THE EARLY IDENTIFICATION AND RELATIVE INCIDENCE OF ACADEMIC UNDERACHIEVEMENT: A FOLLOW-UP STUDY OF AVERAGE, BRIGHT AND INTELLECTUALLY SUPERIOR KINDERGARTEN CHILDREN

by

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Abstract

In this study, the investigator examined whether a pattern of underachievement could be identified as early as the first grade. Moreover, the researcher questioned whether underachievement occurs more frequently in males than females; and whether underachievement occurs more often among an Intellectually Superior (IQ 120+), Bright (IQ 110-119) or Average (IQ 80-109) group of first graders. In addition, the researcher questioned whether the non-verbal IQ score is higher among a group of underachievers relative to their normally achieving peers.

One hundred and two grade one children from the Surrey School District, British Columbia were administered the Woodcock-Johnson Achievement Battery. A linear regression model was applied to the data in order to identify discrepancies between IQ and achievement. If a student's predicted achievement score differed from his observed score by -1.00 standard error of estimate in two or more subject areas, he/she was identified as an underachiever.

In all, 20% of the sample were identified as underachievers. Moreover, underachievement occurred with equal frequency in males and females and was equally represented throughout the ability distribution. In addition, underachievers were not found to differ significantly from achievers in their non-verbal IQ scores.

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CHAPTER I: THE PROBLEM

This study is a follow-up investigation to Perks' doctoral dissertation (University of British Columbia, Doctoral Dissertation, in progress). In Perks' study, 160 average and above average kindergarten children from the Surrey School District were assessed on the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) during the spring term of 1981. In the present study, the investigator assessed the Reading, Mathematics, Written Language and General Knowledge achievement of 102 members of Perks' sample one year later, during the 1982 spring term of their grade one year.

Statement of the Problem

Current research literature suggests that the onset of underachievement in the intellectually superior student has its genesis in the early elementary school years (Whitmore, 1980). Yet, most studies of underachievement have concentrated on the adolescent and adult subject in high school or college when the opportunities for successful intervention are reduced (Terman, 1947; Barrett, 1957; Goldberg, 1958; Shaw & McCuen, 1960). These investigators agree that earlier attention to the problem is critical if we are to understand how underachievement develops and if we are to find effective strategies for intervention (Pringle, 1970; Whitmore, 1980).

In the present study the researcher proposed to examine the identification of underachievement at the beginning of the elementary school years. The investigator asked whether underachievement among a group of intellectually superior,

bright and average children can be identified as early as the first grade and whether its incidence is uniform across these three identified groups.

Considerable research attention has been devoted to the problem of underachievement. Unfortunately, many of these studies have been faulty in various aspects of their design and in the theoretical assumptions which served to define the problem (Thorndike, 1963; Lavin, 1965).

One of the major difficulties stems from the use of the term "academic underachievement" (Shaw, 1961). This term evolved in order to describe a discrepancy between actual and predicted achievement. However, researchers disagree on the method for selecting underachievers and in discerning what the magnitude of this discrepancy should be before underachievement exists (Farquhar & Payne, 1964; Rutter, 1975). Investigators have differed in their treatment of these issues. Evaluative studies conducted by Thorndike (1963); Farquhar and Payne, (1964); Annesley, Odhner and Chansky (1970) analyzed the various selection procedures used to identify underachievers. These authors concluded that the number of individuals identified as underachievers varied with the method of selection. Moreover, an overselection of underachievers were identified at the upper ends of the distribution. Consequently, many superior students may have been incorrectly labelled underachievers. Of the methods surveyed, the regression model identified the adequate achievers most often and the underachiever with greater confidence. These authors support the superiority of the linear

regression prediction using -1.00 standard error of estimate for the selection of underachievers. Therefore this method has been adopted for use in this research investigation.

Several of the methods used to select underachievers were based on incorrect assumptions regarding the relationship between ability and achievement. One of the major theoretical weaknesses in past research was the assumption that a one to one correspondence exists between aptitude and achievement (Thorndike, 1963; Rutter, 1975). Based on this assumption it was reasonable to expect a child of high ability to be correspondingly high in achievement. However, this assumption failed to consider the regression effect.

Regression effect refers to the "likelihood that for any set of observations on individuals, such as their scores on aptitude and their school grades, an extreme score on one measure tends to be associated with a less extreme score on the second measure" (Lavin, 1965 p 26). As Thorndike (1963) points out, "a failure to recognize this regression effect has rendered questionable, if not meaningless, much of the research on underachievement" (p 13).

In the present study the researcher controlled for the effects of regression by defining underachievement as a "discrepancy of actual achievement from the predicted value, predicted upon the basis of the regression equation between aptitude and achievement" (Thorndike, 1963, p. 13).

At present, the precise incidence of underachievement is unknown. Pringle (1970) has suggested that in order to find

effective means for remediating educational failure in the intellectually superior, the first step is to establish "the size of the problem so that plans can be made for overcoming it" (p. 126). Gowan (1964) has hypothesized that the observation of 15 percent underachievement is "normal" and that "if the rate goes higher than this, there may be local or school factors which should be corrected" (p. 295). The current investigator examined the incidence of underachievement in a group of first graders. The researcher asked whether the incidence of underachievement is greater than 15 percent in the population studied.

Another theoretical weakness in the underachievement literature is the failure to control for ability. Underachievers are treated as a homogeneous group and underachievement as the same phenomenon regardless of ability level (Lavin, 1965; Davis 1959). Past studies have failed to distinguish between the intellectually superior underachiever from the bright and average ability underachiever. Consequently, the relative incidence of underachievement among children of different ability levels can only be estimated.

