THE RELATIONSHIP OF ACHIEVEMENT-VARIABILITY TO ACADEMIC PERFORMANCE AND SELF-CONCEPT OF ACADEMIC ABILITY

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THESIS

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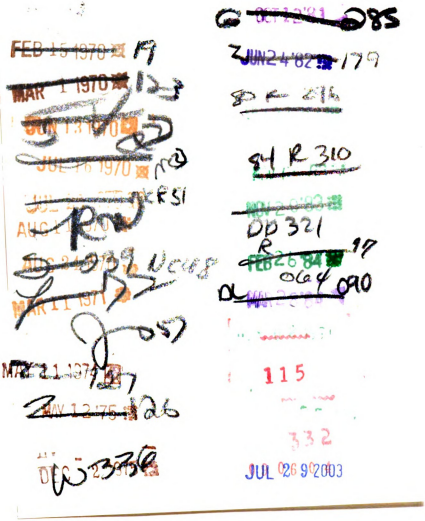
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ABSTRACT

THE RELATIONSHIP OF ACHIEVEMENT-VARIABILITY TO ACADEMIC PERFORMANCE AND SELF-CONCEPT OF ACADEMIC ABILITY

by Rita Bakan

The purpose of this study was to investigate the relationship of Achievement-Variability, operationally defined as the standard deviation of an individual's grades, to measures of academic achievement and self-concept of academic ability over a five-year period.

The research problems investigated were: (1) the relationship of Achievement-Variability to overall mean level measures of Academic Achievement (GPA), Self-Concept of Academic Ability, IQ, and Socio-Economic Status; (2) the relationship of measures of variability in Academic Achievement, general self-concept of Academic Ability and mean Self-Concept of Specific Ability, to each other; (3) the stability of Achievement-Variability scores over time; (4) the overall mean level of scores and the changes with time of scores of High and Low Achievement-Variability groups in the major variables with GPA held constant; and (5) differences between males and females in all of the above measures.

Subjects were all Caucasian students (297 males and 342 females), originally in the eighth grade of four junior high schools in a midwestern city of 120,000 population, for whom complete data were available from years 8-12, who had been regularly promoted and were participants in the regular school program. The Achievement-Variability subjects (52 males and 60 females) were drawn from the longitudinal sample described above, and their GPA was within $\pm$.20 of the mean GPA of the males and females of the longitudinal sample. These students were ranked in order of magnitude of the standard deviation of their grades from years 8-12, and the top and bottom thirds of this distribution were designated as High and Low Achievement-Variability groups.

Major variables were defined operationally as follows: Academic Achievement by GPA; Achievement-Variability by the SD of the individual's grades; IQ by the California Test of Mental Maturity; Socio-Economic Status by the score on the Duncan Scale; Self-Concept of Ability by scores on the MSU General Self-Concept of Ability Scale and by the mean of scores on the MSU Self-Concept of Ability in Specific Subjects Scales (mathematics, English, social science, and science).

The data were collected through the administration of questionnaires and from the students' school records. The analysis of the data involved the use of product-moment

correlations, tests of the significance of the differences between correlations, t-tests of the significance of the differences between means, and analysis of variance. All tests of significance were two-tailed.

Longitudinal Sample (297 Males, 342 Females)

1. A significant difference was found between males and females in mean overall level scores in GPA, GSCA, and MSSCA. Males had significantly higher mean overall variability scores in GPA and GSCA than the females. There were no significant differences between males and females in IQ or SES measures.

2. The relationship of AV (operationally defined as the SD of the individual's grades from years 8-12) to overall mean level measures of GPA, GSCA, MSSCA, and IQ is negative and significant at the .05 level, except in the case of the relationship of AV to IQ for males, which was negative but not significant.

3. The relationships between measures of variability in GPA, GSCA, and MSSCA were all positive and significant except that of AV to variability in GSCA for males, which while positive was not significant.

4. For both sexes, the year-to-year stability correlations of AV are significant, positive, and of increasing magnitude. For the females, however, the correlations are significantly higher than they are for the males for the years 10-11, 11-12, and 10-12.

5. There were no significant differences between males and females in mean IQ or in SES. The correlation between SES and AV was also not significant.

Achievement-Variability Sample
(60 females and 52 males)

1. No significant difference was found between High and Low AV groups or between males and females in either IQ or SES.

2. The GPA of females was significantly higher than that of the males, but no difference was found between High and Low AV males or between High and Low AV females.

For both the High and Low AV groups, the GPA goes down over time from years 8-12, but it goes down significantly more for the High AV males and females than for the Low AV males and females.

3. Females in the AV sample have significantly lower GSCA scores, despite having significantly higher GPA than the males.

The High AV students of both sexes have higher overall GSCA than do the Low AV students. There is, over time, almost no shift in the GSCA of Low AV students, while for the High AV students there is a significant change in GSCA scores from years 8-12.

4. Females have a significantly lower overall MSSCA mean score than do males. While the difference between High and Low AV students in MSSCA approaches significance, it

does not achieve it at the .05 level (two-tailed test). There is, however, a significant difference between High and Low AV students over time in the pattern of their scores in MSSCA. For the Low AV students, there is almost no change with time; while for the High AV students there is a consistent and significant trend downwards in MSSCA from years 8-12. This pattern of decrement for the High AV students in MSSCA is paralleled by the changes over time in GPA and GSCA.

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By

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CHAPTER I

THE PROBLEM

Need

The most common measure of academic achievement in use is the grade point average (GPA). This is computed as the mean of scores in a set of school subjects or disciplines. In statistical usage, it is customary to consider means together with some measure of variability such as the standard deviation. However, measures of variability are hardly ever taken into account when using the GPA.

Consider several students, each having a GPA of 2.00, the average of grades in five school subjects. This average could have been achieved in a number of different ways, e.g., C, C, C, C, C; or B, B, C, D, F; or A, B, C, D, F. Despite the identical GPA, it is clear that these grade patterns are quite different from each other. They differ along the dimension of variability. Such variability in achievement in the courses whose grades constitute the GPA will be referred to as Achievement-Variability (AV). This dissertation is concerned with the problem of achievement-variability and some of its correlates.

Achievement-variability is operationally defined as the standard deviation of the grades constituting the

GPA. It was chosen because it is an efficient and well-known statistic.

Lavin (1965), after an extensive study of the literature related to the prediction of academic achievement, concluded that investigation of the "non-intellective" factors related to academic achievement was one of the steps necessary for increased accuracy of prediction. One of the "non-intellective" variables discussed by Lavin is that of the self-concept.

The general construct of self-concept, as formulated by Cooley (1902) and by Mead (1938) has been used by Brookover (1967) in developing the construct of Self-Concept of Academic Ability, which he found to be a necessary but not sufficient variable in determining the level of academic achievement.

A similar application of the general theories regarding self-consistency, or variability, can be made to the problem of understanding academic achievement. As Gagne (1967), Fiske (1955), and Wessman and Ricks (1966) have shown, the construct of intra-individual differences in variability of response has proven useful in studying learning, performance, and personality. Knowledge of the correlates of differences in intra-individual differences in variability may be an important addition to our understanding of the factors related to academic achievement.

Purpose

The purpose of this study is to investigate:

1. The relationship of Achievement-Variability to mean or level measures[1] of academic achievement, self-concept of ability, IQ, and Socio-Economic status;
2. The relationships of variability in academic achievement, General Self-Concept of Ability, and the Mean of Specific Self-Concepts of Abilities to each other;
3. The stability of Achievement-Variability;
4. Sex differences in Achievement-Variability; and
5. Changes over time in academic performance and self-concept of academic ability of High Achievement-Variability students, as compared to Low Achievement-Variability students.

Research Problems

Since this is an exploratory investigation, the term "problem" rather than "hypothesis" is used, and directionality is not hypothesized. The problems which will be investigated are the following:

Problem 1

Are there differences between males and females in level scores in:

a. Academic Achievement,
b. IQ,
c. General Self-Concept of Ability,

---

[1] Level scores are status scores usually expressed as a mean score on a given instrument; variability scores refer to the standard deviation of an individual's scores on a given instrument.

d. Mean Specific Self-Concept of Ability,

e. Socio-Economic Status.

Problem 2

What is the relationship of Achievement-Variability to level measures of the following parameters?

a. Academic Achievement,

b. IQ,

c. General Self-Concept of Ability,

d. Mean Specific Self-Concept of Ability,

e. Socio-Economic Status.

Problem 3

What is the relationship of measures of variability of the following parameters to each other?

a. Academic Achievement,

b. General Self-Concept of Ability,

c. Mean Specific Self-Concept of Ability,

Problem 4

Is Achievement-Variability stable over time?

Problem 5

If GPA is held constant, will there be significant differences between High and Low Achievement-Variability groups in overall mean level measures of: (a) IQ, and (b) Socio-economic status?

Theory

In order to investigate the problem of predicting academic achievement, a number of theoretical constructs have been developed from theories and research employed in other contexts. Two of the major variables with which this study is concerned--Achievement-Variability and Self-Concept of Academic Achievement--are based on the constructs of self-consistency and self-concept, respectively.

Self-concept, as a construct, was discussed by Cooley (1902) and by Mead (1938) in terms of the whole individual, and a great deal of work, both theoretical and empirical, has been done on various aspects of the self, using their formulations. In attempting to use the construct of self-concept in the study of academic achievement, Brookover narrowed the concept to that of self-concept of academic ability. This was defined operationally in terms of the measure achieved by an individual on a scale which he developed for measuring self-concept of academic ability.

Self-consistency has been discussed by Lecky (1945) and many others, mainly from a theoretical point of view. Little empirical data was available until the last decade. Among those concerned with this problem, Fiske has made the outstanding contribution, both theoretically and empirically. Fiske uses the term "intra-individual differences in variability" rather than self-consistency, and

has attempted to develop a theoretical framework to encompass the major types of instances in which variability of performance is evidenced. His discussion of the nature of variability was used in formulating the construct of Achievement-Variability which is employed in this study.

In pursuing this aspect of the study, a number of questions about the nature of achievement-variability will be investigated. One is the relationship of Achievement-Variability to other variables in which the mean of the measures is used. That is, is variability in achievement related to level of achievement, social class, etc.? Another question is how general is variability--is there a relationship between measures of variability on one parameter and measures of variability on another parameter? A third question is: how stable is achievement-variability over time? And, lastly, are there differences between males and females in achievement-variability?

Though it is not often recognized by explicit discussion, "academic achievement" is itself a construct and measures of it limited to grades are heir to all the weaknesses of vague, theoretical formulation. While grades may be the best, and at times the only, measure of academic achievement <u>available</u>, their limitations should be clearly recognized. A basic assumption of this study is that if grades are one's sole measure of academic achievement, one may increase the accuracy of predictions based on these

measures by using not only their mean value but also information about the variability of the grades constituting the mean.

Overview

The purpose of this study is to investigate the relationships between the constructs of academic achievement-variability and self-concept of academic ability, both to academic ability and to each other. Relationships with other variables such as intelligence and socio-economic status will also be investigated. In addition, changes over time in academic performance and self-concept of ability of High and Low Achievement-Variability groups will also be studied. In Chapter II, the literature relevant to theoretical and empirical work on these variables will be presented in the following order:

1. A discussion of the work on the theory and research related to the general concept of self, as formulated by Cooley and Mead and their followers;

2. A presentation of the application of this general concept of self to the problem of academic achievement reflected in the theory and research of Brookover and his associates;

3. The theory and research related to the concept of variability, especially the work of Fiske;

4. The application of this theory to the problem of academic achievement, resulting in the construct of achievement-variability.

The method employed in carrying out this investigation and the results achieved will be presented in Chapters III and IV, respectively.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Perhaps no measure has been used with greater frequency in educational research than the Grade Point Average (GPA), and no problem has received more attention than that of the nature of academic achievement. Since one of the principal aims of scientific investigation is accurate prediction, most of this research has been concerned with the prediction of academic performance. Unfortunately, many of these studies, in using the GPA as either a dependent or an independent variable, have been deficient in at least three respects. For one, very few of them have been longitudinal in nature. According to Bloom (1964) in his study of stability and change, "We were somewhat dismayed by the lack of longitudinal evidence over [long] periods of time, especially in view of the fact that teachers' marks have been used in the schools since time immemorial." (Bloom, 1964, p. 97.)

A second deficiency of the overall body of literature in this area, and one with which investigators are becoming increasingly concerned, is that some of the lack of predictive accuracy of grades may be due to non-intellective factors.

As Lavin (1965) stated, "If grades will not predict future eminence, and if the early identification of outstanding talent is a task worth pursuing, there is a need to develop additional criteria of good student performance. In short, as soon as education is considered in the context of certain societal values and needs, it is evident that in addition to grades, other dimensions of student behavior need to be considered." (Lavin, 1965, p. 16.) Among the "additional criteria" that have been developed, one of the most promising has been that of the self-concept. A more specific application of this concept--the self-concept of academic ability--has been shown to be helpful in understanding student performance.

A third limitation of the work using the GPA as a measure to predict academic performance has been the failure to distinguish the "phenotype" of GPA from its "genotype;" equal GPA's are treated as identical when, in fact, the pattern of grades resulting in equal means may be very different. Self-consistency or the problem of intra-individual differences in variability has not been investigated in the context of academic achievement, though it has received attention both theoretically and empirically in other contexts. It is the main purpose of this thesis to pursue a study of intra-individual differences in academic achievement in relation to academic performance and self-concept of academic ability.

The literature reviewed in this chapter will be presented in the following order:

Self-Concept

General Theory and Research

Self-Concept and Academic Achievement

Self-Consistency (Intra-individual differences in variability)

General Theory and Research

Self-Consistency and Academic Achievement.

