Differential Quantitative and Verbal Scores

and Creativity

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DIFFERENTIAL QUANTITATIVE AND VERBAL SCORES
AND CREATIVITY

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CHAPTER I

INTRODUCTION

Differences between quantitative (Q) versus Linguistic (L) or verbal (V) abilities have intrigued both research workers and counselors for many years. Many respected tests, such as the American College Testing Program (ACT), American Council on Education (ACE), and College Entrance Examination Board's (CEEB), Scholastic Aptitude Test (SAT), and the Army General Classification Test (AGCT) yield two separate scores in these areas, reinforcing the impression that intellectual structure can be divided into two or more relatively independent sectors—the efficiency of thinking in terms of quantity and efficiency in manipulating less precise, vaguer, frequently affectively-toned verbal constructs. It is possible that differential interpretations might be obtained from discrepancies in these subscores, each of which is presumably representing one's ability to think, reason and learn with abstract, symbolic material. Published research is grossly insufficient to warrant any definite conclusions about Q-L differences. A review of existing literature reveals the need for additional research as well as cross-validation of previous work; not only are there relatively few systematic studies of differential aptitudes reported, but those which have appeared are not markedly consistent in their findings, and at times they are notably contradictory.
Goldman (22) cited the need for studies dealing with the relationship between intra-individual score variability (such as Q-L) and a criterion.

The relationship between Q-L patterns and various personality and interest factors has received more attention than other aspects of this topic. Wells (58) appears to be among the earliest pioneer researchers in this field. His initial publication offered a general discussion of the verbal-quantitative problem, utilizing the case-study approach. A primary assertion was that verbalism and quantitation are both traits of ideational content which are not directly concerned with things, with the "concrete" world; thus, Wells believed they are more temperamental than intellectual in character. The verbalist attitude is described as representing a "preference for words, with their relatively flexible meanings, as against numbers (or things) with their more rigid ones; one wants an elasticity in his thinking that words can give and numbers cannot" (58, p. 72). The verbalist is repelled by the invariance and rigidity of numbers, while being attracted to the connotative nuances of words. Wells noted that Alfred Adler once offered the suggestion that the mathematical mind was likely the more self-sufficient, while the verbal one tended to seek its security in relationship to others. In this regard, Wells related Adler's suggestion to the more social tendency observed generally in the "Verbal Facility" group, as well as a special need for "belonging" in the two cases he reviewed. Wells made
primarily assignment of traits which are requisite to verbalism; outstanding traits must include Verbal Facility itself, as well as at least three of the traits designated Sensitive Affect, Self-conscious Introspective, Ideational, Creative-Intuitive, and Cultural and must exclude Pragmatic, Practical Organizing, Physical Science Motivations and Inarticulate. Thus, verbalism is regarded as more of a temperamental characteristic than an intellectual one.

Much of the credit for stimulating interest in this research area resulted from Munroe's study of Sarah Lawrence students (4:2). Her findings suggested that, while response total was closely proximate, in the high $Q$ and the high $L$ groups, those girls whose ($L$) scores were higher than their $Q$ scores tended on the Rorschach, to have a more "subjective" orientation toward reality (less use of form exclusively and poorer form quality). Greater use of human movement was found, indicating creative organization and imagination; additionally, more words were used in describing the action visualized in contrast to a laconic treatment of pure form responses. Over-abundant movement implies a subjective, introspective approach to reality. The higher $L$ group possessed rich imagination and ideas; responsiveness to color as an indication of out-going affectivity seemed profoundly influenced by highly-developed inner strivings. This structuring from within is likely to find expression as a relatively creative literary, artistic, or theoretical bent. The higher $Q$ girl, on
the other hand, utilized form more extensively and were charac-
terized as "... more bound to a rather literal construction of
objective reality" (4, p. 315). The reduction of movement seen
in the higher Q group thus suggests an inhibition of normal
creative imagination. However, overall adjustment factors for
the two groups were not significantly disparate.

Goldman (22) attempted to test the existence of similar
relationships with high school students. However, the Differ-
tential Aptitude Test (DAT) was utilized instead of the ACE, and
intra-individual scores were expressed as differences between
an individual's score on one test and his mean score on all
others. The Rorschach was employed as a measure of personality.
Little support was found for Munroe's conclusions, but there
was a tendency for higher Verbal students to appear somewhat
more "subjective".

In 1951, Pemberton (44) studied male executives with the
ACE and several interest and personality inventories and re-
ported results partially in agreement with Munroe's. He found
that "The higher L group was significantly more reflective and
socially introverted, with higher literary, esthetic, and theo-
retical interests" (44, p. 162). The higher Q group was "more
extroverted, socially conforming, interest in economic and
practical affairs, and interest in persuasive occupations"
(44, p. 162). The Q group reportedly also "felt more general
pressure for overt activity, expressed greater feelings of
nervous tension and irritability, demonstrated less interest in
social issues, greater lack of tolerance and lower masculinity of attitudes and interests" than did the higher-L group (44, p. 162).

DiVesta (16) studied Air Force officers and found relative Q-L scores associated with membership in certain groups of service occupations and college majors. He hypothesized that, because the demands of a pilot's job are extremely technical and require a high degree of objectivity; more pilots would be in the higher-Q group than non-pilots; because the non-pilots were in administrative positions, he hypothesized that they would tend to be in the higher-L group. Results generally confirmed his major hypotheses; pilots tended to have higher-Q scores, while ground personnel had higher-L scores. Additional findings indicated that job areas which demanded planning, such as intelligence or comptroller, tended to be filled by individuals with higher-L scores, while job areas involving more mechanical or technical routine requirements were filled with persons having higher-Q scores. Further analyses suggested that students who had specialized in arts and sciences achieved higher scores on the ACE "I" score than did those who majored in technical and business administration courses. The applied-science college majors (engineering and business) had higher-Q scores. DiVesta concluded that there is a relationship between the American Council Psychological Examination (ACE) pattern and the utilization of intelligence by the individual.
A preponderance of recently-published research relative to differential Q-L aptitudes is attributable to Altus (4) who attempted to isolate personality correlates concomitant with Q-L variation. Quantitative and linguistic abilities were defined in terms of scores on the ACE, while personality structure was assessed by responses given to the group form of the Minnesota Multiphasic Personality Inventory (MMPI). Forty-three of the MMPI were retained which statistically differentiated between the groups. Higher-Q women were found to admit attraction to their own sex more frequently, deny liking to flirt, prefer to work with women, and avoid "sexy" shows if possible. Avoidance of socially-toned sexual situations, coupled with a greater tendency to resort to like-sex attractions, is apparent in the cluster of items Altus entitles "Sexual Inversion or Immaturity." In the "Religiose or Rose-Colored Glasses Attitudes," the "goody-goody," straight-laced, immature conventionality of the higher-Q woman was clearly delineated; these individuals have "a higher opinion of their personal veracity and goal strength, and they are much surer of their convictions in this age of relativistic thinking" (4, p. 288). The third set of items, "Antipathy Toward the Verbal," is the sharpest, most clear-cut of all the categories. Predictably, the people with a relatively high Q, contrasted with the high L, simply do not like to read. High Q people also tended to worry over locking doors and catching diseases, frequently projecting a resentful, dysphoric mood tone in comparison to L women. The Q woman appeared more responsive to
social pressure; she prefers to work with "things" where words are not necessary. Beneath their Pollyanna-ish, conventional facade, Q women seem to suffer considerable "free-floating" anxiety and emotional constriction. Higher-Q women were not significantly more masculine in their attitudes than higher-L women, contrary to expectations. Altus sums up his results by stating that, compared with the Q, the L woman is "freer, less hidebound, more adventurous, less anxious, more literate and more mature" (4, p. 290). Altus offers a tentative explanatory hypothesis for explaining his data; he speculates that the "Q-higher-than-L" college woman is likely a function of the lack of diverse, catholic reading which would have called into question certain of her prim, conventional attitudes.