In the present study, the investigator controlled for the variable of ability by grouping students according to Wechsler's Intelligence Classifications (1967). The researcher asked whether the incidence of underachievement occurred more frequently among an Intellectually Superior, Bright or Average group of first graders. If underachievement occurs more frequently in an intellectually superior population as the

literature suggests, then the correlations between IQ and achievement should be lower for this group than either the bright or average group. In this connection, the researcher examined the correlational relationships between IQ and achievement separately for each group.

One of the few consistent and universally agreed upon findings is that underachievement occurs more frequently in males than females (Shaw, 1961; Teigland et al. 1966) This researcher investigated sex differences in the incidence of underachievement and asked whether the incidence of underachievement occurs more frequently in males than females.

Very little research attention has been devoted to the ability and achievement patterns of underachievers (Norman, Clark & Bessemer, 1962). Gallagher (1966) reasons that:

> Since Terman's longitudinal studies it has generally been accepted that gifted students will show superiority to the average child in almost any measurable dimension, whether physical development or social or emotional adjustment (p. 131).

However, the work of Norman, et al (1962), suggests that relative to his achieving peers, the intellectually superior underachiever demonstrates a greater facility in non-verbal reasoning than verbal reasoning skills. Non-verbal reasoning skills are not as highly correlated with school success as verbal reasoning skills, and may have an influence on the etiology of underachievement (Gowan, 1964). The present investigation attempted to replicate the findings of these researchers and asked whether there is a significant difference between the verbal and non verbal IQ scores of the underachiever

and his adequately achieving peers on the Wechsler Preschool and Primary Scale of Intelligence (WPPSI).

The Woodcock-Johnson Psycho-Educational Battery (Woodcock, 1978) "is a set of wide-age-range, individually administered standardized tests that measure cognitive abilities, scholastic aptitudes, achievement and interests" (Manual, p.1). The Woodcock-Johnson Tests of Achievement was the criterion measure in this study. Woodcock (1978) reports the results of several studies correlating the Achievement Battery with standardized intelligence tests. However, there are no known studies which examine the correlations between WPPSI Verbal, Performance and Full scale IQ scores with the four achievement clusters of the Woodcock-Johnson Achievement Battery: Reading, Mathematics, Written Language and General Knowledge.

In the present study the researcher examined whether the correlations between WPPSI Verbal, Performance and Full Scale IQ scores and the four achievement clusters of the Woodcock-Johnson Battery are significantly different from zero and merits its use as a measure of early school achievement.

Objectives of the study

The major objectives of this study are to answer the following questions:

1. Are the correlational relationships between WPPSI Verbal, Performance and Full Scale IQ scores and the Reading, Mathematics, Written Language and General Knowledge achievement scores from the Woodcock-Johnson Achievement Battery significantly different from zero?

2. Is the incidence of underachievement among a group of grade one children greater than 15%?

3. Does the incidence of underachievement occur more frequently in any one of an Intellectually Superior, Bright or Average group of first graders?

4. Is the correlational relationship between ability and achievement the same for an Intellectually Superior, Bright or Average group of first graders?

5. Is the incidence of underachievement higher for males than for females?

6. Are the non-verbal IQ scores of underachievers significantly different from those for achievers?

Statistical Hypotheses

The following hypotheses will be tested: The .05 level of significance was the criterion for rejection of the null hypothesis.

1. The correlational relationships between WPPSI Verbal, Performance and Full Scale IQ scores and the Reading, Mathematics, Written Language and General Knowledge achievement

clusters of the Woodcock-Johnson Achievement Battery do not significantly differ in a group of first graders.

2. The incidence of underachievement among a group of grade one students does not exceed 15%.

3. There are no significant differences in the incidence or frequency of underachievement among an Intellectually Superior (IQ 120+), Bright (IQ 110-119) or Average (IQ 80-109) group of first graders.

4. There are no significant differences in the correlational relationship between WPPSI Full Scale IQ scores and each of the achievement clusters of the Woodcock-Johnson, namely, Reading, Mathematics, Written Language and General Knowledge for an Intellectually Superior (120+), Bright (110-119) and Average (IQ 80-109) group of first graders.

5. There are no significant sex differences in the incidence or frequency of underachievement among a group of first graders.

6. There is no significant difference between the mean WPPSI Performance or non-verbal IQ score of an achieving and underachieving group of first graders.

Definition of Terms

The intelligence classifications outlined by Wechsler (1967) have been adopted for use in this study. They are defined as follows:

Intellectually Superior. The Intellectually Superior student is defined as one who achieves a Full Scale score of 120 and above on the Wechsler Preschool and Primary Scale of Intelligence (WPPSI)

Bright Normal. The Intellectually Bright Normal classification corresponds to a Full Scale IQ score of 110-119 on the Wechsler Preschool and Primary Scale of Intelligence (WPPSI)

Average. The Intellectually Average classification corresponds to a WPPSI Full Scale score between 90-109.

Dull Normal. The Intellectually Dull Normal classification corresponds to a WPPSI Full Scale score of 80-89. Note: Due to the small number of children in this intelligence classification the students in this category were combined within the average ability classification.

Underachievement. Underachievement is defined as a discrepancy of -1.00 standard error of estimate, or more, between actual and predicted achievement.

Underachiever. A student was selected as an underachiever if two or more of his actual achievement scores were -1.00 standard errors of estimate, or more, below predicted.