Self-Concept

General Theory and Research

The work of Cooley (1902) and Mead (1938) has provided the theoretical framework for much of the empirical research on self-concept, as well as for the work of Brookover et al (1967) on the self-concept of ability. According to the symbolic interactionist theories of Mead and Cooley, man acquires his self-consciousness in the process of interacting with significant others. "Significant others" are those persons on whom one is dependent for emotional gratification. Through interaction with these others, an individual takes on their ideas, beliefs, and evaluations, and uses them as a frame of reference for judging his own behavior. This "looking glass" process results in a self-evaluation which is referred to as the "phenomenal self-concept" by many current theorists. This central concept of "self" is described by Mead (1938, p. 135):

> . . . has a character which is different from that of the physiological organism proper. The self is something which has a development; it is not initially there, at birth, but arises in the process of social experience and activity, that is, develops in the given individual as a result of his relations to that process as a whole and to other individuals in that process.

The self, in this formulation, can become an object to itself and can achieve distance and objectivity in looking at and evaluating itself. In order that one's self-evaluation be positive, the evaluations of significant others must be perceived as positive even though they may actually not be positive. Positive evaluations are, in turn, the result of engaging in positive-regarded behavioral activities. In this way, we come to behave as we are expected to by the significant others in our lives, and we come to "see ourselves as others see us."

More recently, empirical investigation of the variables of "self-other" interaction has begun to increase, though without a uniform use of terms or of measures (Wylie, 1961). A number of researchers have been concerned with the stability of the self-concept (Brownfain, Engel, Mussen, and Jones), while others have addressed themselves to the problem of the interaction of one's self-concept with the perceptions of the evaluations of significant others. (Manis, 1955; and Davidson and Lang, 1960.) Still others have been concerned with how self-concept is related to academic achievement. In general, despite differences in operational procedure, the bulk of these studies

(Brim, Lum, McDavid, Reeder, Shaw et al) suggest that a positive self-image is associated with higher academic performance.

The purpose of Brownfain's study (1952) was to develop an operational measure of the stability of the self-concept and to demonstrate that stability of the self-concept is a dimension of personality serviceable to the work of understanding and predicting behavior. Several sets of self-ratings on 25 personality variables were obtained successively under different instructions from 62 members of two men's cooperative houses at the University of Michigan. Under one set of instructions, the S gave himself the benefit of any realistic doubt he had about his standing on each inventory item, thus yielding a "positive" self-concept. Under another set of instructions, S denied himself the benefit of such doubt, thus yielding a "negative" self-concept. The difference between these positively and negatively slanted self-ratings on each item, summed over all the items of the inventory without regard to sign, was the operational measure of stability. The larger this discrepancy, the more unstable the self-concept is assumed to be. This measure of stability has an estimated reliability of .93.

The hypothesis was: Ss who have the most stable self-concepts are, according to a number of criteria, better adjusted than Ss with the least stable self-concepts. In making this hypothesis, it was assumed that stability

reflects an integrative function rather than rigidity of personality. Therefore, the 15 Ss identified as rigid, on the basis of high scores on the F (Predisposition for Fascism) Scale developed by Frenkel-Brinswik, were eliminated from the sample before testing the hypothesis. Adjustment was measured in terms of inferences derived from S's behavior in rating himself and others, S's scores on the Guilford Martin Inventory of Factors GAMIN, and the group's evaluation of S. All findings supported the theoretical prediction that Ss with stable self-concepts are better adjusted than those with unstable self-concepts. The following are the more salient findings which favor the Ss with more stable self-concepts. ($p < .05$):

1. They have a higher level of self-esteem, as manifested by a higher mean self-rating and also by a higher self-rating on the inventory item defining self-acceptance. The intertrait variability of their self-ratings is lower, indicating that their self-esteem is generalized.

2. They are freer of inferiority feelings and nervousness, as measured by the GAMIN.

3. They are better liked and considered more popular by the group.

4. They see themselves more as they believe other people see them.

5. They know more people in the group and are better known by the group, indicating more active social participation.

6. They show less evidence of compensatory behavior of a defensive kind.

In a study in which adolescents were the subjects, Engel (1959) explored the Test-retest stability of the self-concept in 172 Ss over a two-year period. One group of boys and girls was tested in the eighth and tenth grades, while the second group was tested in tenth and twelfth grades. The Ss Q-sorted items which had been prejudged for positive and negative tone. Results were given in terms of *r* values which correspond to mean self-self correlations. For 23 of the Ss, the average self-self correlation over a ten-day period was +.68. By comparison, the average self-self *r* over a two-year period was +.53. There was no significant difference between the older and younger groups with respect to self-self correlations over the two-year period. Though the author concluded that these findings confirmed her hypothesis, which was based on the assumption that "crystallization of the self-concept is achieved earlier in development" (Engel, 1959, p. 212), there is some doubt as to whether a correlation of .53 can be interpreted to indicate more than a fairly limited degree of "crystallization."

Self-sorts were scored according to the prejudged favorability values of the items. Over the two-year period, there was an unpredicted increase in mean favorability of the self-concept, significant beyond the .05 level in the case of the older group. Ss whose self-concepts were unfa-

vorable on the first test showed significantly greater change in self-concept over the two-year period than did Ss whose self-concepts were favorable at first testing. Since Ss classed as having unfavorable self-concepts included only the lowest 20 per cent of the self-concept distribution for the first test, and Ss classed as having favorable self-concepts included the upper 80 per cent of that distribution, it seems that either statistical regression effects have not been controlled for in this comparison or some moderator variable is operating.

Another approach to the problem of stability is that of Mussen and Jones (1957). Their investigation was designed to test a number of propositions concerning the relationship between the rate of physical maturation and important aspects of personality structure, specifically self-conceptions, underlying motivations, and basic interpersonal attitudes. The TAT protocols of 33 seventeen-year-old boys--16 of whom had been consistently physically accellerated throughout adolescence and 17 of whom had been consistently retarded--were analyzed according to a scoring schema involving 20 needs, press, and descriptive categories. The scores of early- and late-maturers in each of the categories were compared.

Analysis of the data indicated that the physically retarded are more likely to have negative self-conceptions, feelings of inadequacy, strong feelings of being rejected

and dominated, prolonged dependency needs, and rebellious attitudes toward parents. Early- and late-maturing boys did not differ significantly from each other in needs for achievement or personal recognition. The definition of negative self-concept was the S's description of the heroes of TAT stories in "negative terms." The validity of the measure was thus assumed rather than proven.

In each of the above studies, "stability" is defined differently, and the results are therefore not readily comparable. The following studies (Manis, 1955, and Davidson and Lang, 1960) were concerned with the problem of the relationship of the interaction of the individual's self-concept with his perceptions of the evaluations of significant others.

Manis (1955), in a study of social interaction and the self-concept, compared the descriptions of a group of Ss with the estimates others made of them. This was done by having the Ss describe each member, including themselves, of a group of eight men (those in their own room and in an adjacent room), on 24 bipolar saxles derived from Cattell's factor analysis of Allport and Odbert's adjective trait list. Following his self-description, his description of his "ideal self," and his descriptions of others, each S made sociometric choices from among the members of his group. The sociometric data were used to select a <u>friend</u> and <u>non-friend</u> for each of the Ss. A sample of 36

independent friendship pairs and a sample of 28 independent pairs of non-friends was selected.

Following a period of six weeks, during which the Ss interacted freely, a retest was administered. It was found that the Ss' self-concepts were significantly influenced by their friends' opinions of them, particularly when they were perceived in a favorable light. On the other hand, the friends' perceptions of the Ss were not significantly influenced by the Ss' self-images. Increases in agreement within S-friend pairs were primarily due to changes in the Ss' self-concepts, rather than to changes in the friends' perceptions of the Ss.

The relation of children's perceptions of their teachers' feelings toward them to both self-perception and academic achievement was studied by Davidson and Lang. (1960) A Check List of Trait Names, consisting of 35 descriptive terms, was administered to 89 boys and 114 girls in grades 4, 5, and 6 in a New York City public school. The children were rated by their teachers for achievement and on a number of behavioral characteristics. It was found that

1. The children's perceptions of their teachers' feelings toward them correlated positively and significantly with self-perception. Children with more favorable self-images more likely than not perceived their teachers' feelings toward them more favorably.

2. The more positive the children's perception of

their teachers' feelings, the better was their academic achievement, and the more desirable their classroom behavior as rated by the teachers.

Reeder (1955), in a study of elementary school children, found that students with low self-esteem have lower grades than do students with higher self-esteem. On the high school level, a study by Shaw et al (1960) investigated the self-images of highly intelligent students who differed in level of achievement. Students were compared on a 200-item adjective checklist. For boys, 13 adjectives differentiated, and for girls there were 17 such adjectives. For the boys, a higher achievement level was associated with a more positive self-image. The differentiating adjectives seemed in general to be directly related to academic work ("intelligent," "reliable,""clear-thinking," "realistic"). For girls, a higher achievement level was not related to a more positive self-image and the differentiating items were less relevant to academic work ("softhearted," "lovable").

In a study by McDavid (1959), it was hypothesized that high achievers have higher self-evaluations than low achievers. This was found to be the case for a sample of boys. The method of picking achievement groups, however, failed to control for intelligence. In spite of this shortcoming, the study is of interest, since the author suggests that this dimension of the self-image may operate as a feedback mechanism. That is, high academic performance

may result in higher self-evaluation, which in turn may increase the motivation for attaining high grades in the future.

College students were the subjects in a study by Brim (1954), in which he found that those with high self-estimates of intelligence had higher grade point averages than students of equal-measure intelligence, but lower self-estimates of intelligence. Lum (1960) showed that among female college students, overachievers exhibited greater self-confidence than underachievers.

Borislow (1962) in a study of the importance of self-evaluation as a non-intellectual factor in scholastic achievement used college students as subjects. Each subject completed the same 24-item scale (a modification of Fielder's adjective scale) four times under different sets of instructions: general self, student's self, ideal self, and ideal student. A measure of general self-evaluation was derived from the discrepancy between general-self and ideal-self responses; a measure of student self-evaluation was derived from the discrepancy between student-self and ideal-student responses.

In order to identify which of five "goal areas" a student will be more inclined toward while in college, the Student Behavior Description Inventory was used. Students were designated as Achievers or Underachievers on the basis of the extent to which the student achieved or failed to

achieve a first semester grade point average concordant with this aptitude test score, as measured by the Scholastic Aptitude Test (SAT). These two groups were further divided by distinguishing between Achievers and Underachievers who indicated an intention to strive for scholastic achievement as a prime goal and those who did not (according to the Student Behavior Description Inventory).

Four experimental groups were thus extracted which did not differ in terms of scholastic aptitude, certain demographic factors, and educational-vocational plans: achievers and underachievers both oriented toward academic attainment, and achievers and underachievers not so oriented. He came to the following conclusions:

1. Regardless of an intention to strive for scholastic achievement as a prime goal, students who underachieve scholastically cannot be distinguished from those who achieve scholastically on the basis of general self-evaluation prior to or subsequent to their first semester in college.

2. Regardless of initial (pre-semester) intention to strive for scholastic achievement as a goal, students who underachieve scholastically have a poorer conception of themselves as students than do achievers subsequent (post-semester) to their scholastic performance.

3. Where students exhibit an intention to strive for scholastic achievement as a prime goal, underachievers

have a more pessimistic conception of themselves as students than do achievers prior to their actual scholastic performance. This does not hold true where scholastic achievement is not a prime goal.

4. The student whose prime goal is scholastic achievement, whose conception of himself as a student is good, and who achieves scholastically, has a more favorable general self-evaluation from pre-semester to post-semester assessments. This does not hold true for the student for whom scholastic achievement is not a prime goal.

Borislow interpreted his findings as lending support to the usefulness of a more specific self-evaluation theory which takes into consideration relevant motivation. His results do not support general self-evaluation, based on a global concept of personality adjustment, as a factor in investigating non-intellectual factors in academic achievement.

Self-Concept and Academic Achievement

Borislow's point of view is shared by Brookover et al (1964) who states his position as follows:

> Briefly, the general theory states that self-concept is developed through interaction with significant others which in turn influences one's behavior. When applied to the school learning situation, a relevant aspect of self-concept is the person's conception of his own ability to learn the accepted types of academic behavior; performance in terms of school achievement is the relevant behavior influenced. The student role is composed of several subroles, including one involving academic achievement; the student self-concept similarly

> is a complex of several segments, including self-concept of ability . . . Previous studies have not attempted to measure the academic ability segment of self-concept and test its relationship to achievement and the perception of other's evaluation (Brookover et al, 1964, p. 271).

The propositions basic to this theoretical approach are that:

1. A functional limit on a student's ability to learn in school is set by his "self-concept of ability;"

2. A student's self-concept of academic ability is acquired in interaction with his significant others through his perception of their "evaluation of his academic ability;"

3. A student's self-concept of academic ability is an "intervening variable" between his perceptions of others and his attempts to learn in school. (Brookover, 1967), p. 44.)

From these propositions, general research objectives and hypotheses were formulated and tested in a series of longitudinal studies. The data were obtained from a single secondary school class in a midwestern city each year during the seventh through twelfth grades. A battery of instruments was developed by Brookover and his co-workers to assess self-concept of ability as well as other social-psychological variables which were deemed relevant to self-concept of ability. These instruments are described in greater detail in the section on method in the following

chapter. School grades and intelligence test scores were secured from school records. The most relevant findings of this series of investigations were that:

1. Significant Others.--Contrary to assumptions frequently made, the evidence indicates that parents and other family members are more likely than any other category to be "significant others" for adolescents during the junior and senior high school years. The impact of the evaluations of friends, while lower than that of parents, increases somewhat in later years. Teachers do not appear to be significant others for the major portion of the secondary school group.