More recently Spilka and Kimble (53) utilized Altus' forty-three MMPI items with women students at Washburn University. They found a correlation of .22 with Q-L differentials on the ACE, supplying confirmatory evidence of the validity of these selected items.

Subsequent research performed by Altus (2) with the Group Rorschach (2) supported Munroe's earlier results concerning the higher percentage of human movement found in protocols of high-L persons. However, Altus' data did not confirm Munroe's findings of higher F per cent in Q men; to the contrary, he found the high-L group utilized more pure F. Additionally, the higher-L group was found to have a larger response total, while Munroe found no difference for females. The high-L men also tended
to have a W1 approach, while the high Q men used a D1 approach.

In 1953, Altus (2) repeated his 1952 study (4); this time, however, college males were employed as subjects. The same psychometric variables were used; i.e., the MMPI and differentials in Q and L on the ACE. Two hypotheses were set up: (a) that the higher-Q college males would be more masculine (have a lower Mf score on the MMPI) than the higher-L males; (b) that the higher-L men would appear somewhat "more sophisticated and mature" on certain of their answers. The rationale behind the hypothesis of greater masculinity takes cognizance of the fact that men generally tend to do better on Q tests than women. The basis for the second hypothesis is derived from his previous findings on college women; the more verbal women were more mature and sophisticated in those answers which discriminated them from high-Q women on the MMPI. The initial hypothesis was born out in a rather gross way by higher mean values on the MMPI Lie scale made by Q-higher-than-L men. Additionally, the Mf scale of the MMPI showed a highly significant mean difference between Q and L males; it thus appears that the college male whose abilities are relatively higher in dealing with quantities does have more masculine attitudes as measured by the MMPI. None of the other MMPI scales revealed any significant difference between the groups, corroborating Wells' original contention, as well as Altus' and Munroe's findings, that the Q-L discrepancies on the ACE are not related to general adjustment for college
populations. Naivete, dislike for the printed page, difficulty in social relationships, and greater "masculinity" (or antipathy to the esthetic) are the general characteristics which MMPI items reveal the higher-Q male to possess in comparison to the verbalist L. Males and females with high Q scores tend to be less forward, aggressive, and sure of themselves in social relationships than the students with more verbalist propensities. Altus speculates that social dominance and leadership may thus show more than a chance relationship to higher-L aptitudes. The verbalists, on the other hand, tends to be "more sophisticated, self insightful, socially dominant, literary, and less orthodox in religious matters" (8, p. 371) in terms of the way they evaluate themselves on the MMPI.

Previous publications indicate that Altus did research on samples of the two sexes; in 1959 (5) he decided to search for items that would transcend the barriers of sex in their relationships to quantitative-verbal differentials. Twenty-five items were selected based upon leads from earlier studies; these items were combined with seventy-five others (devised for a different purpose) and administered to incoming students at the University of California, Santa Barbara. The same students were given the Scholastic Aptitude Test (SAT), which, like the ACE, yields separate subscores for verbal aptitude (VAT) and mathematics aptitude (MAT). Altus points out that the verbal section is considerably longer than the quantitative measure, suggesting that the former measure is thus the more reliable and valid of the two
subtests. Results obtained indicated that fifteen of the items statistically differentiated between the high VAT and high MAT students at the .05 level of confidence or better. Those with verbal excess, in contrast to those with higher quantitative aptitude, like poetry, reading about history, reading newspaper editorials, reading in the library, and journalism; seven of the items have a distinct literary cast—the verbal factor here is readily discernible. The verbally superior additionally feel that their relatives are in sympathy with them, display less concern about domesticity in marriage, admit to daydreaming frequently, avoid large, noisy social gatherings, and are less certain that they would make good leaders. Greater freedom from convention, less naivete, and interest in the written word are the distinctive characteristics of the verbally superior when compared with those having relatively higher quantitative facility. These findings corroborate previous studies (6, 4), suggesting that these descriptive adjectives may be accepted with a modicum of confidence as applicable to the populations in question. Altus noted the interesting phenomenon that questionnaire items have often been shown to have varying degrees of positive relationships with scores from conventional intelligence tests. In this regard, he set out to test the hypothesis (7) that a college student's answers to questionnaire items of a "personality" type would show variation relative to aptitude test items according to the sex of the student; additionally, he proposed that the different subsets of items would
be found in the same test of verbal aptitude. He derived two scales from the Verbal Aptitude Test (VAT) of the SAT which correlated differentially with twenty-five questionnaire items, depending upon the scale and the sex of the subject. Both hypotheses received limited (though not quite statistically significant) confirmation. Altus interpreted the findings in this manner:

... One's attitude correlates with one's success on an aptitude test; the specific attitudes that go with one's sex are of special significance; and, finally, the degree of correlation of attitude and aptitude appears to depend greatly upon the type of aptitude items under consideration (7, p. 271).

Aiken (1) obtained results somewhat contradictory to Altus'. Aiken hypothesized that attitudes toward mathematics were merely another reflection of more general personality traits (particularly when no past traumatic experiences with mathematics are indicated). He administered an opinionnaire, the Math Attitude Scale, to 160 female college sophomores at a southeastern women's college; several objective measures of personality traits were also given. Additionally, the Scholastic Aptitude Test (SAT) scores were utilized as assessments of intellectual ability. Sixteen statistically significant correlations were obtained among the Math Attitude Scale scores, personality variables and interactions among these variables. Six of the variables constitute a cluster Aiken labeled "extroversion," while another six form a cluster entitled "conscientiousness." He observed that the theme of intellectual
efficiency runs through both these clusters. Another cluster found to have a correlation of at least .50 was "self-control", while "ego strength," "conservatism-radicalism," "theoretical" and SAT Mathematical did not meet this minimum criterion. It should be observed, however, that none of the personality variables correlate extremely highly with the Math Attitude Scale, yet it is unlikely that these results would have occurred by chance. In summarizing his findings, Aiken asserts:

... high scorers on the attitude scale, with mathematical ability statistically controlled, tend to be more socially and intellectually mature, more self-controlled, and place more value on theoretical matters than low scorers on the scale. These findings suggest that attitude toward mathematics is related to a broad constellation of personality variables indicative of adjustment and interest (1, p. 479).