Significance of the Study

Past researchers have studied the problem of underachievement in the adolescent and adult through the retrospective examination of school records (Shaw & McCuen, 1960; Barrett, 1957). These researchers recognized that "this (the junior high school level) is not when the problem begins, it is merely the point at which it becomes blindingly evident." (Torrance, 1967, p. 122). Although these researchers concluded with a 'plea' for the early identification of underachievement "there are few studies to indicate at what point in the school years this problem begins" (Fox, 1971, p. 42; Whitmore, 1980). The present investigation addressed this need.

At the present time, the incidence of underachievement among intellectually superior students is unknown. Past researchers have estimated that anywhere between 15 and 70 percent of all intellectually superior children underachieve (Whitmore, 1980; Pringle, 1970; Gowan, 1964). Moreover, researchers have failed to examine whether underachievement occurs more frequently in the intellectually superior student relative to students of average ability. A knowledge of the relative incidence of underachievement among students of different ability levels has two implications. First, as Lavin (1965) points out, "factors responsible for underachievement at high levels of ability may be different or operate differently from those causing underachievement at medium or low levels of ability" (p.30). Second, if different factors are responsible for underachievement at different ability levels, as Lavin

(1965) suggests, then programmes of intervention can be designed which meet the needs of each group more effectively. As yet, questions regarding the incidence and relative incidence of underachievement remain unanswered.

CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature is organized around two areas of interest. The first section concerns issues in the operational definition and selection procedures used to identify the underachiever. The second section presents the theory and research related to the ability and achievement patterns of the intellectually superior underachiever.

Issues in the operational definition and selection procedures in underachievement research

The research definition and selection procedures used to identify the discrepant achiever are the "fundamental issues" involved in the study of underachievement (Pippert & Archer, 1963). These issues are not mutually exclusive, but function interdependently. One's operational definition of underachievement has implications for who is selected as an underachiever. An artifical distinction has been drawn between the two issues in order to highlight the implications of each to the study of underachievement.

Issues in the Definition of Underachievement. In the reported research literature, consensual agreement exists concerning the "abstract" definition of underachievement. Underachievement refers to an "individual performing under the level at which he seems capable" (Whitmore, 1980, p. 167).

However, researchers disagree on a method for operationalizing a definition of underachievement. Part of the difficulty arises because "very few children perform exactly at

the level expected. Most have scholastic achievements somewhat above or below expectation" (Rutter, 1975, p. 270). The researcher must then answer two questions. What is the expected achievement for any child and how should it be estimated? What is regarded as significantly below expectation? (ibid, p. 271). Researchers have answered these questions differently. Consequently, efforts to compare the results of related studies are hampered by methodological inconsistencies. In the section to follow, a critical analysis of how individual researchers have approached these issues is presented.

Theoretical Assumptions in the Definition of Underachievement. The concept of underachievement evolved in order to define a deviation from expected achievement. In this context one asks, what is the expected achievement for any child and how should it be predicted? (Rutter, 1975). For a child of average ability, adequate achievement is easily assessed if he can handle the curriculum at his grade level. "Thus a ten year old child of average ability who is in the fifth grade can be credited with doing reasonably effective work if he can perform adequately those tasks expected of an average fifth grader" (Gowan, 1964, p. 34).

However, what standard should be applied to the child of above average ability? What level of attainment should be expected of this child and how should it be calculated?

For a long time educators approached these questions by comparing the child's mental age with his educational age (Rutter, 1975). This approach resulted in the calculation of an

Achievement Quotient. The Achievement Quotient was derived by obtaining an age score from an achievement test and dividing it by a mental age score obtained from an IQ test (Gowan, 1960). As such, if a ten year old boy with a mental age of thirteen achieves a reading score which places him at the twelve year level, he was labelled an underachiever. This approach has characterized much of the research on academic prediction. However, it is based on a fallacious assumption regarding the relationship of ability to achievement and has led to serious error (Rutter, 1975; Johnson, 1942).

This approach is based on the fallacious assumption that there is a perfect relationship between ability and achievement (Rutter, 1975; Annesley et. al., 1970). The relationship between intelligence and achievement is less than unity. This can be accounted for, in part, by the effects of regression. A child with a high IQ score will generally not be as high on an achievement test. Conversely, a retarded child will perform higher on an achievement test than on an ability test. This phenomenon, originally documented by Galton is called 'regression to the mean'. The explanation for this is as follows:

> observed scores are determined by two factors, the true score and measurement error. We assume that measurement error is random - that no systematic factor influencing the error in a particular direction is involved. Thus, if a person scores high on one measure, this will be due, in part to the error component. However, if error is random, this component is not likely to influence his score in the same direction on the second measure.

> Consequently, he will tend to be less extreme on the second score. Applied to the question of academic achievement, this would mean that a student who obtained a very high aptitude score would probably be less extreme on a measure of achievement... (Lavin, 1965, p. 27).

If we now reconsider the boy whose reading achievement appeared below expectation by the deviation method, it becomes clear that a reading score of twelve years is commensurate with his abilities when regression is taken into account. According to Thorndike (1963) "the failure to recognize this regression effect has rendered questionable if not meaningless, much of the research on achievement" (p. 13).

Thus, Thorndike (1963) emphasizes the necessity for defining underachievement as the discrepancy of actual achievement from a predicted value by employing a regression equation. As he says:

> ... We must predict achievement from aptitude, on the basis of the known correlation between the aptitude measure and the achievement measure. The prediction equation or regression equation tells us the average or typical achievement score for individuals at any given aptitude level. This predicted value is an unbiased estimate of achievement, and at any aptitude level positive and negative discrepancies between predicted and actual achievement are equally likely and the average difference is zero... (p. 45).