2. Relation of Perceived Evaluation by Others to Self-Concept of Ability (SCA).--The evaluations which students perceive parents, friends, and teachers hold for them are consistently correlated with self-concept of ability. The correlations range from .50 to .77 over the period of this study. Although all three perceived evaluations are significantly correlated with SCA, partial correlation analysis revealed that perceived parents' evaluation is more likely to affect self-concept than the evaluations of the peers or teachers. Since changes in perceived evaluations were found to be significantly related to changes in SCA over one- and two-year periods, in addition to the high correlation between these two variables, cited above, it was

concluded that perceived evaluations of others are necessary and sufficient conditions for explaining variation in SCA.

3. Relation of Self-Concept of Ability to Achievement.--The correlation between SCA and grade point average ranges from .48 to .63 over the six years. It falls below .50 only among the boys in the twelfth grade. Such evidence is interpreted as support for the basic theory of the research. The higher correlations between perceived evaluations and self-concepts indicates that while perceived evaluations are a necessary and sufficient condition for self-concept of ability, SCA is a necessary but not sufficient condition for achievement. Further support for this conclusion is that an analysis of the achievement of students with high and low self-concepts of ability revealed that, although a significant proportion of students with high SCA achieved at a relatively lower level, practically none of the students with lower SCA achieved at a high level. In addition, the relationship between change in SCA and change in GPA over two-year periods was not significant. This result was anticipated as SCA was hypothesized to be a necessary but not sufficient condition in school achievement.

4. Self-Concept of Ability as an Intervening Variable.--The hypothesis that SCA intervenes between the independent variable, perceived evaluations, and the dependent one, school achievement, was generally supported

by the results. The correlation between perceived evaluation and GPA is generally less than those between each of these variables and SCA. The partial correlations also substantiate the intervening variable proposition. In this, the correlations between perceived evaluations and GPA are significantly reduced by partialing out the effect of self-concept of ability. The correlation between SCA and GPA is not, however, significantly reduced by partialing out the effect of variation in perceived evaluations. Furthermore, changes in perceived evaluations are not directly associated with changes in grade point average over various periods; but changes in self-concept of ability are associated with both changes in perceived evaluations and changes in grade point average over two-year periods. It is, therefore, concluded that SCA makes a significant contribution to the explanation of school achievement, as a means through which the evaluations of others are translated into school achievement behavior.

5. The Effect of I.Q. and Socio-Economic Status of the Relations Among Perceived Evaluations, Self-Concept, and Achievement.--The relationships reported above are not greatly affected by variation in either measured intelligence or socio-economic status. The evidence indicates, rather, that much of the correlation between these variables and school achievement is accounted for by variation in SCA.

6. Relation of Self-Concept of Ability to Other

Conceptions of Self.--The relationship of SCA to a more general self-scale (Rosenberg's) was examined as well as the correlation of each of these scales with school achievement. It was found that the general self-esteem scale had a correlation of .31 with the SCA scale. Although the more general index is significantly correlated with school achievement, nearly all of this is accounted for by variation in self-concept of academic ability. The latter is, therefore, apparently a more relevant variable in school performance.

7. In contrast to Engel's (1959) findings in regard to differential changes in general self-concept over time as a function of its original negative or positive nature, no difference was found over time in SCA as a function of whether the original SCA scores were high or low. No large shifts or systematic changes were found for either the longitudinal or the cross-sectional populations. Correlations for the SCA from year to year, years 8-12, ranged from .69 to .73.

In sum, Brookover's work provides substantial support for the basic hypotheses derived from the more general social psychological theory of school learning. While it was demonstrated, however, that the evaluations of significant others affect the student's conception of his academic ability and thus set limits on his school achievement, there were many students who had high self-concepts without commensurately high achievement. One possible factor contributing

to this finding is that when achievement is defined in terms of the mean of grades, students who may be achieving in one subject at a high level, while achieving in other subjects at a low level, will be lumped together with students who have the same GPA but who are performing in all subjects at a consistent level. Thus, the mean grade point, as the only measure of achievement, may be masking quite divergent patterns of achievement which, in turn, may be related to divergent levels of self-concept.

Paterson, who worked closely with Brookover in carrying out studies of reliability and validity of the SCA Scale, concluded that"general self-definitions of ability are more heavily influenced by areas of strength than by areas of weakness. Among students with 'non-uniform' achievement patterns, the specific subject scales were in general significantly better predictors of achievement in the parallel subject than was the general SCA Scale." (1966) Her findings will be discussed in greater detail in the next section of this chapter, in which studies related to the problem of variability in general and variability in academic achievement are presented.

Self-Consistency (Intra-Individual Differences in Variability)

General Theory and Research

While interest in individual differences has a long history, explicit theory and careful research regarding variability is a relatively new development. The experimental study of short-term oscillations in attention, sensory thresholds, and so on, came into psychology through the work of Wundt and Fechner, but systematic studies of both oscillations and longer term fluctuations did not begin until the studies of Spearman and his colleagues (Flugel, 1928, 1934) of the "O" factor, oscillation, and Flugel's studies of mood changes (Flugel, 1925). Perhaps the most prominent figure in the history of work on variability is Raymond Dodge. One of the few people to study the general problem, he pointed out that variability could be viewed as accidental deviations from some abstracted "true" measure, but that such an approach with its emphasis upon invariants might overlook significant aspects of behavior. (Dodge, 1924) In a later work (Dodge, 1931), he stated that

> The psychophysical organism is in a perpetual state of flux . . . Moreover, the neuro-muscular consequences of two successive instances of stimulation with physically similar stimuli vary not only according to the momentary conditions of the organism and its psychophysical set, but also according to inner reactions and inhibitions. As is well known, the repetition of identical stimuli may not evoke the same reaction in successive instances. (P. 5.)

In addition to publishing laws of relative fatigue in which he pointed out that relative fatigue should be viewed positively (Dodge, 1917) as a conserving mechanism helping to prevent exhaustion, he also collected voluminous data on several levels of neuromuscular processes, for one subject, over a period of two years. (Dodge, 1927.) He interpreted this data, however, in terms of now out-dated constructs derived from contemporaneous neurophysiology.

Research and theory relating variability have developed rapidly in the last decade, in response to several new discoveries within psychology. The instability of imagery and thought in "stimulus deprivation" experiments has revealed a surprising amount of inherent variability in the human organism (Fiske, 1961). Temporal variations in reaction to drugs (Nowlis, 1961) have shown that response depends in part on restime levels and on organic changes in process at the time the drug is administered. Test theory has developed new conceptual tools for describing stability and variability. (Cronbach, 1955.)

The most important work in this area has been that of Fiske, who on the basis of an extensive review of the literature relevant to variability and the results of his own research, concludes that: (Fiske, 1962)

1. Variability is a meaningful parameter of response. There are dependable individual differences in amount of variability.

2. Variability scores are as specific as ordinary

status or level scores--that is, the variability score depends strongly on what particular psychological or physiological variable is being measured. Variability on one parameter does not necessarily predict variability on another parameter.

3. The extent of variability is a function of the situation and the stimuli. In highly structured situations with familiar and unequivocal stimuli, variability is low, (as in intelligence tests). In unstructured situations with ambiguous stimuli (such as projective tests), variability is high.

Fiske (1961) has summarized three main adaptive functions of variability. First, it provides the organism with a range of alternative responses, develops resourcefulness, and avoids fixity and rigidity. Second, variability makes it possible for the organism to cope with ambiguity. Third, it increases the amount of new stimulation in the environment and thereby increases the organism's level of activation. Consistency, on the other hand, conserves energy and increases efficiency in any relatively unchanging situation, since well-practiced, invariant actions are performed rapidly and with little effort. According to Maslow (1954 and 1962), stability is more likely than variability in a situation in which the organism is constrained to focus all of its resources on coping with the demands of the environment, while variability is more likely to the extent

that the organism has energy and interest left over for expressive behavior after coping with external demands.

Fiske's general formulations of variability fit in with this view:

> Behavior is viewed as inherently variable, its relative consistency being an indication of the extent to which the behavior is constrained by the stimulating environment. Perhaps variability scores reflect the extent to which (in a given situation) the person's efforts to adapt to intra-psychic demands have priority over his efforts to handle the pressures from his immediate environment. (Fiske, 1957 (a), p. 334.)

> It seems likely that the apparent consistency of an individual's behavior is based in large part upon the consistency of expressive movements and the highly idiosyncratic patterning of instrumental acts. (Fiske, 1961, p. 339.)

Cattell's (1957) programmatic research into the major dimensions of personality suggests, though by no means conclusively at the present time, that variability in emotional states is likely to be associated with neuroticism (vs. ego strength) on the one hand, and with extroversion (vs. introversion) on the other. Kendall (1954) has shown that subjects who are relatively indifferent about a response are more likely to change it, suggesting that perceived importance of a response, the experiment, or the experimenter, may be a major determinant of stable responsiveness.

Other empirical findings on personality characteristics related to test variability have been surveyed by Fiske and Rice (1955) and by Fiske (1957). These studies

have shown that variability is related to: response heterogeneity (Fiske, 1957); tendency to give unusual, versus popular types of responses (Osterweil and Fiske, 1956); self-ratings of frivolous (versus responsible) to flexibility or tolerance for complexity, and to preference for solitary activities (Fiske, 1957). Klein (1954) and Smith and Klein (1953) related variability to flexible control in perceptual tasks, as opposed to control by constriction.

Relationships between variability and quality of performance tend to be negative when performance is measured as deviation from a fixed goal, such as target shooting (Lashley, in Crozier and Hoagland, 1934) and positive when performance is measured as amount produced (Flugel, 1928). In free response situations, such as a sentence-completion test, an uncooperative attitude may lead to low productivity, faking a "good" response pattern, and little variability (Fiske, 1957).

Hall (1937) found that rats showing more variability among five alleys of equal length also showed greater emotionality (as measured by defecation in the apparatus) and took somewhat more time per run. Emotionality might be construed as an index of unreduced tension. Cummings (1939) found that variability on self-ratings correlated negatively with persistence and introversion. Subjects high on this kind of variability were rated by others as original, imaginative, and talkative; low subjects were regarded as

conventional, thorough, and pugnacious. Walton (1936) demonstrated a relationship between steadiness of character and low oscillation on motor and cognitive tests.

Rosenzweig and Mirmow (1950) found that degree of socialization was associated with trends on the Picture-Frustration test, a trend being a shift from extrapunitiveness to impunitiveness during the testing. This type of change is interpreted to be due to the subject's reactions to his previous responses. Brogden (1940) in a factor analytic study, found that non-variability among 30 trials on addition had an appreciable loading on a factor involving ability to work steadily and to resist distraction.

In one of his own studies, Fiske (1957) found that variability was associated with being rated, both by the self and by observers, as anxious, depressed, retiring, and detached. In addition, observers noted low talk involvement, and the variable subjects themselves noted on an adjective check list that they were "annoyed," "confused," "obstructive," and "modest." Stability was related to self-description by adjectives like "relaxed," "cheerful," and "kindly," and negatively to "withdrawn." Later studies (Fiske, 1960; and Van Der Veen and Fiske, 1960) confirmed the association between variability in group behavior and low levels of individual assertiveness and sociability, as rated by peers and observerss but not as rated by the self.

Eysenck (1947), on the basis of considerable research, distinguishes between the characteristics of anxiety neurotics, who tend to be stable to the point of rigidity, and to be persistent, accurate and conventional in their tastes, but to suffer from irritability and autonomic imbalance, and hysteric patients, whose characteristics are more flighty and emotional. Hanfmann (1950) concluded that all studies, whether they dealt with motor, perceptual, or ideational functions, indicated one of two patterns as being typical of anxiety: either disorganization or a tightly inhibited performance. In any situation tinged with anxiety, variable subjects might be expected to tend toward the hysterical, disorganized style of reaction, while stable subjects could be expected to tend toward the side of rigidity and constriction.

This interpretation is partially supported by the results of a study by Fiske, Howard, and Rechenberg (1960) in which the Edwards Personal Preference Scale was used. Stability was significantly correlated with measured needs for autonomy, consistency, achievement, and dominance, and negatively with needs for abasement and deference. Stability also had significant correlations with measures of donimance, activity, and control on other self-report tests. No relationship between self-reported personality characteristics and variability was found, however, by Raine and Hills (1959) or by Van Der Veen and Fiske (1960).

Wessman and Ricks (1966), in a series of studies of the nature of moods and their detailed formulation, investigated the relationship of personality characteristics to hedonic (mood) level and to hedonic variability. Their subjects were Harvard undergraduate men (17 Ss) and Radcliffe undergraduate women (21 Ss) who made daily self-ratings on an elation-depression scale. In addition to mean level scores, the standard deviation of daily averages and the mean range between daily peaks and troughs were also computed. On the basis of their results, they made the following conclusions:

1. For both women and men, all the standard deviations were highly correlated. That is, the same people were generally high or generally low in day-to-day variability on all three measures (standard deviation of peak, average, and trough). Standing on magnitude of within-day hedonic variability (average daily range) appeared closely related to day-to-day variability (S.D.) for the men, but not for the women.

2. The standings on the hedonic level scores (the mean daily peaks, averages, and troughs) were not as closely related to each other, but the mean trough hedonic level appeared quite independent of the peak, though possibly related to the average.

3. Wide variation of within-day hedonic variability (mean daily range) was significantly related, as would

be expected, to having a high mean on peaks, and a low mean on troughs; it was not significantly related to standing on average level.