Two studies have been completed concerning possible relationships between Q-L patterns and scores on the Strong Vocational Interest Blank (SVIB). These studies agreed that there are few, if any, SVIB occupational scales or group patterns associated with Q-L differences. Gustad (28) undertook his study to obtain evidence bearing on the hypothesis concerned with the origins of such interests as reflected by differential scores on the Quantitative (Q) and Linguistic (L) portions of the ACE. Male college juniors were utilized as subjects; for each student, the difference between local percentiles on the ACE Q and L subsections was computed. The groups were selected so that there was a relatively higher L group (one-half sigma or more), a relatively higher Q group, and one group whose scores were nearly
equal (the Q group). Profile comparisons of the SVIB patterns of the three groups failed to yield statistically significant differences related to students with differing aptitude scores even when the intelligence factor was controlled statistically. Gustad pointed out that some of the Q-L differences may have arisen by chance, tending to obscure real differences which may exist among the three groups. Additional confounding variables may be that amounts of intelligence required for various occupations are not generally recognized and that most occupations are so heterogeneous in their demands that not one but several patterns of aptitudes would be acceptable. Gustad concluded that, on the basis of present results, "the hypothesis that vocational interests are conditioned by differential aptitudes was unsubstantiated" (28, p. 167).

Woolf and Woolf (60) studied two groups of students, equated for quantitative ability, but differing in linguistic ability, in order to determine whether or not they differed in interest or clinical profiles on the SVIB. Group A consisted of students having a mean difference between Q and L of forty-four percentile points in favor of Q. In group B the Q rank was approximately equal to the L rank, having a mean difference of two percentile points between Q and L. Group B, with superior linguistic ability and superior verbal skills, ranked higher than Group A in Interest Maturity, the difference being statistically significant at the .01 level of confidence. The interests of Group B are more nearly like those of men in Social Welfare occupations
than are the interest of Group A by a statistically reliable margin, although neither group exhibited a pronounced interest in this type of vocation. They also found that the higher \( q \) group performed much more poorly than the equal \( q-L \) group on two linguistic tests. The interpret their findings in developmental terms, hypothesizing that there is a relationship between linguistic development, social development and general maturity; in this regard, Interest Maturity thus appears related to a balance in development between verbal and quantitative abilities; those students whose \( L \) scores were markedly inferior to their \( Q \) scores were undeveloped in the linguistic area as a part of a broader underdevelopment as individuals. The question is thus raised, "Might a low score in interest maturity be suggestive of delay in the development of a differentiated self concept?" (58, p. 415).

Ferguson and Maccoby (18) offer additional research from the developmental aspect. Their working hypothesis was that a significant portion of the variance in over-all intellectual performance (such as in verbal, spatial and/or mathematical realms) was functionally related to the nature of personality and emotional development the child undergoes as the result of crucial interpersonal experiences. They speculate that the development of verbal ability is likely facilitated by close and extensive adult-child interaction. High verbal children, according to Ferguson and Maccoby, therefore might be expected to be more dependent, "at least on adults." They study sample was composed
of the entire fifth-grade student population of two school
districts in the San Francisco Bay area. The Thurstone Primary
Mental Abilities Test, in combination with scores on the Cali-
ifornia Achievement Test, was employed as the measure of space,
verbal and numerical abilities. (They are careful to point out
that the less-than-perfect reliability of the aptitude measures
used is a contaminating variable which may partially account
for some of the discrepancies obtained.) The groups were divided
into high and intermediate verbal, number, and space groups.
The high-low discrepancy was 1.5 standard-score units. Peer-
ratings were utilized as measure of interpersonal characteristics.
The differential-abilities group was judged by their peer group
as being less aggressive. Results indicated that high-verbal
boys score higher on self-reported antisocial aggression than
low-verbal boys and report less dependency on adults when sick,
alone or afraid. Other findings, in agreement with Atlus,
suggest that high number ability is associated with a high de-
gree of social interaction with peers; additionally, high-number
children are low in withdrawal, higher on the Like-ability
Scale, with higher scores in masculinity and aggression for
high-number boys. High differential space ability was asso-
ciated with inappropriate sex typing in children of both sexes.
It was also found, in support of their working hypothesis, that
high-verbal children tended to have experienced an unusually
close, dependent interaction with adults; these children were
found to be significantly more distractible, particularly when
the distraction factor was the human voice. The authors posit the explanation that differences in interpersonal stress might be less vulnerable to stress and less likely to deteriorate with maladjustment. From this point of view, high-verbal, low-quantitative ability could then be related to a history of greater interpersonal stress during childhood.

Sanders, Mefford and Brown (46) approached the problem of discrepant abilities from a different direction, injecting, for the first time, the use of bio-chemical variables as performance criteria. As they pointed out, the development of mental abilities cannot be assumed to occur independently of the interaction with personality attributes and physiological processes. They employed an interdisciplinary approach, concomitantly studying certain personality, metabolic and scholastic performance attributes of students having notable discrepancies between verbal and quantitative aptitude versus those whose abilities approached equality. All scored within the upper thirty per cent of their particular population and thus would be considered above average in intellectual functioning. Male university freshmen at the University of Texas were selected on the basis of their University of Texas Admission Test (UTAT). Subjects were matched on both high and low scores so that obtained results might be related to the differential aptitudes rather than to disparate ability levels, per se. The personality instruments employed were the Edwards Personal Preference Schedule (EPPS), the Holtzman Inkblot Test (HIT), and the McQuire Q-check (Q). Other
measurements included scores on the English Placement Test, a reading comprehension test, and grades and grade points earned in all courses. Four overnight urine samples, collected over a predetermined number of hours (in order to assess rates of excretion), were also obtained. Analysis of the samples was performed to measure the following:

Electrolytes (sodium, potassium, calcium, magnesium, and phosphate), nitrogenous waste products (urea, uric acid, creatinine, and taurine), creatine, hormones (epinephrine, norepinephrine, serotonin, 17-hydroxycorticosteroids), twelve amino acids and five phenolic acids. These compounds were selected as indices of various physiological processes, including energy metabolism and food intake (urea, uric acid/creatinine ratio, steroids, epinephrine, norepinephrine, serotonin, creatine), and autonomic function (magnesium, tyrosine, phenylalanine, glycine, serine, metanephrin, phenolic acids, as well as the stress indices). The epinephrine and norepinephrine each were determined by two independent methods, paper chromatographic and colorimetric, but ... only the latter are presented (p. 493).