This section has examined the issues involved in formulating an operational definition of underachievment. It was pointed out that the operational definition of underachievement is based on a deviation from expectancy. Methods for calculating this expectation were presented. The

superiority of the regression equation for predicting achievement from aptitude was recommended and therefore has been adopted for use in this investigation.

Issues in the selection procedures used to identify underachievers. Evaluative studies conducted by Thorndike (1963); Farquhar and Payne (1964); Annesley et al. (1970) analyzed and compared the various selection procedures used to identify underachievers. The selection methods were classified into four distinct categories. Each method was applied to the same sample of subjects.

The results of these comparative studies suggest that there is an extreme range in the number of individuals identified as underachievers depending on the technique used (Farquhar & Payne, 1964). Annesley, et al (1970) conclude that many pupils have been incorrectly labelled as underachievers. They report that the regression model identified the greatest number of adequate achievers. (Annesley, et al., 1970).

On the basis of these studies, Thorndike (1963), Farquhar & Payne (1964) recommend the superiority of the linear regression prediction model using -1.00 standard error of estimate as the limits of discrepancy for selecting underachievers.

Theory and Research related to the Ability and Achievement Patterns of the Intellectually Superior Underachiever

Whitmore (1980) refers to the problem of underachievement as a "persistent" and "continuously neglected" problem in the education of the intellectually superior student. She estimates that 70% of all gifted students in American schools underachieve

p. 165). Newland (1976) points out:

> For decades, information has been amassed which depicted clearly the extent to which the gifted are educationally retarded in light of their respective capacities. No condition is more clearly recognized by those conversant with the field of the gifted....(p. 333).

One reason for this apparent "neglect" stems from early attitudes towards the intellectually superior and their development. Terman's Genetic Studies of Genius (1930) disspelled previously held beliefs that geniuses were psychotic and that child prodigies burn out by adolescence. This mythology was replaced with a new stereotype. The new myth was based on an overgeneralization of Termans findings and asserted "if you find someone who is superior on one type of intellectual task, you can expect that person to be above average or superior on activities involving other mental abilities" (Whitmore, 1980, p. 13).

A belief in the overall superiority of the intellectually superior remained unchallenged until the mid 1950's. The social and political upheaval of the 1950's brought the education and development of the intellectually superior under closer scrutiny. The Russian launching of Sputnik in 1957 brought the American technological superiority into question. "The nation became conscience- stricken over its failure to produce sufficiently high level manpower to meet the threat of its ideological and cold war adversary" (Tannenbaum, 1972, p. 22). Although research activity into the problem of underachievement peaked during the following decade, the idea that

"intellectually able children may in their schoolwork not reach the level of their own potential or fail to achieve even the level of the majority of their own age group... has been particularly slow in gaining acceptance" (Pringle, 1970, p. 105).

During this period a considerable body of research amassed focusing on the personality characteristics of the adolescent and adult underachiever. A comparison of the underachiever with his overachieving peers was a popular research paradigm. It is well documented that underachievers have low self-concepts and poor overall adjustment patterns (Gallagher, 1966; Whitmore, 1980).

Very little research attention has been devoted to establishing when the pattern of underachievement begins (Fox, 1971; Whitmore, 1980). One such study conducted by Shaw & McCuen (1960) traced the onset of underachievement in bright (IQ 110+) high school students. The results indicated that the onset of the underachievement pattern began in grade three for boys and in grade six for girls. Once begun, underachievement remained a persistent problem which worsened with each school year. This led Shaw and McCuen (1960) to conclude that "specific information regarding the point at which underachievement begins has implications for both preventive and remedial measures which may be undertaken" (p. 103). Despite more recent concern with early identification of academic difficulties, there are very few studies to indicate at what point in school this problem begins" (Fox, 1971, p. 42;

Whitmore, 1980).

Very little research attention has been devoted to the early ability and achievement patterns of the intellectually superior underachiever. A study conducted by Norman et al. (1962), compared the ability and achievement patterns of 215 "gifted" (IQ> 130) grade six children. Using the California Test of Mental Maturity (CTMM) they found that the underachieving "gifted" student had a significantly ($p<.001$) higher non-language than language IQ score. This was true of both the male and female students. These authors concluded that the higher non-language IQ score in the "nonachiever" may reflect their "interests as well as, or rather than, one of adjustment" (p. 123).

Another researcher comments that:

> The high non-verbal scores for the non-achievers may mean that the traditional curriculum penalizes them for poor work in spelling and mechanics, and that a different curriculum appealing to spacial, numerical and other non-verbal abilities might improve the problem of underachievement. Thus, the relationship between achievement, verbal intelligence and non-verbal IQ seems to be the converse of that between achievement, verbal intelligence and creativity. The third variable is a negative factor in the first relationship, but a positive factor in the second. It is evident that a wider-spectrum curriculum, like a wider-spectrum testing programme might do much to remove the problem of underachievement (Gowan, 1964, p. 304-5).