In neither the male nor female groups were the correlations between hedonic level and the measures of its variability significant, indicating that the two are independent and possibly related to different aspects of personality. On the basis of further investigation employing various instruments to gather clinical data over a three-year period, they found the following characteristics differentiated the emotionally stable from the emotionally variable people:

> The most general characteristic related to mood variability, permeating every type of data gathered, contrasted the emotional openness of the variable people to the constriction of the stable. This is not a simple matter of introversion vs. extroversion. The variable people were more open to their own inner lives, more subjective, introceptive, and narcissistic, but--at least in the male sample--they were also more involved with their fellow men and more likable.
>
> Related to this greater openness, this pro-emotional stance, was a more diffuse, but also livelier, richer fantasy life, relatively free from repression and suppression of feeling. The more stable men were relatively aloof, emotionally controlled, and given to fantasies of isolation when they fantasied at all. On the positive side, the stable men and women proved to be more integrated personalities with more stable identities, solid citizens of their time and place.
>
> A third set of variables suggested a possible tempermental perhaps physiological, substrate to emotional variability. The stable men appeared to be relatively passive people with a good deal of inertia, while the variable were more energetic, fast paced, full of iniative, oriented toward the future. (Wessman and Ricks, 1966, p. 187.)

They also found that:

> The major difference that emerged between stable and variable men and women from their self- and ideal descriptions was the degree to which the self-described personality is adapted to the demands of the environment. The stable men and women were well adapted . . . to the role of student . . . while the more variable men and women were more independent, more introspective and more inventive and intellectual, though less diligent. Not fitting their divergent roles so well, the two sexes were more like each other than were the stable men and women. (Wessman and Ricks, 1966, p. 189.)

Unfortunately, though, in view of the limited range of ability of the sample perhaps understandable, Wessman and Ricks made no attempt to relate mood, either in terms of level or of variability, to the level and variability of academic achievement. The study is an important one, however, since it provides an intensive study of variability over a relatively long time span and demonstrates the usefulness of the construct of intra-individual differences in variability in the study of personality.

Self-Consistency and Academic Achievement

The following studies were carried out to investigate, either as their main purpose or as a subsidiary purpose, the problem of the relationship of variability in the pattern of academic achievement to other parameters.

Paterson (1966), in a study designed primarily to evaluate the Self-Concept of Ability Scale developed by Brookover (1967), used the terms "uniform" and "non-uniform" to describe the achievement patterns of seventh grade students. Her measure of "non-uniformity" was derived from a

discrepancy score of two or more points between the highest and lowest grades which the students achieved that year. She found that the mean scores of the general SCA Scale were higher than the means of any of the Specific-Subject scale scores and closest to the specific-subject score in that subject in which the student has his highest achievement.

> This suggests that general self-definitions of ability are more heavily influenced by areas of strength than by areas of weakness. Among students with "non-uniform" achievement patterns, the specific subject scales were in general significantly better predictors of achievement in the parallel subject than was the general SCA scale. (Paterson, 1966, p. ii.)

In distinguishing "uniform" from "non-uniform" students, she found that females are less likely to be non-uniform achievers. Those females who were "non-uniform" had lower mean GPA and SCA scores than the total group; they also developed specific subject self-concepts that are more distinctive from the general SCA than do "non-uniform" males. Paterson hypothesized that "non-uniform" achievement is perceived as negative by females, in contrast with males to whom it is apparently of no consequence. There was no attempt in this study to control for such factors as level of achievement or I.Q. in assigning subjects to "uniform" and "non-uniform" groups. Her hypothesis and findings are, however, in line with the findings of Wessman and Ricks in terms of the self-images of variable and stable men and women.

Bakan (1964), in a study of the relationship of

grade variability to a number of cognitive and affective measures also used a discrepancy score as a measure of variability. In this case, however, it was determined by subtracting each term's grade point average from the student's final grade point average. Deviations were then summed regardless of sign and this sum was then divided by the number of term-end averages used to get the final average. Subjects were 135 members of the freshman class of 1958 at Michigan State University and the number of terms in attendance varied from nine to twelve, with most students attending a total of eleven to twelve terms. Her findings were:

1. The number of males who were highly variable was significantly greater than the number of females.

2. Highly variable males are significantly more individualistic and less conformist in their values than are males with low variability.

3. High variability males are significantly more variable than low variability males in scores on the Critical Thinking Test, MSU Reading Test, the CQT Numerical and Total Scores.

4. High variability females are significantly more variable on Puritan Morality and Present Time scores on the DVI and on Information scores on the CQT.

An analysis of the responses to one of a series of questions concerning self-perception revealed that there was

a significant difference between high and low variability groups on occupational training versus social life as being the most important reason for attending college; the high variability group chose the former alternative more often. There was also a shift among the low variable Ss to choosing the vocational objective when the question was changed to ascertain how the subjects viewed themselves when they first came to Michigan State University. Since males and females were combined (because of the smallness of the number) for this analysis, these differences between variable and stable groups may also be reflecting differences attributable to sex.

Summary

Despite the fact that school grades have been used as a measure of academic achievement in countless studies, very few of these studies have been of a longitudinal nature and fewer still have utilized any measure other than the mean of these grades. In recent years, as a result of the growing dissatisfaction with the use of grades as the only criteria in predicting academic performance, researchers have begun to use other measures as well.

One of the most promising of these has been that of the self-concept. Brookover has developed from the general self-concept the construct of the self-concept of academic ability and has shown it to have a positive and significant relationship to academic achievement. Another measure which

may prove to be valuable in understanding academic achievement is that of achievement variability. This measure was developed by applying Fiske's formulation of intra-individual differences in variability of response to measures of academic achievement (GPA)

In the following chapter, the method employed to investigate the relationship of achievement variability to academic performance and self-concept of academic ability will be described.

CHAPTER III

METHOD

The presentation of research method in this chapter is divided into four sections. The first is a description of the sample used in this study. In the second section, each of the major variables investigated is operationally defined in terms of the research instruments used to measure them. The third and fourth sections deal respectively with procedures of data collection and analysis. The data for this study were originally collected by Brookover et al (1967). The analyses of the data in terms of achievement-variability and the selection of the achievement-variability sample are the author's.

The Sample

All of the students in the population were originally in the eighth grade class during the 1961-62 academic year in the four junior high schools of a midwestern city of approximately 120,000. The total eighth grade population numbered about 2,000.

The Longitudinal Sample consisted of all students who met the following criteria:

1. Questionnaire data was available from the eighth through twelfth grades.

2. Academic Achievement Information (GPA) was available from the eighth to twelfth grades.

3. Caucasian.

4. All subjects were promoted regularly from grades four through twelve. Students who repeated grades or who withdrew and re-entered were excluded.

5. All were participants in the regular school program. All who were in special education programs (such as those for the retarded) and all who were in experiments designed to enhance self-concept of academic ability during the ninth grade were excluded.

Negro students were not included in this study because research evidence suggests some differences in self-concept and related variables. (Morse, 1963.)

The total N was 639: 342 females and 297 males.

Achievement-Variability Sample

From the longitudinal group of subjects, a selection was made of all male students whose grade point average over a period from years 8-12 was within $\pm$.20 of the mean GPA of all males in the longitudinal sample. A similar selection was made for the female subjects. Males and females were than ranked in terms of the magnitude of the standard deviation of their overall GPA. The top and bottom thirds of these distributions were designated as High and Low Achievement-Variability groups. Each group of females numbered 30, making a total of 60 females, and each

group of males 26, making a total of 52 males. The interval $\pm$.20 was chosen as it was small enough to preclude significant differences between the mean GPA of the High and low Achievement-Variability groups (male and female, respectively), and large enough to ensure obtaining groups which would each have an N of at least 25. In Table 3.1 a summary of the above data is presented.

TABLE 3.1.--Achievement-Variability scores: means and standard deviations for High and Low AV males (N=52) and females (N=60), year by year from year 8 to year 12; overall means and standard deviations for AV scores and overall (years 8-12) GPA for above groups

YEAR	MALE				FEMALE			
	Low AV (N=26)		High AV (N=26)		Low AV (N=30)		High AV (N=30)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
8	.52	.21	.74	.26	.48	.15	.70	.18
9	.59	.17	.77	.24	.52	.14	.80	.24
10	.67	.33	.88	.37	.58	.20	.92	.38
11	.70	.28	.95	.42	.68	.32	.94	.26
12	.62	.27	.97	.41	.68	.22	.83	.35
Overall AV	.66	.07	.95	.08	.63	.07	.90	.07
Overall GPA	2.33	.13	2.32	.12	2.56	.11	2.60	.12

In Figure 3.1, the change with time (years 8-12) for high and low average groups in Achievement-Variability scores is diagrammed.

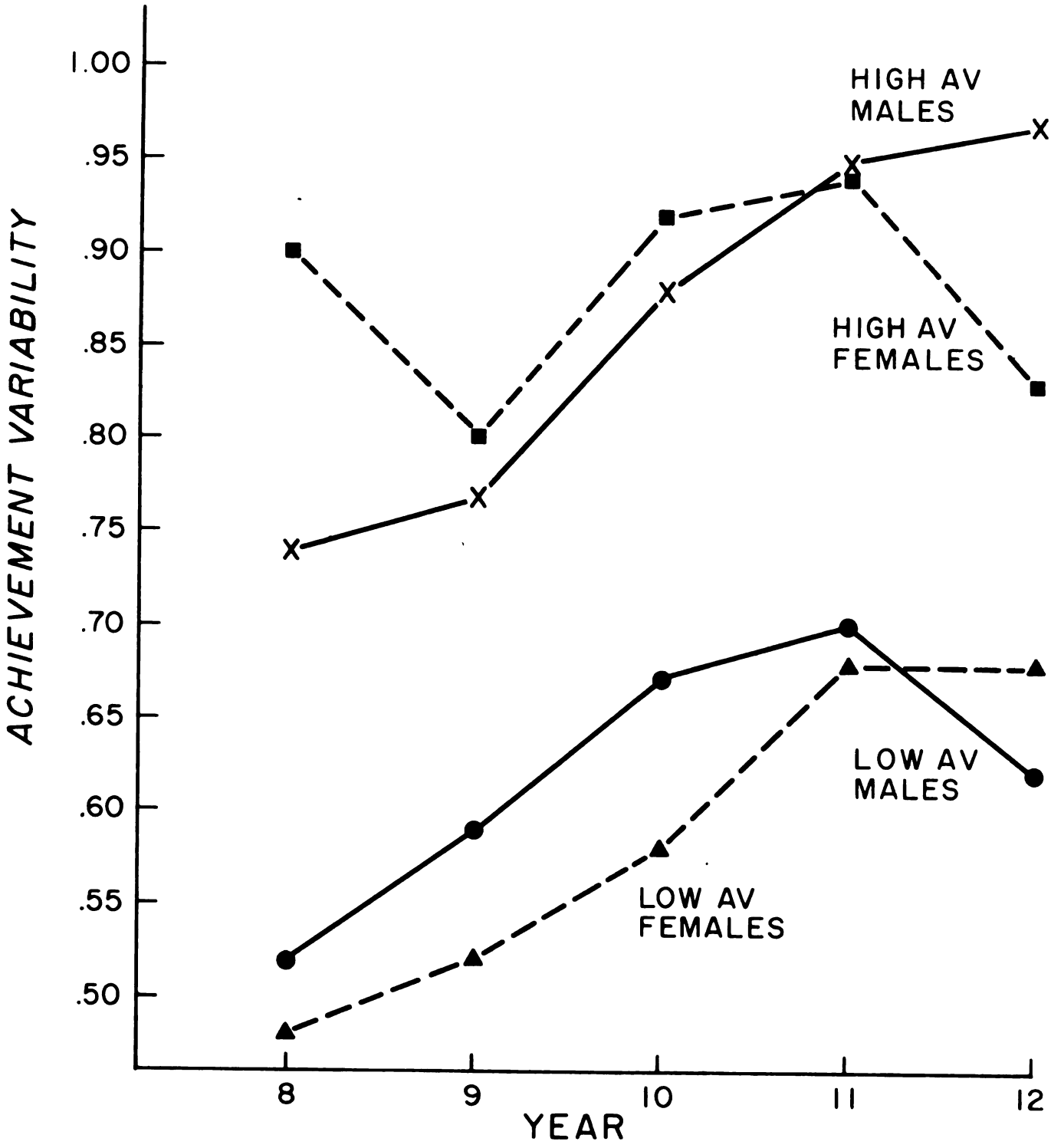

FIG. 3.1 Achievement Variability Scores from Years 8–12 for High and Low Achievement Variability — Males and Females.

Major Variables and Instrumentation

The major variables studied in this investigation were: (1) Achievement-Variability, (2) Academic Achievement, (3) I.Q., (4) Socio-Economic Status, (5) General Self-Concept of Academic Ability, and (6) Mean Specific Self-Concept of Ability.

Operational definitions and the instruments used to measure these variables are presented below:

1. Achievement-Variability.--Variability of academic achievement is defined as the Standard Deviation of the individual scores achieved in subjects (mathematics, English, social science, and science), from grades eight through twelve. Each SD is thus based on a total of 20 individual course grades over a period of five years.

2. Academic Achievement.--Academic Achievement was defined as the grade point average of four academic subjects from grades eight to twelve. English, mathematics, social science, and science were used in the eighth and ninth grades. Other academic subjects were used in the later years if the student was not enrolled in all of the above subjects. Physical education, music, art, and driver education grades were never included. January grades were used for the analysis. Questionnaire data were obtained two to three months before grades were communicated to students in order to control for the effect of grades on self-concept of ability (Brookover, 1967).

3. I.Q.--Group intelligence test scores were obtained for a major portion of the students in the fourth, sixth, ninth, and eleventh grades. Only the mean scores of the latter two testings are used in this report. The California Test of Mental Maturity was used for this purpose.

4.--Socio-Economic Status.--Socio-economic status was determined by using the Duncan Scale where the occupation of the student's father (or whoever supports the family) was assigned a value ranging from 1 (lowest) to 100 (highest). Only the twelfth grade score was used. (See Reiss (1961), Appendix B-1, pages 263-275.)