Results indicated that the high V individuals were strikingly better able to verbalize than the high Q students and were notably more imaginative as well. Further, the high V students were significantly higher on the Autonomy scale than the equal VQ group. The VQ group, on the other hand, scored significantly higher on the Dominance scale, while the high V group was significantly lower on the Endurance scale. The Q-check data indicated that the high V group described themselves as having a more personal orientation, rejecting authority more strongly, but simultaneously experiencing greater ambivalence than the other two groups. The high Q group was more dependent, rejecting a reality orientation, while the equal VQ group had moderate
scores on dependence and expressed less personal orientation than the other groups. Each group presented distinctive patterns of self-representation. Urinary analyses revealed that the high V subjects had strikingly lower urine flow and excretion rates for most measured variables than did either of the other groups. Two of the phenolic acids were highest in this group, while twenty-four of the thirty-four measured variables were lowest. The high Verbal group was readily distinguished metabolically from the others, and the high Quantitative group also tended to be different from the equal group. The equal VQ individuals were generally capable academically, performing well in any course attempted; they saw themselves as needing only moderate degrees of either autonomy or affiliation, yet strongly aspired to positions of leadership. Additionally, they desired order and routine in their daily lives, expressing a need to conform to custom and to avoid the unconventional. The norepinephrine/epinephrine ratio was significantly low in these subjects, a characteristic often related to passivity in emotional display. The VQ group was less active physically than the VQ but much more active than the VQ students. The high V individuals, in contrast, can be characterized as being rather idealistic, subjective, imaginative and intuitive; they describe themselves as independent, aloof from higher authority, with neither a need for affiliation nor conformity to custom and convention. High levels of aspiration were evidenced, but they felt these goals could be achieved without concomitant perseverance. The low preference
for physical activity is corroborated by the psychological as well as metabolic evidence, although the elevated norepinephrine/epinephrine ratio is suggestive of active, aggressive emotional behavior; these subjects apparently relied upon their own feelings in order to decide what the appropriate response should be in various social situations. The high Q group exhibited inclinations toward introspection, objectivity, systematization, perseverance, factuality, ambivalence, and dependence on higher authority and group affiliation; they preferred strong leadership and apparently were accustomed to letting others make the decisions and set the pace for them. This group of students participated most actively in group sports which partially accounts for increased excretion rates of muscular activity indices. As Sanders, Mefford and Brown observe, the very substantial differences between these three ability groups in personality, metabolic and scholastic performance points clearly to the need for further research in this area. It is obvious that these expressions of behavior are conditioned by the interaction of genetic, physiological, biochemical, psychological, and sociological factors. Interdisciplinary research is needed for the development of understanding of the many factors which influence personal preferences and rejections in the development and maturation of intellectual abilities (48, p. 502).

It has been noted that many of the adjectives employed to describe high-verbal subjects are strikingly similar to those used to describe creative individuals—sensitive, esthetic, subjective, imaginative, original, dominant, capable of creative organization. As more information on Q-L (or V-Q) discrepancies is direly needed, it might be well to explore
and test the hypothesis that higher-L subjects would be more creative than higher-Q subjects.

First, a review of recent literature concerning creativity itself is in order. Research in creativity has greatly increased since 1950. At that time, Guilford (24) in his presidential address to the American Psychological Association, stated that less than two tenths of one per cent of books and articles indexed in the Psychological Abstracts for the preceding quarter-century were directly concerned with creativity. In the last decade, however, many theoretical and research reports have been published. Today, although interest has been greatly stimulated in this area, researchers are plagued by the same major problems apparent nearly two decades ago. To begin with, there is the problem of definition. It is difficult to ensure agreement as to what creativity means, much less to objectify it sufficiently for empirical measurement.

In the fast-paced society of an aerospace age, new ideas, methodologies, products, inventions, designs, and compositions are constantly demanded. Business, universities, and counselors are all concerned with the identification of employees and students who are potentially creative. This is particularly so in the fields of science, medicine, and engineering, in which research for new products or ideas is of primary interest. Colleges and universities, especially in the realm encompassed by fine arts, are notably concerned about assessing creative potential. Evaluation of degree of creativeness in prospective or new students would greatly facilitate counseling students as to
their major fields of study. Ghiselin (21), in his introduction to the symposium on creativity in 1952, goes one step further in assessing the value of studies of the creative process. He asserts:

Today, when widespread, deep, and rapid changes are taking place in the very structure of our lives, whether we desire it or not, and when still other changes seem necessary to preserve us from disaster, understanding of the creative process is particularly important because it can assist in the control of these difficult developments (21, p. 12).

Rogers (9) emphatically supports the concept that creativity is crucially relevant to cultural survival; he maintains:

In a time when knowledge, constructive and destructive, is advancing by the most incredible leaps and bounds into a fantastic atomic age, genuinely creative adaptation seems to represent the only possibility that man can keep abreast of the kaleidoscopic change in his world. With scientific discovery and invention proceeding, we are told, at a geometric rate of progression, a generally passive and culture-bound people cannot cope with the multiplying issues and problems. Unless individuals, groups, and nations can imagine, construct, and creatively revise new ways of relating to these complex changes, the lights will go out. Unless man can make new and original adaptations to his environment, our culture will perish. Not only individual maladjustment and group tensions but international annihilation will be the price we pay for a lack of creativity.

Writers, artists, philosophers, psychologists, and others—all have their own preferred definition of creativity. Some would limit it to esthetics, while others use the term broadly to cover nearly any kind of original or imaginative ideas as well as esthetic sensitivity or exhibiting unique usage of materials or ideas.
Guilford's definition of a creative personality is "a matter of those patterns of traits that are characteristic of creative persons" (24, p. 444). This definition is not circular, as it first appears, for he goes on to specify that a creative pattern includes many activities such as investing, designing, contriving, composing, and planning. Guilford stressed that only people who exhibit these types of behavior to a marked degree are recognized as being creative.

Ghiselin (21) maintains that "The creative process is the process of change, of development, of evolution, in the organization of subjective life."

Roger's (9) definition of the creative process is: "It is the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other" (9, p. 70).

Fromm (9) describes creativity as the "ability to see (or to be aware) and to respond," while May (9) defines it as "the process of bringing something new into birth."