Shaw (1961) asserts that one of the few consistent and universally agreed findings is that underachievement is primarily a male problem (p. 22). It has been estimated that

males outnumber female underachievers by an average of 3:1 (Shaw, 1961, Tiegland et al. 1966). Gowan (1964) has suggested that the disproportionate number of male underachievers can be attributed to several factors: the slower maturational, emotional and social development of boys; the greater difficulties boys have with reading; the greater difficulty of adjusting to the male role in our culture; the lesser degree of conformity demanded by boys; the fact that more is often expected of boys in the sense of increased college going, entrance to professions and the prevalence of female teachers in school (p. 299).

Summary

In this section, the literature relevant to the ability and achievement patterns of the intellectually superior underachiever was reviewed. It was pointed out that early attitudes towards the achievement of the intellectually superior child hampered a recognition of underachievement in these individuals. It was further emphasized that very little research has been conducted to describe the early intellectual and achievement patterns of intellectually superior underachievers.

CHAPTER III

METHODOLOGY

In this section, the population, sample, research procedures, instrumentation and data analysis are described.

Population

This study was conducted in the Surrey School District, in British Columbia, Canada. The Surrey School District is situated in the Surrey Area and includes the city of White Rock and the Douglas and Barnston Islands (British Columbia Regional Index, 1978).

The Surrey Area is considered similar to Richmond and Delta in that it supports both agricultural and residential lifestyles. Residential development is concentrated in the areas of Cloverdale and White Rock while the low lying areas are primarily agricultural. The local industries include the manufacturing of wood products, forestry, agriculture, tourism and commercial fishing.

The population of Surrey is represented by many ethnic groups including British, French, German, Italian and Scandinavian peoples. Approximately 62% of the labour force are employed in agriculture, forestry, fishing, mines, manufacturing, construction and transportation. Approximately 38% of the labour force are employed in finance, insurance, real estate, public administration, defence, community, business and personal service (British Columbia Regional Index, 1978).

School District 36, Surrey has 62 elementary schools; 8 junior secondary schools; 4 senior secondary schools; and 3

junior-senior secondary schools. There are currently 9,224 children at the elementary school level and 2,474 children are in the first grade (personal communication, May, 1982, District Office).

In the current investigation, 102 grade one children (40 boys and 62 girls) from 25 elementary schools in the Surrey School District participated in the follow-up study. The children were between 6-3 and 7-3 years of age.

Sample

As the present study is a follow-up to Perks' doctoral investigation and due to the interdependence of the two samples, a description of Perks' sampling procedures are presented followed by the sampling procedures used in the current study.

Sampling Procedures for the Perks' study. Perks' randomly selected 25 elementary schools in the Surrey School District. Letters of parental consent were sent home with all the kindergarten children enrolled in these 25 schools. Pending parental consent, the children were tested on the Vane Kindergarten Test (VKT). The results of the Vane Kindergarten Test formed the basis for dividing the children into two groups. The first group, designated the "Average Ability" Group included children who scored between 85-115 on the VKT. The second group, designated "Academically-Able" included those children who scored between 118-155 on the VKT. Following this procedure, 80 children from the "Average Ability" group and 125 children from the "Academically Able" group were randomly selected for participation in the next stage of the study. The

next stage of the study involved the administration of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) to the 205 randomly selected children.

Research Procedures for the Follow-up Study

1. Following the consent from the Deputy Superintendent's office of the Surrey School District, Perks' released the names and schools of the participants in her research study to the investigator conducting the follow-up study. No other information about the children was released.

2. Each school principal was contacted and asked whether the participants of Perk's study were enrolled in grade one at the same school.

3. A list of children currently in attendance at the same school was compiled. Thirty children from Perks' sample of 160 had moved to different schools and were therefore not included in the follow-up study.

4. In all, 130 letters of parental permission were drawn up requesting their child's continued participation in the follow-up study. Permission was received from 102 parents. All 102 children were tested. Approximately four children from each of the 25 schools were included in the sample.

5. Testing on the Woodcock-Johnson Achievement Battery commenced in March 1982 and continued until the beginning of April 1982. One hundred and two children, 40 boys and 62 girls were individually tested on the Woodcock-Johnson Achievement Battery by the current investigator and two trained research assistants.

6. Once the data collection was completed, Perks released the WPPSI Verbal, Performance and Full Scale IQ scores obtained on these same children one year earlier. The children were then grouped according to their Full Scale score on the WPPSI. The groups were formed in accordance with Wechsler's (1967) Intelligence Classications. Table 1 compares the distribution of subjects falling into these categories in Perks' study and their representation in the follow-up study.

Table 1

Distribution of IQ scores: Sample comparisons between Perks' study and the follow-up study

Intelligence Classification	Number of Children		
	Perks' study	Follow-up Study	Percentage
Very Superior (130+)	21	13	61
Superior (120-129)	36	28	77
Bright Normal (110-119)	49	31	63
Average (90-109)	47	26	55
Low Average (80-89)	7	4	57
Totals	160	102	

7. The scoring of the Woodcock-Johnson was verified by another graduate student. Ninety-five percent verification was obtained.

8. In preparation for the data analysis, the subjects were

then divided into two sub-groups. Through the SPSS computer programme Range, approximately, 1/3 of the children in each of the ability groupings were randomly selected. These 34 children are identified throughout the sections to follow as the "Predictor Group". The remaining 68 subjects are designated the "Study group". The Predictor Group was selected in order to build the parameters for the regression equations. The resulting values were then applied to the Study Group.