5.--General Self-Concept of Academic Ability.--This construct refers to estimates which an individual makes concerning his ability to achieve in academic tasks in general, as compared with others in his school class. General self-concept of ability is defined operationally as the sum of scored responses of a subject to the Michigan State General Self-Concept of Ability Scale (GSCA). (See Appendix A.) The scale consists of eight multiple-choice items with each item scored from 5-1, the higher self-concept alternatives receiving the higher values.

6.--Mean Specific Self-Concept of Ability.--This score is derived by combining the scores in the four Specific Self-Concept of Ability Scales. This refers to the evaluation one makes of himself in respect to a given

subject matter area. It is defined operationally as the scored responses to the Michigan State University Self-Concept of Ability in Specific Subjects Scales. (See Appendix B.) The items for these scales are directly parallel to the general self-concept of ability items, only in this instance dealing with specific subjects. The specific subjects are mathematics, English, social science, and science. Students are asked to respond separately by subject, thus resulting in four eight-item scales which are scored like the general self-concept test.

Data Collection Procedures

In the fall of 1960, the first questionnaire was administered to the seventh grade students in four junior high schools. During the fall of each succeeding year (1961-1965), the questionnaire was administered to the same class. The questionnaires were administered to the students in this class in each of the schools under the direction of Dr. W. B. Brookover and his research associates. (Brookover, 1967.)

Data Analysis Procedures

Data were coded and punched on IBM cards, subsequent analysis being performed mainly by the CDC 3600 computer at the Michigan State University Computer Center. All computations were based on raw scores. Separate analyses were carried out on the two groups of subjects described above--

the longitudinal sample and the achievement-variability sample.

Longitudinal Sample

Two kinds of measures were computed for this sample--level scores and variability scores. Level scores were mean values on the following parameters: IQ, SES, GPA, GSCA, AND MSSCA. Variability scores were computed by determining the standard deviations of each student's scores on the following parameters: GPA, GSCA, AND MSSCA.

Correlations between these scores were computed and tests of significance (i.e., the correlation differs from 0) were made at the .05 and .01 level. Tests of the significance of difference between correlations were carried out at the .05 and .01 level. The significance of differences between means was determined by using t-tests at the .05 and .01 level.

Achievement-Variability Sample

Means and Standard Deviations of scores of males and females in the High and Low Achievement-Variability groups were computed for the following variables: IQ, SES, GPA, GSCA, and MSSCA. On all but SES and IQ, year by year means and standard deviations were computed for each year as well as for the overall five-year period from grades 8-12. The means and standard deviations of SES scores were based on twelfth year scores and the means and

standard deviations of IQ scores were based on ninth and eleventh grade scores.

The analysis techniques used were analysis of variance and t-tests of significance, two-tailed, at the .05 or .01 level of significance.

Summary

Two groups of subjects were used in this study. The longitudinal group included all-Caucasian students, originally in the eighth grade for whom complete data was available from years 8-12. All students had been regularly promoted and were participants in the regular school program. There were 639 students, 297 males and 342 females. The Achievement-Variability sample was drawn from the longitudinal population. All males (N=52) and females (N=60) having a GPA over all years (8-12) within $\pm$.20 of the mean for the males and females, respectively, of the longitudinal population were ranked in order of the magnitude of the standard deviation of their grades over the five-year period from grades 8-12. The top and bottom thirds of this distribution were designated as High and Low Achievement-Variability groups.

Major variables were operationally defined as follows: Academic Achievement by GPA, Achievement-Variability by the SD of the individual's grades, IQ by the California Test of Mental Maturity, Socio-Economic Status by the score on the Duncan Scale, General Self-Concept by the

MSU General Self-Concept of Academic Ability Scale, and Mean Specific Self-Concept by the mean of the individual's scores on the four MSU Self-Concept of Ability in Specific Subject scales (mathematics, English, social science, and science). The latter two scales were developed by Brookover.

The data were collected through the administration of questionnaires and from the students' school records. The analysis of the data involved the use of product-moment correlations, tests of the significance of differences between correlations, t-tests of the significance of the differences between means, and analysis of variance of the differences between correlated means.

CHAPTER IV

RESULTS

Research findings are presented in this chapter in the same order as the presentation of research problems in Chapter I. The results of analyses will be presented in two sections. The first section will contain those findings for which the entire longitudinal sample was used; the second section will contain findings based on analyses of the Achievement-Variability sample data. A summary of the findings will be found at the end of the chapter.

Longitudinal Sample

The longitudinal sample consisted of 297 males and 342 females, with a total N of 639. All students had completed five years of school, from years[1] 8-12. For a more detailed description of this sample, see Chapter III.

Problem 1

Differences between males and females in:

1. Level[2] scores in:

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[1]The term years is used throughout this chapter instead of grades to denote school year.

[2]The term level score is used to distinguish such measures from variability scores. Level scores are those mean scores which are conventionally used to indicate an individual's scores on a given instrument over a given period of time; variability scores refer to the standard deviation of an individual's scores on a given instrument within a stated period of time.

a. Academic Achievement

b. IQ

c. General Self-Concept of Ability

d. Mean Specific Self-Concept of Ability

e. Socio-Economic Status.

As indicated in Table 4.0, there is a significant difference in mean level scores between males and females in Academic Achievement (GPA), General Self-Concept of Ability, and Mean Self-Concept of Ability. Despite the higher GPA of the females, their mean level score in both measures of self-concept of ability is lower than that of the males. There was no significant difference found between males and females in either IQ or Socio-Economic Status.

TABLE 4.0.--Comparison of means and standard deviations of level scores: Academic Achievement (years 8-12), IQ (years 9 and 11), General Self-Concept of Ability and Mean Specific Self-Concepts of Abilities (years 8-12), and Socio-Economic Status (year 12): longitudinal sample, 297 males and 342 females

Variable	MALES		FEMALES		
	Mean	SD	Mean	SD	t
GPA	2.35	.65	2.62	.66	5.20**
IQ	108.90	16.18	107.95	13.68	NS
General SCA	29.09	3.91	28.45	3.41	2.01*
Mean Specific SCA	28.48	3.87	27.65	3.32	2.88**
SES	43.59	22.20	43.98	20.54	NS

*P beyond .05 level.
**P beyond .01 level.

2. Variability scores in:

   a. Academic Achievement

   b. General Self-Concept of Ability

   c. Mean Specific Self-Concepts of Abilities

In Table 4.1, the mean variability scores of males and females in academic achievement and self-concept of ability are presented. A variability score is the standard deviation of an individual's scores over the five-year period from years 8-12 on a given instrument. The mean variability scores were derived by averaging the respective standard deviations of all males and all females over the five-year period. Thus, mean variability scores in academic achievement were derived by first computing each individual's standard deviation of all grades from year 8 through year 12 and then taking a mean of these standard deviations. A similar analysis was carried out for scores on the self-concept of ability scales.

TABLE 4.1.--Comparison of means and standard deviations of variability scores: Academic Achievement, General Self-Concept of Ability, and Mean Specific Self-Concepts of Abilities: Longitudinal sample, 297 males, 342 females, grades 8 - 12

Variable	MALES		FEMALES		t
	Mean	SD	Mean	SD	
GPA	.75	.14	.71	.18	3.67**
GSCA	2.44	1.78	1.98	1.03	3.93**
MSSCA	4.32	1.47	4.51	1.53	1.61 NS

*P beyond .05 level.
**P beyond .01 level.

The findings shown in Table 4.1 above indicate that males have significantly higher variability scores, both in academic achievement and in general self-concept of ability. There was no significant difference between variability scores in the mean of self-concept of specific abilities.

Problem 2

Relationship of Achievement-Variability (AV) to level measures of the following parameters:

a. Academic Achievement (GPA)

b. IQ

c. General Self-Concept of Ability (GSCA)

d. Mean Specific Self-Concept of Ability (MSSCA)

e. Socio-Economic Status.

a. Achievement-Variability to Academic Achievement

As shown in Table 4.2, the relationship over the five-year period (years 8-12) of Achievement-Variability to Academic Achievement is negative for both males and females. Thus, the degree of Achievement-Variability goes down as the level of Academic Achievement goes up. Both correlations (-.49 for females and -.28 for males) are significant at the .05 level.

A test for significance of the difference between correlations (McNemar, 1955, p. 148) revealed that the correlation between AV and GPA for females was significantly greater (P=.003) than that for males.

TABLE 4.2.--Pearson Product Moment correlations between mean (years 9 and 11) IQ, mean GPA, var. GPA, mean GSCA, var. GSCA, mean SSCA, var. SSCA (years 8-12); longitudinal group, 297 males, 342 females

Variable	IQ	Mean GPA	AV	M-GSCA	Var. GSCA	M-SSCA
		Longitudinal Group, Males (N=297)				
IQ						
Mean GPA	.54**					
AV	-.07	-.28*				
Mean GSCA	.50**	.72**	-.16**			
Var. GSCA	-.07	-.16**	.09	-.23**		
Mean MSSCA	.48**	.73**	-.14*	.91**	-.13*	
Var. MSSCA	...	-.07	.27**	-.12*	.41**	-.17**
		Longitudinal Group, Females (N=342)				
IQ						
Mean GPA	.52**					
AV	-.24**	-.49**				
Mean GSCA	.47**	.71**	-.26**			
Var. GSCA	-.12*	-.14**	.15**	-.13**		
Mean MSSCA	.46**	.67**	-.23**	.91**	-.04	
Var. MSSCA	-.05	-.22**	.33**	-.06	.20**	-.13**

*P beyond .05 level.
**P beyond .01 Level.

b. Achievement-Variability (AV) to IQ

The relationship between Achievement-Variability and the mean IQ (grades 9 and 11) is also a negative one, as is indicated in Table 4.2. It is, however, not significant for the males as it is for the females. The correlation of AV to IQ for the females ($r=-.24$) is significantly greater ($P=.03$) than the correlation of AV to IQ for the males ($r=.07$). These findings indicate that the higher the IQ of females, the lower the level of Achievement-Variability, while for males the level of IQ is not related to degree of Achievement-Variability.

c. Achievement-Variability to General Self-Concept of Ability

For both males ($r=-.16$) and females ($r=-.26$) the relationship between Achievement-Variability and General Self-Concept of Ability is a negative one and statistically significant ($P=.01$); there is no statistically significant difference between them. Thus, for both males and females the higher the degree of Achievement-Variability, the lower is the mean level of General Self-Concept of Ability. (See Table 4.2.)

d. Achievement-Variability to Mean Specific Self-Concept of Ability

As with the other correlations between level scores and Achievement-Variability, that of Mean Specific Self-Concept of Ability is also a negative one and is significant

for the males (r=-.14, P=.05) and for the females (r=-.23, P=.01). These findings are presented in Table 4.2. The difference between the correlations for males and females was not statistically significant. Thus, for both sexes, the greater the degree of Achievement-Variability, the lower is the mean level of their specific self-concepts of academic abilities.

e. Achievement-Variability to Socio-Economic Status

The relationship of Achievement Variability to Socio-Economic Status was not significant for either males (r=.05) or females (r=.09).

Problem 3

Relationship of the following measures of variability to each other:

a. Academic Achievement

b. General Self-Concept of Ability

c. Mean Specific Self-Concept of Ability.

a. Achievement-Variability to Variability in General Self-Concept of Ability

As is indicated in Table 4.2, the correlation between variability in AV and variability in GSCA is a positive one and significant for the females (r=.15) but not for the males (r=.09). The former correlation is, however, quite low, and indicates that variability in academic performance (AV) contributes little to the variance of variability in

General Self-Concept of Ability for both sexes.

b. Achievement-Variability to Variability in Mean Specific Self-Concept of Ability

For both males (r = .27) and females (r=.33) the correlations between AV and Variability in Mean Specific Self-Concept of Ability are positive and significant at the .01 level. (See Table 4.2.) Thus, the greater degree of variability in AV, the greater the degree of variability in MSSCA, regardless of sex. The fact that scores in MSSCA reflect more specific measures of self-concept in each subject in which students receive grades than do scores on GSCA, is consistent with the higher relationship of variability scores in Academic Achievement (AV) to variability scores in MSSCA.

c. Variability in General Self-Concept of Ability to Variability in Mean Specific Self-Concept of Ability

The relationship between these two variables was the only one investigated for which the correlation was higher for males (r=.41) than it was for females (r=.20) (see Table 4.2), and in which the difference between correlations was statistically significant (P=.004). While the relationship between variability scores in GSCA and MSSCA was positive and significant (P=.01) for both sexes, indicating that variability in General Self-Concept of Ability increases as variability in Specific Self-Concept increases,

it was significantly more marked for males than for females, indicating a possibly greater generality of variability of response for the males.

Problem 4.

Stability of Achievement-Variability over time:

It was found (see Table 4.3) that the correlations between Achievement-Variability from year to year were all positive and, except for that between males when in the ninth and tenth grade, all significant at at least the .05 level. For both sexes, the correlations from year to year increase in magnitude until the largest correlation is obtained between grades eleven and twelve (males, r=.32, P=.01; females, r=.56, P=.01). This increasing strength of relationship indicates what may be called a stabilizing of variability. That is, the individual becomes either more consistently stable or more consistently variable in his pattern of academic achievement over time.

That this relationship is closer for females than it is for males is indicated by the finding that the correlations between year by year Achievement-Variability scores are always higher for the females and significantly higher for females in the following years:

Year 10 to Year 11	P=.004
Year 11 to Year 12	P=.001
Year 10 to Year 12	P=.04.