It becomes readily apparent that there are likely as many definitions of creativity as there are persons interested in this sphere. Several schools of thought may be delineated, however, within whose boundaries may be found some modicum of agreement among the various theorists. Machler and Schontz (38) have divided these points of view into the broad classifications of psychoanalytic, associationistic, Gestalt, existential, interpersonal, and trait theories.
The psychoanalytic view is based upon the concept of sublimation, in which the creative act is seen as a substitute process for gratification unobtainable in reality, and thus represents a neurotic adaptation pattern. Associationistic theory pertains to the ability to think productively, utilizing the number of associative bonds as individual possesses; it is the recombination of these bonds which results in creativity. The Gestalt theory, on the other hand, stresses the dynamic interplay of the person, process, environment, and the product involved in a creative performance. The existential viewpoint describes creative persons in their creative movements; creativity is seen as the encounter of the intensely-dedicated, conscious human being with his world. The interpersonal approach, in contrast, places emphasis upon the creator as "innovator," in conjunction with another person who recognizes or acknowledges the creation. Thus, creativity is viewed by some theorists as a manifestation of neurotic patterns, while others view it as the ultimate in self-actualization. The theoretical confusion is obvious and is reflected in the research literature; the results of future studies must be awaited in order to clear up the confusion.

Creativity has frequently been equated with intelligence in the past. Recent studies have indicated, however, that although a relationship does exist, the two are by no means synonymous. Drevdahl and Cattell (17) found that a certain degree of intelligence must be present in order for creativity to function, but intelligence alone is insufficient to guarantee creative ability.
This idea is supported by Thurstone (56), who reports that in many universities, students judged highly intelligent were not necessarily those who produced the most original ideas. Torrance (57) reported that, if an I.Q. test is utilized as the sole selector of high-level talent, about seventy per cent of the persons who have the highest twenty per cent of the scores on a creativity test battery will be missed. Guilford (24) maintains that creative talents are not confined to a few favored individuals, but are probably widely distributed to varying degrees, throughout the population.

Getzels and Jackson (20) studied adolescents enrolled in a private school in the Chicago area in whom the mean I.Q. score was above average. Two experimental groups were selected; students were in the top twenty per cent I.Q., but below the top twenty per cent in creativity comprised one group; students scoring in the top twenty per cent in creativity but were not concomitantly in the two twenty per cent in intelligence composed the second group. Students who exhibited high (upper twenty per cent) ability in both realms were not studied. Their results indicated there was a relatively low relationship between the I.Q. metric and measures of creativity (at the I.Q. level of their subjects) and, more significantly, that, despite the twenty-three point difference in I.Q., both groups were equally superior in scholastic achievement as measured by a standardized achievement test. They also point out the interesting correlation obtained between verbal achievement and three of the
creativity tests that were employed; these correlations were
greater than that between verbal I.Q. and achievement.

Mednick and Andrews (41) found a moderate relationship
between verbal and mathematical ability (as measured by the
Scholastic Aptitude Test) and creativity as assessed by the
Remote Associates Test. In this regard, it is of interest to
note that there was a correlation of .43 between the Scholastic
Aptitude Test—Verbal section and the Remote Associates Test of
creativity, while a correlation of only .20 was found with the
Mathematics section of the same aptitude test, suggesting that
the verbal section is tapping to a greater degree the same com-
ponent that is measured by the Remote Associates Test.

Scioritino (49) studied the relationship among originality,
intelligence, scholastic achievement, and scholastic ability
measures. He found that "denotativeness and connotativeness
can be taken as relative from each other on a presumed con-
tinuum of creativity" (49, p. 954). He found relatively low
correlations among the scores of vocabulary, grade-point average,
the OSPE, and the measures creativity (denotativeness and conno-
	tativeness.)

Research pertaining to the relationships between an in-
dividual's personality characteristics and his production has
yielded the most consistent findings in the literature relative
to creativity. Taylor and Barron (55) contribute various re-
search conferences on the identification of creative scientific
talent. Taylor (54) later summarized their findings in con-
junction with research done with the Air Force; he recounted
that the creative personality is more self-sufficient, independent in judgment, stable, feminine in interests and characteristics, dominant and self-assertive, self-accepting, resourceful, radical, emotionally sensitive, flexible, and introverted than the "non-creative" personality.

Roe, (46) in her studies with "topflight" research scientists, found a coherent picture of the U.S. research scientist. General characteristics include a "need for autonomy, for personal mastery of the environment" (46, p. 32). He resists pressures to conform and is challenged by ideas which appear mutually contradictory. Attitude toward his work is happy and intent, while emotionally he is stable and sensitive. He has a strong ego, tending to keep an unduly tight rein on himself. His family almost invariably places a premium on book learning. During adulthood, he is openminded about religion, neither particularly agnostic or aesthetic. He is a responsible community member—the more violent crimes are almost unknown to him. Over-all, the scientist's personality profile is remarkably similar to those typically related to creative artists; he shares with other creative groups a strong tendency toward introversion (excepting the social scientist) and self-sufficiency.

Rees and Goldman (45) also attempted to definitively delineate personality characteristics related to creativity, additionally assessing the role that emotional adjustment plays in the creative process. They utilized the Guilford-Zimmerman Temperament Survey (GZTS) and the Minnesota Multiphasic
Personality Inventory (MMPI) as personality measures, while a creativity questionnaire was employed in an attempt to assess creativity in terms of production of creative works. On the basis of the questionnaire, three groups were selected: Group A, the highest creative group, Group B, the moderately creative group, and Group C, the least creative group. Analysis of the results indicated that, of the nine clinical scales in the MMPI, only hysteria was found to be significantly different among the three groups; the most creative group possessed the greatest amount of this variable, with scores on this scale progressively increasing with degree of creativity. On non-clinical scale, Group A scored significantly lower on "restraint" than did Group C, while the highest group displayed significantly greater "ascendence" than the least creative group. Group A obtained lower scores on C on "friendliness," corroborating the notion that highly-creative individuals tend to be less friendly than those less endowed in this area. Women at the lower end of the creative spectrum tended to score higher on the "masculinity" scale, and displayed significantly greater tendencies toward depression as well. When the arts group was compared with the science group, it was found that the science group scored higher on the factors of emotional stability and friendliness and lower on thoughtfulness, while the arts group seemed more inclined toward thoughtfulness or "thinking introversion." Additionally, the arts group scores significantly higher on depression, psychopathic deviate, and masculinity-feminity
scales, suggesting that artistic persons display tendencies toward depression, greater disregard for social mores, and tend toward more "feminine" behavior and interest patterns than scientists. In summary, creativity is apt to incur in individuals who are "impulsive, aggressive, dominating, and characterized by lack of deliberation, self-control and restraint" (45, p. 156). Rees and Goldman venture the hypothesis that the typical creative personality structure leans toward the hysteric personality character (in the sense of impulsive behavior rather than caution and inhibition) as opposed to the obsessive-compulsive syndrome. These traits were not displayed, however, to the extent that maladjustment or neurosis was indicated; present evidence is not, therefore, supportive of the notion that creativity is related to abnormality or emotional instability.

