as the divergent-convergent abilities of extreme groups in the dogmatism population.

An estimate of level of dogmatism was obtained on an eleventh grade high school class. From this population, three experimental groups were identified. The experimental groups consisted of the Ss highest in dogmatism, lowest in dogmatism, and a third group, medium in dogmatism. Estimates of divergent and convergent abilities were obtained on the total samples. The following hypothesis were generated on the basis of previous research on the relationship between open and closed belief systems and cognitive abilities:

1. There will be a negative correlation between dogmatism scores and originality scores.
2. There will be a negative correlation between dogmatism scores and spontaneous flexibility scores.
3. There will not be a significant correlation between scores on the dogmatism scale and ideational fluency scores.
4. There will be a negative correlation between dogmatism scores and the composite divergent abilities scores.
5. Groups of high and low dogmatics will have significantly different mean spontaneous flexibility scores.
6. Groups of high and low dogmatics will have significantly different mean spontaneous flexibility scores.

7. Groups of high and low dogmatics will not have significantly different mean ideational fluency scores.

8. Groups of high and low dogmatics will have significantly different mean divergent ability scores.

9. There will not be a significant correlation between dogmatism scores and the composite convergent abilities scores.

10. Groups of high and low dogmatics will not have significantly different mean convergent abilities scores.

11. Groups of high dogmatics will have higher mean standard scores on tests of convergent abilities than on tests of divergent abilities.

12. Groups of low dogmatics will not have higher mean standard scores on tests of convergent abilities than on tests of divergent abilities.

There was general support for hypothesis 1 through 8, and 11 and 12. Hypothesis 9 and 10 were rejected. It was concluded that level of dogmatism is negatively correlated with both divergent and convergent ability, although the highly dogmatic person does function on a higher level when convergent production is the desired end.

These findings were seen as having general support for the pervasiveness of Rokeach's construct of dogmatism and for the general notion that personality factors influence intellectual ability. The findings were seen as being meaningful for those engaged in research on the interaction between student personality and classroom learning, and also for those engaged in personality research on what constitutes a successful therapist.