TABLE 4.3.--Year-by-year correlation coefficients of Achievement-Variability (AV) scores, years 8-12: Longitudinal sample, Males (N=291), Females (N=230)

Grade	9	10	11	12
		MALES		
8	.10	.17*	.07	.14*
9		.25**	.17*	.15*
10			.23**	.17*
11				.32**
		FEMALES		
8	.13*	.20**	.17**	.18**
9		.33**	.29**	.26**
10			.43**	.33**
11				.56**

*P beyond .05 level.
**P beyond .01 level.

Achievement-Variability Sample

The Achievement-Variability sample consisted of 60 females and 52 males selected from the longitudinal sample according to the following criteria: their mean GPA over the five-year period (years 8-12) was within $\pm$.20 of the mean for males and females, respectively, in the longitudinal sample; their AV score (the SD of the 20 grades which they received in four subjects over five years from years 8-12) was in the highest or lowest third of the distribution of AV scores.

Problem 5

Differences between high and low Achievement-

Variability groups (GPA held constant) in overall mean level measures of: (a) IQ, and (b) Socio-Economic Status.

No significant differences were found between High and Low AV groups, either male or female, in IQ or in SES. (See Table 4.4.) Thus, while the male AV groups had a significantly lower overall GPA (see Table 4.5) than the females, there was no significant difference between males and females, or High and Low AV, in IQ or SES.

TABLE 4.4.--Means and standard deviations of IQ (grades 9 and 11) and Socio-Economic Status (grade 12) for males (52) and females (60) of the Achievement-Variability sample (N=112), all students having a GPA within ±.20 of the mean GPA of longitudinal samples of males and females

Factor	Male (N=52)		Female (N=60)	
	Low AV (n=26)	High AV (n=26)	Low AV (n=30)	High AV (n=30)
IQ Mean	109.55	111.31	108.81	108.24
SD	13.93	10.36	8.59	8.60
SES Mean	48.65	43.15	46.90	44.00
SD	21.27	23.22	20.73	23.17

Problem 6

Differences between High and Low Achievement-Variability groups (GPA held constant) in level measures from year to year (years 8-12) and over all years (8-12) in the following:

a. Academic Achievement,

b. General Self-Concept of Ability,

c. Mean Self-Concept of Ability.

a. Achievement-Variability (AV)and
Academic Achievement (GPA)

The data for GPA are presented in Table 4.5. These results are arranged by years (8-12), sex, and achievement-variability group (high-low). An analysis of variance of the GPA data is summarized in Table 4.6. This is a factorial analysis adjusted for correlated means (Edwards, 1960) since all sources of variance involving a between-years component contain correlated means. Each student contributes five measures of mean GPA, one for each year, and these are correlated.

There is a highly significant difference between male and females in GPA (P=.001). This difference in academic achievement was also found in the total group. Females are consistently higher in GPA over the five-year period.

There is no significant difference in GPA between the high and low achievement-variability groups. This result was anticipated as the two groups were selected so as to control for GPA.

Over the five-year period, the GPA does not remain stable, but shows a generally decreasing trend. This results in a between-years variance significant at the .001 level. Though this decrease in GPA is characteristic of both high and low Achievement-Variability groups, it is more marked for the High Variability group than for the Low Variability group. The trend of GPA over time is shown for both these groups in Figure 1. It is interesting to note that

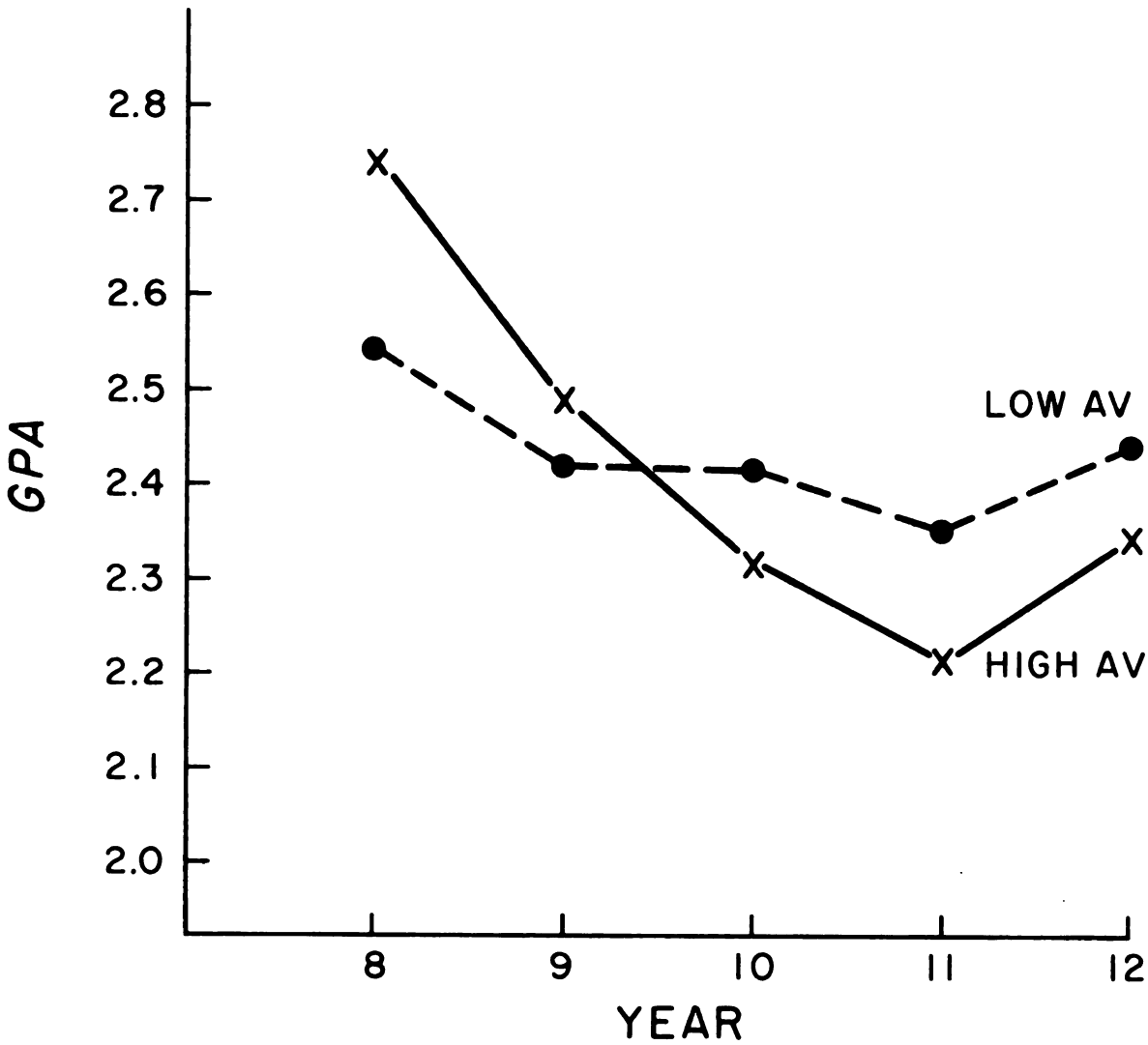

FIG. 4.1 Changes in GPA overtime (Grades 8-12) of High and Low Achievement Variability Groups.

TABLE 4.5.--Means and standard deviations of Academic Achievement (GPA), eighth through twelfth years, for 52 males and 60 females of the Achievement-Variability sample (all students having a GPA within ±.20 of the mean GPA of longitudinal samples of males and females)

Year	MALES				FEMALES			
	Low AV (n=26)		High AV (n=26)		Low AV (n=30)		High AV (n=30)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
8	2.48	.27	2.66	.39	2.59	.27	2.81	.45
9	2.25	.28	2.32	.33	2.58	.26	2.66	.30
10	2.31	.30	2.12	.44	2.51	.42	2.46	.43
11	2.31	.34	2.05	.53	2.38	.45	2.37	.48
12	2.24	.43	2.15	.55	2.61	.33	2.52	.51
Overall	2.33	.13	2.32	.12	2.56	.11	2.60	.12

though there is no overall difference in GPA between the High and the Low Variability groups, the GPA of the High Variable subjects starts out higher in the eighth and ninth years and then falls so that it is lower than that of the Low Variability subjects in the tenth, eleventh, and twelfth years. In the statistical analysis, this difference between the High and Low Variability groups in the GPA over the course of time is reflected by the Achievement-Variability x Years interaction. This interaction is significant at the .05 level. It might be expected that the High Variability group would be more variable over time, but the importance of this finding lies in the fact that the high variability

over time takes the systematic form of a sharper decrease in GPA.

TABLE 4.6.--Analysis of variance of Academic Achievement (GPA) means between High and Low Achievement-Variability Groups, years eight through twelve, 60 females and 52 males (all students having a GPA within ±.20 of the mean GPA of longitudinal samples of males and females)

Source of Variance	df	SS	Mean Square	F	P
Between Sexes	1	9.42	9.42	104.67	.001
Between High AV-Low AV	1	.01	.01	. . .	NS
Sex x High AV-Low AV	1	.28	.28	3.11	NS
Between Ss Error	108	10.09	.09		
Between Years	4	8.28	2.07	11.50	.001
Sex x Year	4	1.14	.28	1.56	NS
High AV-Low AV x Year	4	2.29	.57	3.17	.05
High AV-Low AV x Sex x Year	4	.32	.08	. .	
Within Ss Error	432	75.92	.18		
Total	559	107.75			

b. Achievement-Variability (AV) and General Self-Concept of Ability (GSCA)

The data for GSCA are presented in Table 4.7. In this table, the GSCA is broken down by years, sex, and Achievement-Variability groups. A summary of the analysis of variance of the data presented is shown in Table 4.8.

TABLE 4.7.--Means and standard deviations of General Self-Concept, eighth through twelfth years, for 52 males and 60 females, of the Achievement-Variability sample (all students having GPA within $\pm$.20 of the mean for longitudinal samples of males and females)

Years	MALES				FEMALES			
	Low AV (n=26)		High AV (n=26)		Low AV (n=30)		High AV (n=30)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
8	29.38	2.87	30.12	2.97	26.33	2.61	29.50	3.59
9	29.23	3.01	29.73	3.01	27.73	2.01	29.70	3.63
10	29.08	3.56	29.23	3.04	27.87	2.54	29.13	3.24
11	29.50	3.74	29.15	3.75	27.17	2.26	28.03	2.38
12	29.31	3.48	28.69	3.13	26.96	2.76	28.43	2.79
Over-all	29.30	2.69	29.38	2.55	27.41	1.96	28.96	2.31

TABLE 4.8.--Analysis of variance of General Self-Concept of Ability means, years eight to twelve, between High and Low Achievement-Variability groups, 60 females and 52 males

Source of Variance	df	Sums of Squares	Mean Square	F	P
Between Sexes	1	219.61	219.61	7.72	.01
Between High-Low AV	1	133.09	133.09	4.68	.05
Sex x High-Low AV	1	96.19	96.19	3.38	NS
Between Ss Error	108	3071.40	28.44	. . .	. . .
Between Years	4	44.22	11.06	1.95	NS
Sex x Year	4	208.48	52.12	9.21	.01
High-Low AV x Year	4	54.56	13.64	2.41	.05
High-Low AV x Year x Sex	4	33.05	8.26	1.46	. . .
Within Ss Error	432	2445.29	5.66	. . .	. . .
Total	559	6305.89			

The difference between sexes in overall GSCA is significant at the .01 level. This is due to the fact that GSCA for females is lower than that for the males. This is true despite the fact that the GPA is higher for females than it is for males.

There is also a difference between the High and Low Achievement-Variability groups in overall GSCA (P=.05). The GSCA is higher for the High Achievement-Variability group than for the low Achievement-Variability group. The difference between High and Low Variability groups seems more marked for females than for males, but the Sex-by-AV group interaction which bears on this differential sex effect falls short of significance at the .05 level; the F-value of 3.38 is less than the 3.92 required for the interaction to be significant at the .05 level, but it is significant at the .10 level.

In view of the greater drop in GPA over time for the High AV group found in the previous section, a study of the Years x AV interaction in GSCA was of special interest. Do the High AV students show a greater decrease from a higher initial level in GSCA than do the Low AV students? Examination of the data in Table 4.7 shows this to be the case. There is hardly any shift in GSCA over time for the Low AV students; for the High AV students, there is a trend toward decreasing GSCA over time. This is confirmed by the significance at the .05 level of the AV x Year interaction.

This interaction is pictured in Figure 2. Both GPA and GSCA change over time in a similar way for the two AV groups.

The Sex x Year interaction for GSCA was found to be significant at the .01 level. This seems to be due to a rise in female GSCA between the eighth and ninth year, followed by a decline. The male pattern over time is more consistently decremental.

There is no significant between-years effect for GSCA as there is for GPA. But the trend is in the direction of decreasing General Self-Concept of Ability which parallels the decrease in Academic Achievement.

c. Achievement-Variability and Mean Specific Self-Concept of Ability

The data for Mean Specific Self-Concept of Ability (MSSCA) is shown in Table 4.9. The results are subdivided by years, sex, and Achievement-Variability. The analysis of variance of these data is summarized in Table 4.10.

As is the case for GPA and General Self-Concept, there is also a significant effect of sex (P=.05) on Mean Specific Self-Concept. The MSSCA is lower for females than for males. This finding parallels the results for GSCA.

The difference between the High and Low AV groups in MSSCA parallels that found for the GSCA. The High AV students tend to have higher MSSCA. Though this effect falls short of significance at the .05 level, it is significant at the .10 level.