MacKinnon (39) sets forth some useful techniques in the study of creativity which had been employed at the Institute of Personality Assessment and Research (IPAR). He cites an illustrative nationwide study of American architects, which correlated items on a checklist with combined ratings of the subject's creativeness in architecture made by eleven editors of the major American architectural journals and by the architects themselves. Trait ratings significantly correlated with rated creativity were "originality, aesthetic sensitivity, sensitivity, sense of destiny, ideational responsiveness, cognitive flexibility, inquiringness as a habit of mind,
independence, sense of personal identity, intellectual competence, cathexis of intellectual activity, critical judgment, and social acuity" (39, p. 296).

Purpose of the Study

The purpose of the present study was to investigate the relationship between differential quantitative and linguistic abilities and creative potential in a college population. The following hypotheses were investigated:

1. The group whose linguistic scores are notably higher than their quantitative scores will reveal significantly greater creative potential than the group with the opposite subscore.

2. The group with closely proximate quantitative and linguistic scores will be more highly creative than the higher quantitative group.

3. The relationship between quantitative-higher-than-linguistic and creativity will be inverse.
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CHAPTER II

METHODS AND PROCEDURES

Subjects

Subjects used in the study were drawn from a population of 168 students enrolled in sixteen second-semester freshman English courses at North Texas State University. As this is a required course for all undergraduate students, it was assumed that this was a heterogeneous group representing various schools and disciplines within the university. Group I consisted of forty-two students whose verbal scores were at least one sigma or more higher than their mathematical score on their college entrance examinations. Group II was comprised of thirty-nine students whose mathematical scores were one sigma or greater than their verbal scores on their entrance examinations, while Group III was the control group, whose subscores were not significantly disparate (less than one sigma). A total of ninety-nine females and sixty-nine males participated in the study.

Tests

Official aptitude scores were obtained from the North Texas State University report of American College Testing Program (ACT) and College Entrance Examination Board (CEEB) test results, which was secured through the Chairman of Freshman English at North Texas State University. Both tests enjoy wide usage and
respectability as measures of ability and achievement and offer high reliability and validity coefficients (1); thus, it was considered that scores from these standard tests would likely yield more valid, reliable scores than shorter, abbreviated measures which could feasibly be administered within a single class meeting. Both the ACT and CEEB yield two separate scores relative to English or verbal and mathematical abilities which are similar to the Linguistic (L) and Quantitative (Q) scores obtained on the ACE. Although it is recognized that scores attained on these two measures may not be strictly equivalent, past research has indicated that traits associated with subscore variation seem to be relatively consistent regardless of which major aptitude measure was employed. In this regard, a conversion table utilized by the Freshman English division was employed to convert ACT scores to their comparable CEEB counterparts, as it is solely the relation of the subscores to each other which is considered to be of importance in this study rather than the scores per se.

Questionnaire techniques are thought to be one of the most convenient means of evaluating creative potential, therefore, a score on the Cree Questionnaire will be employed to operationally define creative ability. The Cree is an untimed, semi-disguised, paper-and-pencil test of creativity and inventiveness developed by Thurstone, Thurstone, and Millinger (6). It is a self-report inventory consisting of 145 questions concerning specific attitudes, preferences, abilities, and
habits to which the subject responds by choosing either "yes," "no" or "undecided." Items for the test were standardized on 238 engineers, approximately half of whom had demonstrated a high degree of creativity (as judged by number of patents, original ideas, and inventions) and half of whom displayed little creative ability. The 145 items which discriminated between the two groups comprise the questionnaire; scores are determined by the number of items which are answered in the same fashion as those of the individuals known to be creative. The items were found to be significantly related to creativity at .20 level of confidence or better.

The Cree has been used primarily in industrial settings with engineers and others engaged in work requiring originality, inventiveness, and ingenuity. The test manual cited no reliability studies; however, Tarte (5), using a college population, found a correlation of .323 between the Cree Questionnaire and the AC Test of Creative Ability which was statistically significant at the .01 level of confidence. Additionally, Allred (1) found significant correlations between the Cree scores and the Practical Uses test scores of university students.

Procedure

The Cree Questionnaire was administered during a single class session; students were invited to remain on a voluntary basis; they were told that they would be participating in a departmental research program, but the specific nature of the
questionnaire was not revealed to them until all sections were administered in order to avoid establishing a mental set which might confound the results. Students were assured that the test scores would be strictly confidential and would not affect their course grades; they were also informed that test results would be available to them at a later date if they so desired. The Cree was administered in accordance with the standardized procedure set forth in the manual, and answer sheets were scored by computer to ensure accuracy.

Statistical Treatment

No raw scores were utilized in the statistical analysis, as all data were converted into standard scores. An analysis of variance was computed among the three primary groups (Verbal, Quantitative, Control), and t-tests were also calculated between each pair of groups. The three groups were then broken down further on the basis of high ability, sex, and high creativity in addition to their primary classification as to subscore pattern. Three two-by-two factorial designs were then employed to analyze possible differences existing within each group. Each primary group was subdivided as to sex and on the basis of high or low overall ability. Subsequently, two three-by-two factorial designs were employed to analyze differences among the three groups relative to male-female variables and relative to high and low overall ability.
CHAPTER II BIBLIOGRAPHY


CHAPTER III

RESULTS AND DISCUSSION

Hypotheses one and two, which stated that there would be a significant correlation between creative ability and aptitude subscore patterns (High Q vs. High L), were not confirmed by the statistical analysis of the data. Hypothesis three, which proposed an inverse relationship between discrepantly high quantitative ability and creativity was rejected, while the null hypothesis was retained. Although non-significant trends were noted in the predicted direction for each hypothesis, these results are not statistically reliable and might have occurred by chance. The results of the analysis of variance of Groups I, II, and III are presented in Table I. Fisher's t test was employed in comparing each possible pair of groups; these results are presented in Table I, although none of the t ratios attained a level that was statistically significant.

TABLE I

FISHER'S t TEST OF SIGNIFICANCE BETWEEN GROUPS I, II, AND III

<table>
<thead>
<tr>
<th>Variable</th>
<th>Groups</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Fisher t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I &amp; II</td>
<td>18.0476</td>
<td>9.2374</td>
<td>46.9743</td>
<td>9.8488</td>
<td>.5120*</td>
</tr>
<tr>
<td>1</td>
<td>I &amp; III</td>
<td>18.0476</td>
<td>9.2374</td>
<td>47.9425</td>
<td>9.1543</td>
<td>.0593*</td>
</tr>
<tr>
<td>1</td>
<td>II &amp; III</td>
<td>16.9743</td>
<td>9.8488</td>
<td>47.9425</td>
<td>9.1543</td>
<td>-.5330*</td>
</tr>
</tbody>
</table>

*P < .05
Supplementary analyses, which subdivided the major groups, did yield several significant findings relative to intra-group differences. High and low ability within the high group yielded an F ratio significant at the .10 level of confidence; however, a three-by-two factorial design which compared all three primary groups on the basis of high and low overall ability yielded no significant differences. Significant differences were also found between males and females of high overall ability within the control group; more specifically, this analysis indicated that control males scored significantly higher than control females at better than the .01 confidence level. A second three-by-two factorial design which compared the three primary groups on the basis of male-female variables corroborates the impression that females within the sample studied tend to score significantly lower than males on the Cree; this ratio reached the .05 level of confidence. Results of the supplementary analyses are presented in Tables II, III, IV, V and VI.