Instrumentation

The Vane Kindergarten Test (Vane, 1968)

The Vane Kindergarten Test (Vane, 1968) was developed in order to "evaluate the intellectual and academic potential and behavior adjustment of young children" (Vane, 1968, p. 12). The Vane Kindergarten Test (VKT) was the preliminary group screening instrument used in the Perks' study. In her doctoral dissertation proposal, Perks' outlined her reasons for selecting the Vane Kindergarten Test as the screening instrument in her study (ibid). They were as follows:

> The three subtests (vocabulary, perceptual-motor, and draw a man) deal with factors which have been found to be good indicators of school success; the scoring system of the VKT covers a wide range of scores (two standard deviations below the mean to four standard deviations above the mean); directions for administration are precise; guidelines to aid in the scoring of the VKT are stated clearly; scoring can be completed rapidly; teachers are able to administer the VKT (p. 7).

Organization of the scale. The VKT is composed of three parts, a Perceptual-Motor subtest, a Draw-A-Man subtest and a

Vocabulary subtest. The first two subtests can be administered to a group.

Standardization. The VKT was standardized on a sample of 50 boys and 50 girls at half year intervals ranging in age from 4 1/2 to 6 years. Four hundred children comprised the entire standardization sample (Vane, 1968). The urban-rural ratio of the sample; proportion of black to white subjects and socioeconomic status were representative of the 1960 census figures for the 4 1/2 to 6 year age group. The entire sample was drawn from New York and New Jersey and is not considered representative of the United States.

Reliability. Vane (1968) conducted two studies in order to assess the test-retest reliability of the VKT. The first study was conducted with 14 kindergarten children with an interval of one week between the two testings. The test-retest reliability coefficient was .97. The second study was conducted with 36 children with a test-retest interval of 5 months. The test-retest reliability coefficient was .88. Powers (1977) computed the test-retest reliability coefficients for two groups. The first group contained 140 pre-kindergarten children. The test-retest interval was seven months. The test-retest reliability coefficient was .65 for the VKT Full scale. Group two contained 150 kindergarten children. The test-retest interval was 10 months. The test-retest reliability coefficient for this group was .68 with the Full VKT. "Thus the VKT seems to have comparable stability over a seven-month retest period" (Powers, 1977, p. 35).

Validity Vane (1968) correlated the VKT with the Stanford-Binet Form L-M for two separate samples each containing 212 children. The VKT correlated .76 with the Stanford-Binet in both samples. Powers (1974) assessed the predictive validity of the VKT with grade one achievement. She found that the VKT vocabulary subtest correlated .47 with the Stanford Vocabulary Achievement subtest. The VKT correlated .53 with the Metropolitan Readiness Tests. "Although most of the correlations obtained were significant, the VKT does not appear to have sufficient validity for use in assessment and programme planning for individual children" (Powers, 1974, p. 1003).

Wechsler Preschool and Primary Scale of Intelligence (Wechsler, 1967)

The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) is an individually administered intelligence test designed for children between 4 and 6 1/2 years of age. The WPPSI is the predictor measure in the investigation.

Standardization. The WPPSI was standardized on 100 boys and 100 girls at six half year age intervals ranging from 4 to 6 1/2 years. Twelve hundred children comprised the entire standardization sample. The 1960 U.S. census data was used to select a normative sample representative of the population by geographic location, urban-rural residence; colour and father's occupation (Wechsler, 1967, p. 13-14).

Reliability. Split-half reliability coefficients were computed for the Verbal, Performance and Full Scale IQ scores and correlated by the Spearman-Brown Formula. The reliability

coefficients are .94,.93, and .96 respectively (Sattler, 1974).

Concurrent Validity. Correlations between the WPPSI and Stanford-Binet Form L-M range from .33 to .92 for the Verbal Scale; from .33 to .88 for the Performance Scale and from .44 to .92 for the Full Scale. (Sattler, 1974).

Correlations between the WPPSI and the Stanford-Binet are lower for gifted samples (ibid). The WPPSI is considered a more difficult test than the Stanford-Binet. Discrepancies between the two tests increases with the intelligence of the child. The brighter the child, the more discrepant the scores become in favour of the Stanford-Binet (Rellas, 1968; Zimmerman & Woo-Sam, 1970). Full Scale scores correlated .35 with Word Knowledge and .30 with Word Analysis.

Predictive Validity. Krebs (1969) examined the predictive validity of the WPPSI for predicting first grade reading achievement. Seventy grade one children, stratified for socioeconomic status were tested on the WPPSI. The following year, the children were tested on the reading achievement subtests of the Stanford Achievement Test. The Full Scale WPPSI score correlated .66 with reading in the lower socioeconomic group and .40 in the upper socioeconomic groups.

Kaufman (1973) correlated the WPPSI with the Metropolitan Achievement Tests. Thirty-one subjects between 6 and 6 1/2 years of age comprised the sample. The WPPSI Full Scale score correlated .35 with Word Knowledge, .30 with Word Analysis, .36 with Reading, .30 with Mathematics and .37 with the total Reading and total raw score. The latter two correlations were

significant at the .05 level.

Oldridge and Allison (1968) concluded that "the WPPSI is a carefully developed and well standardized instrument of general intelligence that warrants widespread acceptance ..." (p. 348).

The Woodcock-Johnson Psycho-Educational Battery: Part Two Tests of Achievement

The Woodcock-Johnson Psycho-Educational Battery is "a set of wide range, individually administered standardized tests that measure cognitive abilities, scholastic aptitudes, achievement and interest" (Woodcock, 1978, p. 1).