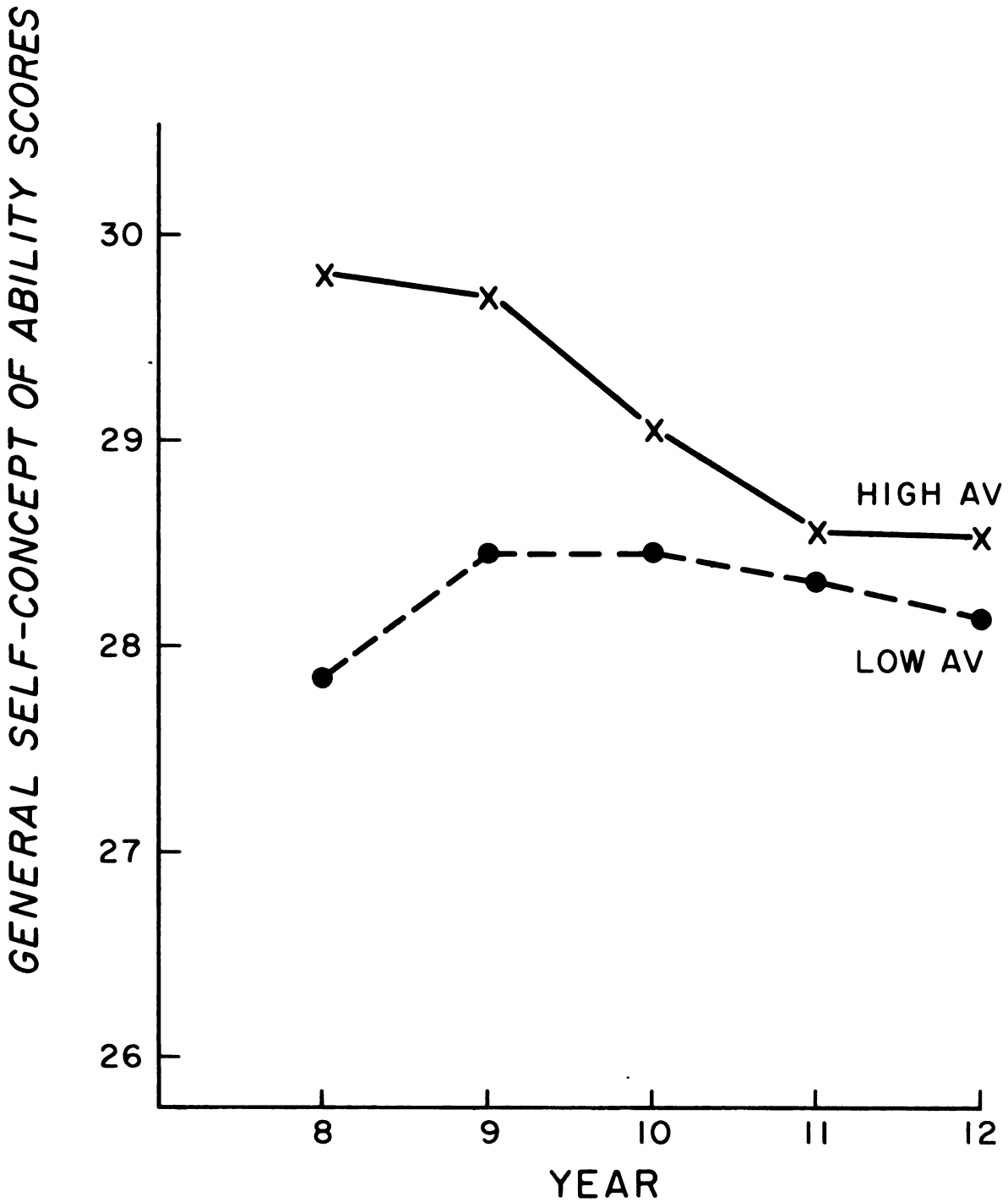

FIG. 4.2 Changes in General Self-concept of Ability Scores overtime (Grades 8-12) for High (n=56) and Low (n=56) Achievement Variability Groups.

TABLE 4.9.--Means and standard deviations of Mean Specific Self-Concept of Ability, years eight to twelve for 52 males and 60 females of the Achievement-Variability sample (all students having GPA within ±.20 of the mean for longitudinal samples of males and females)

Year	MALES				FEMALES			
	Low AV (n=26)		High AV (n=26)		Low AV (n=30)		High AV (n=30)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
8	28.93	2.63	30.17	3.13	26.49	3.73	30.12	3.42
9	28.79	3.09	29.57	3.38	27.54	2.53	29.44	3.43
10	28.91	3.74	29.33	2.41	27.12	2.59	28.53	2.92
11	28.59	3.69	28.25	2.73	26.19	3.17	27.31	2.79
12	28.53	3.32	27.35	2.89	26.12	2.80	26.20	3.09
Over-all	28.75	2.75	28.93	2.42	26.88	2.19	28.32	2.43

TABLE 4.10.--Analysis of variance of Mean Specific Self-Concept of Ability, year by year, years eight through twelve, between High and Low male and female Achievement-Variability groups (all students having GPA within ±.20 of the mean for longitudinal samples of males and females)

Source of Variance	df	Sum of Squares	Mean Square	F	P
Between Sexes	1	248.17	248.17	6.59	.05
Between High-Low AV	1	128.49	128.49	3.41	NS
Sex x High-Low AV	1	73.30	73.30	1.95	NS
Between Ss Error	108	4069.57	37.68	. .	. .
Between years	4	312.87	78.22	20.32	.001
Sex x Year	4	20.62	5.16	1.34	NS
High-Low AV x Year	4	141.07	35.27	9.16	.001
High-Low AV x Sex x Year	4	8.58	2.15	.56	NS
Within Ss Error	432	1664.35	3.85	. .	. .
Total	559	6667.02			

Here also the relationship between AV and MSSCA appears more marked for the female, but the Sex x AV interaction is not significant.

The significant Years x AV interaction found for GPA and GSCA was also found for the Mean Specific Self-Concept of Ability. The interaction for MSSCA is significant at the .001 level. The nature of this interaction is clear from Figure 3. There is very little change in MSSCA over time for the Low AV group, but there is a very dramatic drop from a higher level for the High AV group.

The Between-Years variance is also highly significant (P=.001), but, as can be seen from Figure 3, the drop in MSSCA is due mainly to the High AV group.

Summary

In this chapter, the research findings concerning the relationship of Achievement-Variability to Academic Performance and Self-Concept of Academic Ability have been presented. Two groups of subjects were studied: the longitudinal group, made up of all males (297) and all females (342) for whom complete data was available from the eighth to twelfth years of school, and the Achievement-Variability group (52 males and 60 females). The latter group was selected from the longitudinal group according to the following criteria:

1. All those students whose GPA over the five-year period (years 8-12) was within $\pm$.20 of the mean of males and

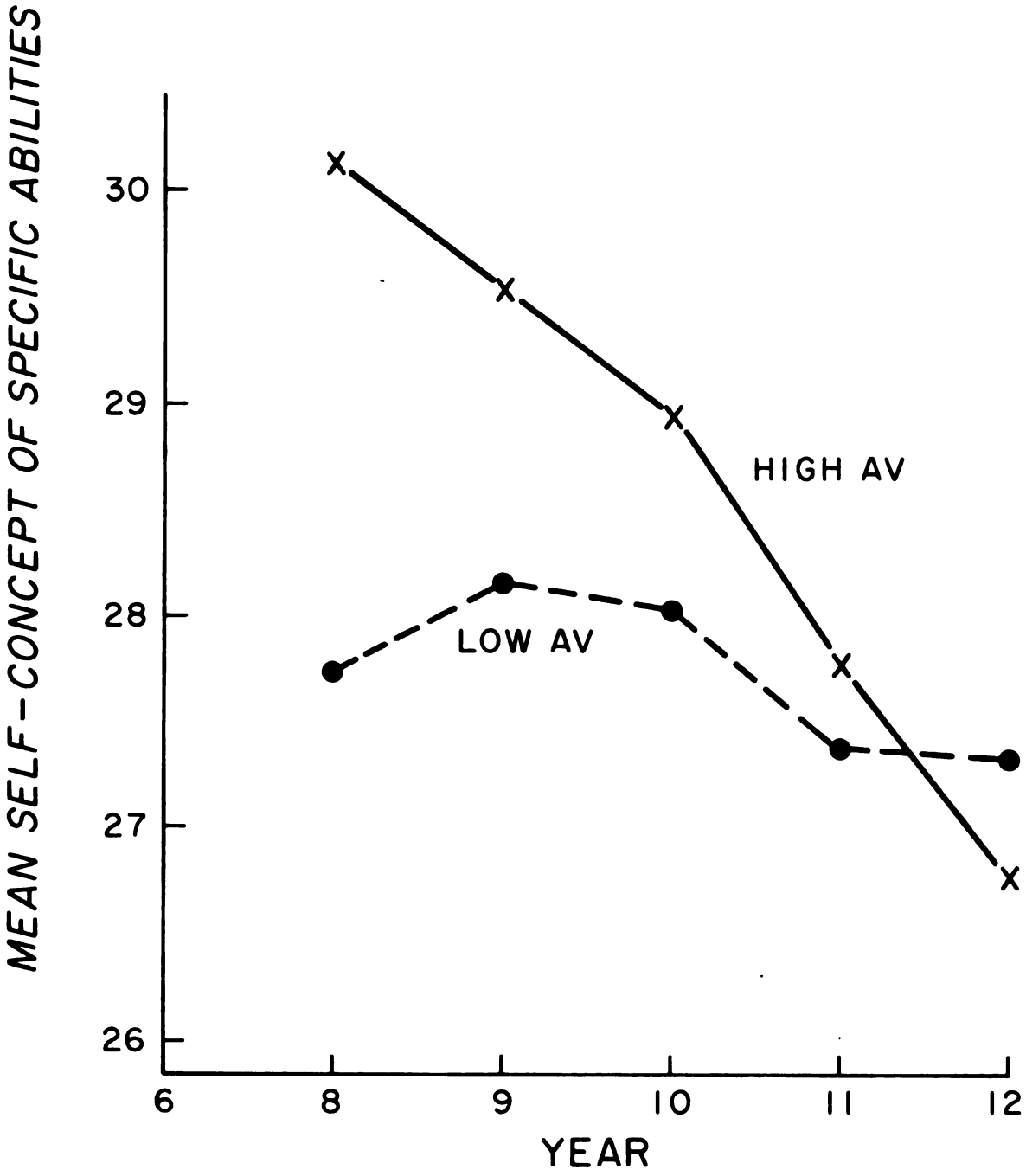

FIG. 4.3 Changes in Mean Self-concept of Specific Abilities over time (Grades 8-12) for High (n=56) and Low (n=56) Achievement Variability Groups.

females, respectively, of the longitudinal group; and

2. Of these students, those whose standard deviation of grades over the five-year period (years 8-12) was in the top or bottom third of the distribution of standard deviations for those students having a GPA within $\pm$.20 of the mean GPA.

Longitudinal Sample
(297 males and 342 females)

1. Females had significantly higher overall mean academic performance (GPA) than males. Males had significantly higher overall mean level scores in General Self-Concept of Ability (GSCA) and Mean Specific Self-Concept of Ability (MSSCA). They also had significantly higher variability scores in GPA and GSCA. There were no significant differences between males and females in IQ and Socio-Economic Status (SES).

2. The relationship of Achievement-Variability (AV) to overall mean level measures of GPA, GSCA, and MSSCA was negative and significant for both males and females. The relationship of AV to IQ was negative for both males and females, but significant only for the females.

3. The relationship of measures of variability in GPA, GSCA, and MSSCA were all positive and significant, except for that of variability in GPA to variability in GSCA which was not significant for the males.

4. For both sexes, the year-to-year (years 8-12)

stability correlations of AV are significant, positive, and of increasing magnitudes. They are significantly higher for the females for the years 10-11, 11-12, and 10-12.

5. No significant differences were found between males and females in IQ or SES. The correlation between AV and SES was not significant.

Achievement-Variability Sample
(60 females, 52 males)

1. No significant difference was found between High and Low AV students or between males and females in IQ or SES.

2. Females had significantly higher GPA than males; there was not a significant difference in GPA between High and Low AV students of either sex. For all students, there is a significant drop in GPA over time (years 8-12) though the decrement is significantly greater for High AV students than for Low AV students.

3. Females have significantly lower GSCA scores than males. High AV students, male and female, have higher GSCA overall mean level scores than do Low AV males and females. Over time, there is almost no shift in GSCA scores of the Low AV students, while for the High AV students there is a significant change with time.

4. Females have a significantly lower overall mean level MSSCA score than do males. The difference between High and Low AV students in MSSCA approached significance

but did not achieve it at .05 level (two-tailed test). For the High AV students, there is a consistent and significant downward trend in MSSCA from years 8-12.

CHAPTER V

SUMMARY AND CONCLUSIONS

There has been an increasing interest in the relationship of "non-intellective" factors to academic achievement. Brookover, using the general construct of self-concept originally formulated in a symbolic-interactionist framework, has developed the construct of self-concept of academic ability which he has employed in studies of academic achievement with positive and significant results.

The purpose of this study was to develop from the general construct of self-consistency (or intra-individual differences in variability of response) another "non-intellective" factor related to academic achievement, that of Achievement-Variability. The primary focus of this study was to investigate the relationship of Achievement-Variability, operationally defined as the standard deviation of an individual's grades, to level, variability, and changes over time of measures of academic achievement and self-concept of academic ability.

Summary of Research Problems

The research problems investigated were:

1. The relationship of Achievement-Variability to overall

mean level measures of Academic Achievement (GPA), Self-Concept of Academic Ability, IQ, and Socio-Economic Status;

2. The relationship of measures of variability in Academic Achievement, General Self-Concept of Academic Ability and Mean Self-Concept of Specific Ability, to each other;
3. The stability of Achievement-Variability scores over time;
4. The overall mean level of scores and the changes with time of scores of High and Low Achievement-Variability groups in the major variables with GPA held constant; and,
5. Differences between males and females in all of the above measures.