**TABLE II**

**COMPARISON OF THE CREE SCORES OF MALES AND FEMALES OF GROUP I HAVING HIGH OR LOW OVERALL ABILITY USING A 2 x 2 FACTORIAL DESIGN**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Row</td>
<td>29.1130</td>
<td>1</td>
<td>29.1130</td>
<td>.3487*</td>
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<td>1</td>
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<td>133.8433</td>
<td>1</td>
<td>133.8433</td>
<td>1.6032*</td>
</tr>
<tr>
<td>1</td>
<td>RXC</td>
<td>62.6244</td>
<td>1</td>
<td>62.6244</td>
<td>.7501*</td>
</tr>
<tr>
<td>1</td>
<td>Within</td>
<td>3255.7820</td>
<td>39</td>
<td>83.4815</td>
<td></td>
</tr>
</tbody>
</table>

*P < .05.
There were no significant relationships between Cree scores of males and females relative to high or low overall ability. Table III compares the same variables as Table II within Group II.

**TABLE III**

**COMPARISON OF THE CREE SCORES OF MALES AND FEMALES OF GROUP II HAVING HIGH OR LOW OVERALL ABILITY USING A 2 x 2 FACTORIAL DESIGN**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Row</td>
<td>32.3611</td>
<td>1</td>
<td>32.3611</td>
<td>.3279</td>
</tr>
<tr>
<td>1</td>
<td>Column</td>
<td>120.1284</td>
<td>1</td>
<td>120.1284</td>
<td>1.2175</td>
</tr>
<tr>
<td>1</td>
<td>RXC</td>
<td>218.3346</td>
<td>1</td>
<td>218.3346</td>
<td>2.2128*</td>
</tr>
<tr>
<td>1</td>
<td>Within</td>
<td>3552.0370</td>
<td>36</td>
<td>98.6676</td>
<td></td>
</tr>
</tbody>
</table>

*P > .10.*

There were two significant findings revealed in the third two by two factorial design which compared the same variables as above within Group III. Table IV presents these results.
TABLE IV
COMPARISON OF THE CREE SCORES OF MALES AND FEMALES OF GROUP IV HAVING HIGH OR LOW OVERALL ABILITY USING A 2 x 2 FACTORIAL DESIGN

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>379.7801</td>
<td>1</td>
<td>379.7801</td>
<td>4.4291*</td>
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<td>1</td>
<td>Column</td>
<td>823.6843</td>
<td>1</td>
<td>823.6843</td>
<td>9.6060**</td>
</tr>
<tr>
<td>1</td>
<td>RXC</td>
<td>24.2423</td>
<td>1</td>
<td>24.2423</td>
<td>.2827</td>
</tr>
<tr>
<td>1</td>
<td>Within</td>
<td>6945.4560</td>
<td>81</td>
<td>85.7463</td>
<td></td>
</tr>
</tbody>
</table>

*P > .05.
**P > .01.

A three-by-two factorial design comparing scores on the Cree for the three primary groups relative to male-female differences indicated that males tend to score significantly higher on the Cree than do females. The results of this analysis are presented in Table V.

TABLE V
COMPARISON OF THE CREE SCORES OF MALES AND FEMALES OF GROUPS I, II, and III USING A 3 x 2 FACTORIAL DESIGN

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Row</td>
<td>480.7678</td>
<td>1</td>
<td>480.7678</td>
<td>5.3035*</td>
</tr>
<tr>
<td>1</td>
<td>Column</td>
<td>164.7143</td>
<td>2</td>
<td>82.3571</td>
<td>.9085</td>
</tr>
<tr>
<td>1</td>
<td>RXC</td>
<td>61.2415</td>
<td>2</td>
<td>30.6207</td>
<td>.3377</td>
</tr>
<tr>
<td>1</td>
<td>Within</td>
<td>14685.4290</td>
<td>162</td>
<td>90.6507</td>
<td></td>
</tr>
</tbody>
</table>

*P > .05.
The second three-by-two factorial design compared scores on the Cree for the three primary groups relative to high and low overall ability levels. The results of this analysis are presented in Table VI.

**TABLE VI**

**COMPARISON OF THE CREE SCORES OF GROUPS, I, II, AND III ON THE BASIS OF HIGH AND LOW OVERALL ABILITY USING A 3 x 2 FACTORIAL DESIGN**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F Level</th>
</tr>
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<td>80.4764</td>
<td>.8659*</td>
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<tr>
<td>1</td>
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<td>36.2502</td>
<td>2</td>
<td>18.1251</td>
<td>.1950*</td>
</tr>
<tr>
<td>1</td>
<td>RXC</td>
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<td>2</td>
<td>152.4753</td>
<td>1.6406*</td>
</tr>
<tr>
<td>1</td>
<td>Within</td>
<td>15055.6890</td>
<td>162</td>
<td>92.9363</td>
<td></td>
</tr>
</tbody>
</table>

*P < .05.

**Discussion**

Although obtained results were in the predicted direction, they did not attain statistically significant proportions. Group I, the high verbal group, had a mean score of 48.04 on the Cree; Group II scored 46.97, while Group III had a mean score of 47.94. It should be noted that Group I is comprised primarily of females, while Group II is heavily male. Allred (1) found Cree mean scores for females to be significantly lower than male mean scores at the .001 level confidence level. Tarte (5) also obtained mean scores on the Cree which were higher (64.13) for
males than for females (63.08). In the present study, the top ten percent group of scores belonged to males exclusively.

In view of the fact that males tended to score significantly higher on the Cree (no separate norms are available), relationships are thus obscured that might exist between discrepant abilities and creativity. Indeed, Wells (3) noted that group ability tests tend to show (globally) a verbal advantage for women and a quantitative advantage for men. Additionally, one suspects that sex-related responses may account, in part, for the disparity between male and female scores. In this regard, yes-no answer tendencies could also influence score ratings; one wonders if females and/or highly verbal individuals might not tend to be somewhat vacillatory in their responses—marking more answers undecided—while men and/or high quantitative subjects tend to emit more decisive responses. Logically, it would seem untenable to assume inherent differences in the distribution of creative ability among males and females. However, it is possible that disparate subscore patterns may represent different clusters of traits for men than for women, so that a given subtest pattern might be conventional for one sex and atypical for the other. The need for separate norms and comparative studies in this area is clear, as creative females may thus display different traits than do creative males. The addition of measures of personality traits in the present study might have yielded valuable information in this context.
In discussing sources of variability and confounding of results, the possibility should not be overlooked that, in an attempt to secure true differences between subscores, many subjects whose scores fell just short of the one full sigma which was specified were excluded from the differential groups; a highly heterogeneous control group resulted, in which the distribution of creativity scores approached a normal, bell curve. Within the given groups, the intelligence factor was not controlled or factored out, although most research agrees that a given level of intelligence is necessary for creative production. In this regard, it is interesting to note that, among the statistical results attaining significance, were analyses related to high and low overall ability within the High \( Q \) group and within the Control group. However, findings relative to these subtest breakdowns must be interpreted cautiously in view of the small \( n \) involved within the subgroups.