Organization of the Battery. The Woodcock-Johnson Psycho-Educational Battery (Woodcock, 1978) contains 27 subtests which are organized into three parts. Part one consists of 12 subtests focusing on the assessment of cognitive abilities. Part Two, Tests of Achievement contains 10 subtests designed to assess four areas of school achievement, Reading, Mathematics, Written Language and General Knowledge. Part Three of the Battery contains 5 subtests designed to assess preference for scholastic and nonscholastic activities.

Organization of the Achievement Subtests. The Woodcock-Johnson Achievement Battery (1978) is the criterion measure in this study. The Achievement Battery consists of 10 subtests which combine to form four achievement clusters, Reading, Mathematics, Written Language and General Knowledge. The Reading cluster is made up of three subtests; Letter-Word Identification, Word Attack and Passage Comprehension. The

Mathematics cluster is composed of two subtests, Calculation and Applied Problems. The third cluster is Written Language and contains two subtests, Dictation and Proofing. The fourth cluster is General Knowledge. It is made up of three subtests, Science, Social Studies and Humanities.

Standardization. The norming sample was stratified by age, race, occupational status, geographic region and type of community. The proportions of each are representative of the 1970 and 1976 U.S. census data. Normative data were collected from 4,732 subjects ranging from 3 to 65 years of age from 49 communities in the United States. Normative data were used to establish Grade and Age Equivalencies, Percentile Ranks, Expected Grade Scores and Range Tables.

Reliability. The test-retest reliability coefficients for the individual subtests range from .81 to .95. "The technical characteristics of the Battery as reported by Woodcock (1978) appear to be adequate" (Ysseldyke, Algozzine, & Shinn, 1981).

Validity. Woodcock (1978) reports the results of several validity studies conducted during the norming of the instrument. He reports the results of four types of validity studies: the criterion-related validities (predictive and concurrent); content validity, and construct validity. In this section, the validity studies relevant to the current research study are presented.

In order to assess the current validity of the four Woodcock-Johnson Achievement clusters, 83 third grade children and 82 fifth grade children from 12 elementary schools in the

Anoka-Hennepin (Minnesota) School District were compared on the following instruments: The Iowa Tests of Basic Skills, Form 5 (Hieronymous & Lindquist, 1971); Keymath Diagnostic Arithmetic Test (Connolly, Natchtman & Pritchett, 1971); Peabody Individual Achievement Test (Dunn & Markwardt, 1970); Wide Range Achievement Test (Jastak, Bijou & Jastak, 1965); Woodcock Reading Mastery Tests (Woodcock, 1973) and the Woodcock-Johnson Psycho-Educational Battery (Woodcock, 1978).

Tables 2-5 summarize the correlation coefficients obtained between the individual achievement clusters of the Woodcock-Johnson Achievement Battery and each of the aforementioned instruments.

Table 2

Concurrent Validity Coefficients of the Reading Tests

	N	IOWA	PIAT	WRAT	(WRMT) WOODCOCK-READING
Grade 3 Sample					
W-J Reading Ach	83	.81	.91	.89	.92
Grade 5 Sample					
W-J Reading Ach	86	.76	.75	.84	.87

Table 3

Concurrent Validity Coefficients of the Mathematics Tests

	N	IOWA	KEYMATH	PIAT	WRAT
Grade 3 Sample					
W-J Mathematics	83	.62	.82	.70	.46
Grade 5 Sample					
W-J Mathematics	86	.77	.80	.69	.78

Table 4

Concurrent Validity Coefficients of the Written Language Tests

	N	IOWA	PIAT	WRAT
Grade 3 Sample				
W-J Written Language	83	.84	.78	.83
Grade 5 Sample				
W-J Written Language	86	.80	.76	.71

Table 5

Concurrent Validity Coefficients of the W-J Knowledge with Piat General Information

	N	PIAT GENERAL INFORMATION
Grade 2 Sample		
W-J General Knowledge	83	.72
Grade 5 Sample		
W-J General Knowledge	86	.68

The results of the concurrent validity studies indicate that the Reading Achievement cluster of the Woodcock-Johnson Achievement Battery correlates .75 to .92 with other commonly used instruments designed to assess Reading Achievement.

The Written Language Achievement cluster correlates between .71 and .84 with other tests of Written Language Achievement. These results are illustrated in Table 4.

The Woodcock-Johnson General Knowledge Achievement cluster correlates .72 with the General Information subtest of the Peabody Individual Achievement Test. "It appears that the Battery compares well with and is in fact superior in most instances to the instruments presently used in psychoeductional evaluations" (Woodcock, 1976, p. 157).

Scoring Procedures. Woodcock (1978) has provided a variety of scoring techniques for test interpretation. In this study, each subject's cluster score was converted into it's age score

equivalent. The age score reflects "the subject's performance in terms of the age level in the norming sample at which the average score is the same as the subject's score" (Woodcock, 1978, p. 63) The subject's score was then converted to a percentile rank. The percentile rank indicates the percentage of subjects in the selected segment of the norming sample who had scores the same as or lower than the subjects cluster score" (Woodcock, 1978, p. 63). Finally, the subjects percentile rank in each of the four achievement areas was converted to a standard score equivalent based on a mean of 100 and a standard deviation of 15. Tables for converting percentile ranks into their standard score equivalents are provided in the test materials. This step was taken in order to place the ability and achievement tests on the same scale of measurement.

Reasons for the selection of the Woodcock-Johnson Achievement Battery

The Woodcock-Johnson Achievement Battery was selected as the criterion measure in this study for several reasons. They are as follows:

1. The ten achievement subtests provide a broad sampling of content in several areas of achievement (Woodcock, 1978).

2. The technical characteristics of the instrument appear to be adequate (Ysseldyke, Algozzine & Shinn, 1981).

3. The administration of the achievement battery takes approximately 45 minutes and sustains the attention of young children.