Summary of Method

The population under investigation included all Caucasian students, originally in the eighth grade of four junior high schools in a midwestern city of 120,000 population, for whom complete data were available from years 8-12. All students had been regularly promoted and were participants in the regular school program. There were 639 students, 297 males and 342 females. The Achievement-Variability sample was drawn from the longitudinal sample described above, and consisted of 52 males and 60 females whose GPA was within $\pm$.20 of the mean GPA of the males and females of the

longitudinal sample. These students were ranked in order of magnitude of the standard deviation of their grades from years 8-12, and the top and bottom thirds of this distribution were designated as High and Low Achievement-Variability groups.

Major variables were defined operationally as follows: Academic Achievement by GPA, Achievement-Variability by the SD of the individual's grades, IQ by the California Test of Mental Maturity, Socio-Economic Status by the score on the Duncan Scale, Self-Concept of Ability by scores on the Michigan State University General Self-Concept of Ability Scale and by the mean of scores on the Michigan State University Self-Concept of Ability in Specific Subjects Scales (mathematics, English, social science, and science).

The data were collected through the administration of questionnaires and from the students' school records. The analysis of the data involved the use of product-moment correlations, tests of the significance of the differences between correlations, t-tests of the significance of the differences between means, and analysis of variance. All tests of significance were two-tailed.

Summary of Research Findings

Longitudinal Sample (297 males, 342 females)

1. A significant difference was found between males and females in mean overall level scores in GPA, General

Self-Concept of Ability, and Mean of Self-Concept of Specific Abilities. Despite having a significantly higher GPA, females had a significantly lower General Self-Concept and Mean Self-Concept of Specific Abilities.

There was also a significant difference between males and females in mean overall variability scores in GPA and GSCA, with the males being significantly more variable than the females.

There were no significant differences between males and females in IQ or SES measures.

2. The relationship of Achievement-Variability (operationally defined as the SD of the individual's grades from years 8-12) to overall mean level measures of GPA, GSCA, MSSCA, and IQ, is negative. This finding indicates that the higher the degree of AV, the lower the level of self-concept of ability and IQ. This relationship was significant at at least the .05 level for both males and females, except in the case of the relationship of AV to IQ for males, which was negative but not significant.

3. The relationships between measures of variability in GPA, GSCA, and MSSCA were all positive; all were significant except that of variability in GPA (AV) to variability in GSCA for males, which while positive was not significant. Thus, in general, the greater the degree of variability in one of these parameters, the greater the

degree of variability in the others, indicating some generality of variability of response.

4. For both sexes, the year-to-year correlations of Achievement-Variability are significant, positive, and of increasing magnitude. For the females, however, the correlations are significantly higher than they are for the males for the years 10-11, 11-12, and 10-12. The increasing magnitude of these correlations indicates an increasing consistency or stability in the degree of variability of academic achievement, which for the females comes earlier and reaches a higher level than for the males.

5. There were no significant differences between males and females in mean IQ or in SES. The correlation between SES and AV was also not significant.

Achievement-Variability Sample
(60 females and 52 males)

1. No significant difference was found between High and Low Achievement-Variability groups or between males and females in either IQ or SES.

2. As with the longitudinal sample, the GPA of females was significantly higher than that of the males, but no difference was found between High and Low AV males or between High and Low AV females.

For both the High and Low AV groups, the GPA goes down over time from years 8-12, but it goes down significantly more for the High AV males and females than for the

Low AV males and females. Thus, while the High AV students start out in eighth grade with a higher GPA than the Low AV students, their GPA in eleventh and twelfth grade is lower than that of the Low AV students. This finding indicates that there is a greater systematic decrement over time for the High AV students, as compared with the Low AV students.

3. Females in the AV sample have significantly lower GSCA scores, despite having significantly higher GPA than the males.

The High AV students of both sexes have higher overall GSCA--largely as a result of high initial level--than do the Low AV students. There is, over time, almost no shift in the GSCA of Low AV students, while for the High AV students there is a significant change in GSCA scores from years 8 to 12.

4. As in the case of GSCA, females have a significantly lower overall GSSCA mean score than do males. While the difference between High and Low AV students in MSSCA approaches significance, it does not achieve it at the .05 level (two-tailed test). There is, however, a significant difference between High and Low AV students over time in the pattern of their scores in MSSCA. For the Low AV students, there is almost no change with time; while for the High AV students, there is a consistent and significant trend downwards in MSSCA from years 8-12. This pattern

of decrement for the High AV students in MSSCA is paralleled by the changes over time in GPA and GSCA.

Conclusions

The following conclusions have been reached concerning the findings of this study:

1. Both academic performance and self-concept of ability exhibit a greater decrement over time for the High Achievement-Variability student than for the Low Achievement-Variability student. Further evidence of the negative effect of variability on students' performance and self-concept of ability is the negative relationship of variability measures to level measures of academic achievement and self-concept. It is, therefore, concluded that for this population at least, being variable, as opposed to being stable, in terms of academic performance as measured by the GPA, is detrimental both to the students' subsequent performance and to his subsequent self-concept of his ability.

2. Since the year-to-year relationships of Achievement-Variability increase with time--reaching their highest level between years 10-12--it is concluded that the pattern of variability or stability of response becomes more fixed with time, that there is perhaps a crystallization of one's self-concept in the direction of variability or stability.

3. There is some limited evidence that variability

or stability of response may be a general characteristic of the individual across different aspects of behavior, but these results would limit this generality to that existing between variability in academic performance and variability in self-concept.

4. The lack of significant findings in regard to the relationship of IQ and SES to achievement-variability indicates that factors other than these measures are operating to create a "variable" or "stable" pattern of academic achievement.

5. While some subtle differences were found between the sexes in regard to the relationship of achievement-variability to academic performance and self-concept of ability, the pattern of change over time and the negative relationship of variability measures to level measures were the same. Sex, then, is not a crucial variable, though it may be an important variable, in explicating the relationship between achievement-variability and academic performance and self-concept of ability.

Discussion

The purpose of this study was to make an exploratory study of the relationship of variability in achievement to the level of academic achievement and to the students' self-concept of his academic ability. The most important finding of the study was that students with a highly

variable pattern of grades are more likely to suffer decrements over time in academic performance and in self-concept of academic ability than students with relatively stable patterns of achievement. It was also found that achievement-variability was negatively related to level measures of academic performance and self-concept of ability. These findings, in addition to those indicating that neither IQ nor SES is significantly related to achievement-variability, indicate that whatever the feedback mechanism operating between self-concept and academic performance, it manifests itself differentially for High and Low Achievement-Variability students and is independent of IQ or SES.

The apparent detriment of variability to the student's performance and to his concept of his ability in regard to that performance is probably the result of the interaction of a number of factors. Among these may be the teacher's explicit or perhaps unconscious preference for students whose work is more consistent and predictable. Studies by Getzels and Jackson indicate that teachers prefer the "intelligent" student to the "creative" student. Rosenthal (1967) has shown that teachers manage to communicate to students, in ways that are not necessarily overt or readily measurable, their evaluation of the student's potential. These evaluations are, in turn, internalized by the student and influence his own conception of his potential.

In support of this line of argument is the finding that "stability" of Achievement-Variability increases from year to year, reaching its highest point in the twelfth grade. Students thus are becoming more markedly stable or more markedly variable in their pattern of academic achievement. The question which may be asked here is whether there is an awareness on the part of the student, or significant others, of this increasingly marked pattern of behavior? Wessman and Ricks (1966) indicate that individuals can be characterized on the basis of their personalities as "variable" or "stable," and are to some extent aware of this facet of their personalities. Is it possible then to characterize a student as being variable or stable in academic achievement?

Going farther than this question is that of the generality of stability or variability. Is variability in achievement related to variability in other aspects of behavior? In this study, it was shown that variability in achievement is related positively to variability in both measures of self-concept (though the pattern of relationship is somewhat different for males than for females) and that variability in General self-Concept scores is associated positively with variability in Mean Self-Concept of Specific Ability scores. These measures, however, constitute too limited an evaluation of the total make-up of the individual to make any inferences, except of the most tentative nature.

In conclusion, the most important finding of this study is that both the achievement level and the self-concept of ability of the High Variable students show a greater decrement over time than those of the Low Variable students. This may be a function not only of the perceptions of the students of the evaluations of significant others, but also a concomitant of an educational system which is intentionally or not designed to meet the needs of the Low Variable, or consistent, student at the possible cost of frustrating the needs of the High Variable student. According to Wessman and Ricks (1966), the prevalent view in psychology today is one in which variability is viewed negatively by those who conceive of the organism as primarily homeostatic and adaptive. The results of this investigation indicate that such a view is probably prevalent in our schools also. In view of the description of the variable and stable students which Wessman and Ricks developed on the basis of their research (and which appears below), it would seem a worthwhile goal to pursue research which would lead to the enhancement, rather than the deterioration, of the academic performance and self-concept of ability of students whose patterns of achievement are variable.

> The stable people had the quality of closed systems quiescent occupants of fixed social roles, no longer searching out the alternative ways of life possible in their social environments, fitting in without open struggle but with perhaps a good deal of inner work directed toward control. The variable men and women, on the other hand, had personality organizations that were still in the process

> of formation, still open to the disruptive and rewarding influences of both inner and outer stimulation, still searching. More energetic, more productive, and less focused than their stable peers, perhaps even less socialized and civilized, they were also less contented. Though their personalities were less formed than those of the stable people, and therefore more vulnerable to some kinds of threat, they were also more open to change, and probably in the long run more adaptable. (Wessman and Ricks, 1966, p. 241.)

Implications of Future Research

In view of the findings of this study and of the relationship of these findings to other studies in the area of self-concept of ability and of variability of response (that the degree of achievement-variability is negatively related to academic performance and self-concept of ability), a number of research possibilities to further explore this relationship are presented.

1. What is the relationship of "creativity" to variability?

2. Is it possible to enhance the performance and self-concept of variable students by communicating through significant others the positive aspects of their behavior?

3. Is it possible to increase the accuracy of academic prediction formulae by including in them the achievement-variability scores of students as well as their mean level scores?

4. Is there a relationship between "over and under" achievement and achievement-variability?

5. Is dropping out of school possibly related to achievement-variability?

6. Is there a relationship between achievement-variability and variability or stability of personality as defined by Wessman and Ricks?

7. Is achievement-variability related to such variables as extraversion-intraversion, cognitive style, persistence, and distractibility?

8. Does the general (as opposed to specialized) curriculum accepted by most schools work to the disadvantage of the variable student?

While measures of variability of academic performance contain a certain degree of random error, they may, despite this limitation, prove to be useful in pursuing a greater understanding of the nature of academic performance.

APPENDIX A

GENERAL SELF-CONCEPT OF ACADEMIC ABILITY

SELF-CONCEPT OF ABILITY--GENERAL
(FORM A)
Michigan State University
Bureau of Educational Research

Circle the letter in front of the statement which best answers each question.

1. How do you rate yourself in school ability compared with your close friends?

    a. I am the best
    b. I am above average
    c. I am average
    d. I am below average
    e. I am the poorest

2. How do you rate yourself in school ability compared with those in your class at school?

    a. I am among the best
    b. I am above average
    c. I am average
    d. I am below average
    e. I am among the poorest

3. Where do you think you would rank in your class in high school?

    a. among the best
    b. above average
    c. average
    d. below average
    e. among the poorest

4. Do you think you have the ability to complete college?

    a. yes, definitely
    b. yes, pdobably
    c. not sure either way
    d. probably not
    e. no

5. Where do you think you would rank in your class in college?

    a. among the best
    b. above average
    c. average
    d. below average
    e. among the poorest

6. In order to become a doctor, lawyer, or university professor, work beyond four years of college is necessary. How likely do you think it is that you could complete such advanced work?

   a. very likely
   b. somewhat likely
   c. not sure either way
   d. unlikely
   e. most unlikely

7. Forget for a moment how others grade your work. In your own opinion how good do you think your work is?

   a. my work is excellent
   b. my work is good
   c. my work is average
   d. my work is below average
   e. my work is much below average

8. What kind of grades do you think you are capable of getting?

   a. mostly A's
   b. mostly B's
   c. mostly C's
   d. mostly D's
   e. mostly E's

APPENDIX B

SPECIFIC SELF-CONCEPT OF ABILITY SCALES

SELF-CONCEPT OF ABILITY--SPECIFIC SUBJECTS
(FORM B)
Michigan State University
Bureau of Educational Research

Put an "X" in the box under the heading which best answers the question. Answer for all four subjects. (You will have one "X" on each line).

1. How do you rate your ability in the following school subjects compared with your close friends?

	I am the poorest	I am below average	I am average	I am above average	I am the best
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

2. How do you rate your abilty in the following school subjects compared with those in your class at school?

	I am among the poorest	I am below average	I am average	I am above average	I am among the best
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

3. Where do you think you would rank in your high school graduating class in the following subjects?

	among the poorest	below average	average	above average	among the best
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

4. Do you think you have the ability to do college work in the following subjects?

	no	probably not	not sure either way	yes, probably	yes, definitely
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

5. Where do you think you would rank in your college class in the following subjects?

	among the poorest	below average	average	above average	among the best
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

6. How likely do you think it is that you could complete advanced work beyond college in the following subjects?

	most unlikely	unlikely	not sure either way	somewhat likely	very likely
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

7. Forget for a moment how others grade your work. In your own opinion how good do you think your work is in the following school subjects?

	my work is much below average	my work is below average	my work is average	my work is good	my work is excellent
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

8. What kind of grades do you think you are capable of getting in the following subjects?

	mostly E's	mostly D's	mostly C's	mostly B's	mostly A's
Mathematics	☐	☐	☐	☐	☐
English	☐	☐	☐	☐	☐
Social Studies	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐

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