A paramount factor which must be considered in discussion of the present study is the nature of creative ability itself. It is quite likely that creativity is a multifactorial concept rather than a unitary one—originating from many sources, no one of which may be called the primary contributor. It then becomes a broad classification subsuming originality, ingenuity, imaginativeness, artistry, inventiveness, fluency, and other common synonyms. Taylor (2) stated the following concerning the nature of creativity:
... all of the research results to date indicate that no single characteristic by itself accounts for much of the total phenomenon of creativity; in other words, many human characteristics are usually involved in making creative contributions. No single-variable panacea and no single-variable theory will serve in this area. In fact, our present theory of creativity would definitely be a multivariable one along these lines: creative performance is dependent upon a large number of relatively separate variables, each one of which accounts generally for only a small, unique, and usually statistically almost insignificant part of the total variation in creative performance. . . .

Kneller (1) also points out that, in response to tests of creativity, some people show themselves to be primarily fluent, some mainly original, etc.; these abilities are often called into play together, so that creative production or achievement may represent a composite of various aspects of creative ability. In this regard, somewhat different facets of creativity may also be represented in diverse fields, such as art, music, science, theatre, and literature, each of which may be related to rather unique clusters of personality variables or traits. Thus, while the Cree may be a valid measure of certain aspects of creativity, it may not be assessing the same types of inventiveness possibly tapped by disparate ability patterns.

To explore this possibility, an entire battery of tests, including a personality inventory, actual tasks of a creative nature, ability tests, and several other tests and measures of creativity which might each contribute to a composite portrait of the creative individual. Special care should be exercised to assure that creativity tests employed are as sensitive as possible, as there are likely many levels of creativity, and
some means must be ferreted out that can distinguish among this hierarchy. Self-report questionnaires, such as the Cree, might reflect what people think about creativity rather than what they truly are, and are thus subject to distortion by faking or prior mental sets. Finally, caution should always be employed in generalizing from results standardized on one population to another dissimilar one; scores obtained from the standardization group of male industrial engineers may have different meanings when interpreted for male and female college freshmen. Test-retest reliability studies should also be helpful in a study of this nature, as some of the discrepant ability scores could have occurred by chance. Finally, the possibility should also be considered that the ACT and SAT patterns may not be strictly comparable, each of which may tap somewhat different types of traits, thus obfuscating the score patterns upon which the primary group classifications were made.
CHAPTER III BIBLIOGRAPHY


CHAPTER IV

SUMMARY AND CONCLUSIONS

A review of related research and literature relative to differential or discrepant aptitudes revealed somewhat ambivalent, conflicting conclusions regarding the personality traits associated with the various subscore patterns and regarding the nature and measurement of creativity itself. The present study attempted to determine the relationship between creative ability and differential Verbal (or Linguistic) Quantitative subtest clusters on college entrance examination tests. The Cree Questionnaire was employed to assess creativity, while scores from the American College Testing Program (ACT) or the College Entrance Examination Board (CEEB) were utilized as ability measures. The following hypotheses were tested:

1. The group whose Linguistic scores are notably higher than their Quantitative scores will reveal significantly greater creative potential than the group in which the opposite subscore pattern obtains.

2. The group with closely proximate Quantitative and Linguistic scores will be more highly creative than the higher Quantitative group.

3. The relationship between Quantitative-higher-than-Linguistic and creativity will be inverse.
Subjects used in the study were drawn from a population of 168 students enrolled in sixteen second-semester freshman English courses at North Texas State University. Group I consisted of forty-two students whose verbal scores were at least one sigma or more higher than their mathematical scores on their college entrance examinations. Group II was comprised of thirty-nine students whose mathematical scores were one sigma or greater than their verbal scores on their entrance examinations, while Group III was the control group, whose subscores were not significantly disparate (less than one full sigma).

The data were analyzed by an analysis, initially, by a simple analysis of variance among the three primary groups, with t tests also performed between each pair of groups also being calculated. The three groups were then broken down further on the basis of high ability, sex, and high creativity in addition to their primary classification as to subscore pattern. Three 2x2 factorial designs were employed to analyze possible differences existing within each subgroup; each primary group was also subdivided as to sex and as to high or low over-all ability. Two 3x2 factorial designs were subsequently utilized to analyze differences among the three groups relative to male-female variables and relative to high and low over-all ability.

Statistical results failed to confirm Hypotheses One, Two, and Three, and the null hypothesis was retained in each case. However, non-significant trends were noted in the predicted
direction for each hypothesis; although these trends are not, therefore, statistically reliable, possible confounding variables were discussed which might have obfuscated the results. Supplementary analyses, which subdivided the major groups, did yield several significant findings relative to intra-group differences. High and low ability within the high Q group yielded an F ratio significant at the .10 level of confidence. Significant differences were also found between males and females of high over-all ability within the Control group; more specifically, this analysis indicated that Control males scored significantly higher than Control females at better than the .01 confidence level. A second three-by-two factorial design, which compared the three primary groups on the basis of male-female variables, corroborates the impression that females within the sample studied tended to score significantly lower than did males on the Cree; this ratio reached the .05 level of significance.

It was concluded that it is likely that there are differences in the manner in which males and females manifest creative ability; in this regard, the need for separate norms for males and females on tests of creativity is clear, as a given score on the Cree appears to have somewhat different meaning for a male than for a female subject. The possibility certainly exists that disparate subscore patterns may represent different clusters of personality traits for men than for women. The present study partially supports the generally-accepted notion that a given level of intelligence is requisite to the manifestation of
creative talent, as the level of overall ability seemed to be related to scores on the Cree within the Q group. The intelligence factor should, therefore, be factored out in further studies of this nature.

The nature of creativity itself is also called into question; it is quite likely that this elusive quality is not a unitary concept, but is, rather, a multifactorial one. The label creativity, then, must be considered a broad classification which subsumes other characteristics, such as originality, fluency, ingenuity, imaginativeness, artistry, inventiveness, and other common synonyms. Future studies of this topic should, therefore, involve an extensive battery of tests, including a personality inventory, actual creative tasks, ability tests, and several other measures of creativity which might each contribute to a composite picture of the creative individual and of the creative process.
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