4. Directions for the administration of the Battery are

clear and precise.

5. The Battery has appropriate basals and accommodates the high ceiling attained by Intellectually Superior children.

Analysis of the Data

This study was based on the concept of prediction, the prediction of a criterion measure (achievement) from a predictor variable (intelligence). The analysis of the data incorporates both the theoretical and methodological considerations involved in prediction (see chapter 2).

Four techniques were used for the statistical analysis of the data. They were as follows:

Descriptive Statistics

As indicated in the section outlining the research procedures, the 102 subjects were divided into two subgroups, the Predictor Group and the Study Group. The Predictor Group contained 34 children randomly selected through the SPSS computer programme Range. The Study Group contained the remaining 68 children.

Pearson's Correlation Coefficient. In order to build the parameters of the four regression equations, the means, standard deviations, and the correlation coefficients between WPPSI Full Scale Scores and the four Achievement clusters from the Woodcock-Johnson were established on the Predictor Group. These values were applied to the regression equations.

Regression Analysis. A regression analysis was then conducted on the Study Group. The predicted and obtained scores for each subject in each of the four achievement clusters were charted. The positive and negative discrepancies between these scores were recorded. If the child's predicted score exceeded his obtained score by one standard error of estimate in at least

two subject areas, s/he was identified as an underachiever.

Inferential Statistics

Chi Square Statistical Test. The Chi Square Goodness-of-Fit Test and the Chi Square Statistical Test of Association were applied to the data in order to determine the incidence of underachievement and the association of underachievement with sex respectively.

t-Tests. The appropriate t-tests were applied to the data to determine whether the differences in the correlational relationships within the different ability groupings were statistically significant. In addition, t-tests were also used to determine whether the mean WPPSI Performance scores of underachievers were significantly different from those of achievers.

Summary

Chapter three began with a description of the population from which the study sample was drawn, followed by an outline of the sampling procedures used in the Perks' study and the research procedures employed in the current investigation. A description of the instrumentation was presented. The chapter concluded with the plan for the analysis of data. The following chapter presents the results of data analysis.

CHAPTER IV

RESEARCH FINDINGS

The presentation of the research findings was organized around the three stages of data analysis. In the first section, the descriptive statistics (means, standard deviations and correlation coefficients) which built the parameters for the regression analysis are presented. In the next section the data resulting from the regression analysis is presented. The final section is organized around the research hypotheses and statement of objectives outlined in chapter one. A restatement of the research hypothesis is presented followed by the method of analysis and the results obtained.

Descriptive Statistics

Subjects. One hundred and two subjects representing 25 elementary schools in the Surrey School District participated in the follow-up study. There were 40 boys and 62 girls in the study. The children ranged in age from 6-3 to 7-3 years. The I.Q. distribution ranged from a WPPSI Full Scale I.Q. score of 78 to 144.

The Reading Achievement scores ranged between 81 and 135; Mathematics Achievement ranged between 83 and 135; Written Language between 84 and 135; and General Knowledge Achievement scores ranged between 75 and 135.

Information regarding the socioeconomic status and education of the parents was not collected because District policy prevented the researcher from gaining access to this information.

Selection of the Predictor Group. In order to develop the parameters for the regression equation, a stratified random sample of 34 cases (the Predictor Group) were selected from the entire sample of 102 subjects using the SPSS computer programme, Range. In order to randomly select these 34 cases, the entire sample was grouped according to Wechsler's (1967) ability classifications. The distribution of subjects are presented in Table 6.

Table 6

Distribution of Subjects in the Predictor and Study Groups according to Wechsler's (1967) Ability Classifications

Ability Classification	N	Representation in Predictor Group	Representation in Study Group
Very Superior (130+)	13	4	9
Superior (120-129)	28	9	19
Bright (110-119)	31	10	21
Average (90-109)	26	9	16
Dull Normal	4	1	3
Totals	102	34	68

The Predictor Group represents one-third of the entire sample. As Table 6 illustrates, approximately one-third of the

subjects within each ability grouping were randomly selected for inclusion in the Predictor Group. Sixty-eight subjects comprised the Study Group.

Subsample Comparisons The first stages of the data analysis focused on describing the two subsamples in terms of their means, standard deviations and correlation coefficients between the I.Q. and Achievement measures. These values were obtained for two reasons. First, a comparison of the means, standard deviations and correlation coefficients between the subgroups was drawn in order to ensure that the values obtained from the Predictor Group approximated those of the Study Group. Second, the values obtained for the Predictor Group were needed in order to build the parameters for the regression equations. These values were then applied to the Study Group.

Tables 7 and 8 illustrate the means and standard deviations for the Predictor and Study Groups respectively. The means and standard deviations of the Predictor Group reasonably approximate the values obtained from the Study Group.

Table 7

Means and Standard Deviations for the Predictor Group N=34

Variable	Mean	Standard Deviation
Full Scale IQ	114.44	13.76
Reading	112.76	14.36
Mathematics	103.38	13.31
Written Language	108.47	13.79
General Knowledge	106.11	14.79

Table 8

Means and Standard Deviation for the Study Group N=68

Variable	Mean	Standard Deviation
Full Scale IQ	115.94	12.98
Reading	113.19	13.17
Mathematics	103.13	10.89
Written Language	106.82	13.50
General Knowledge	104.98	13.36

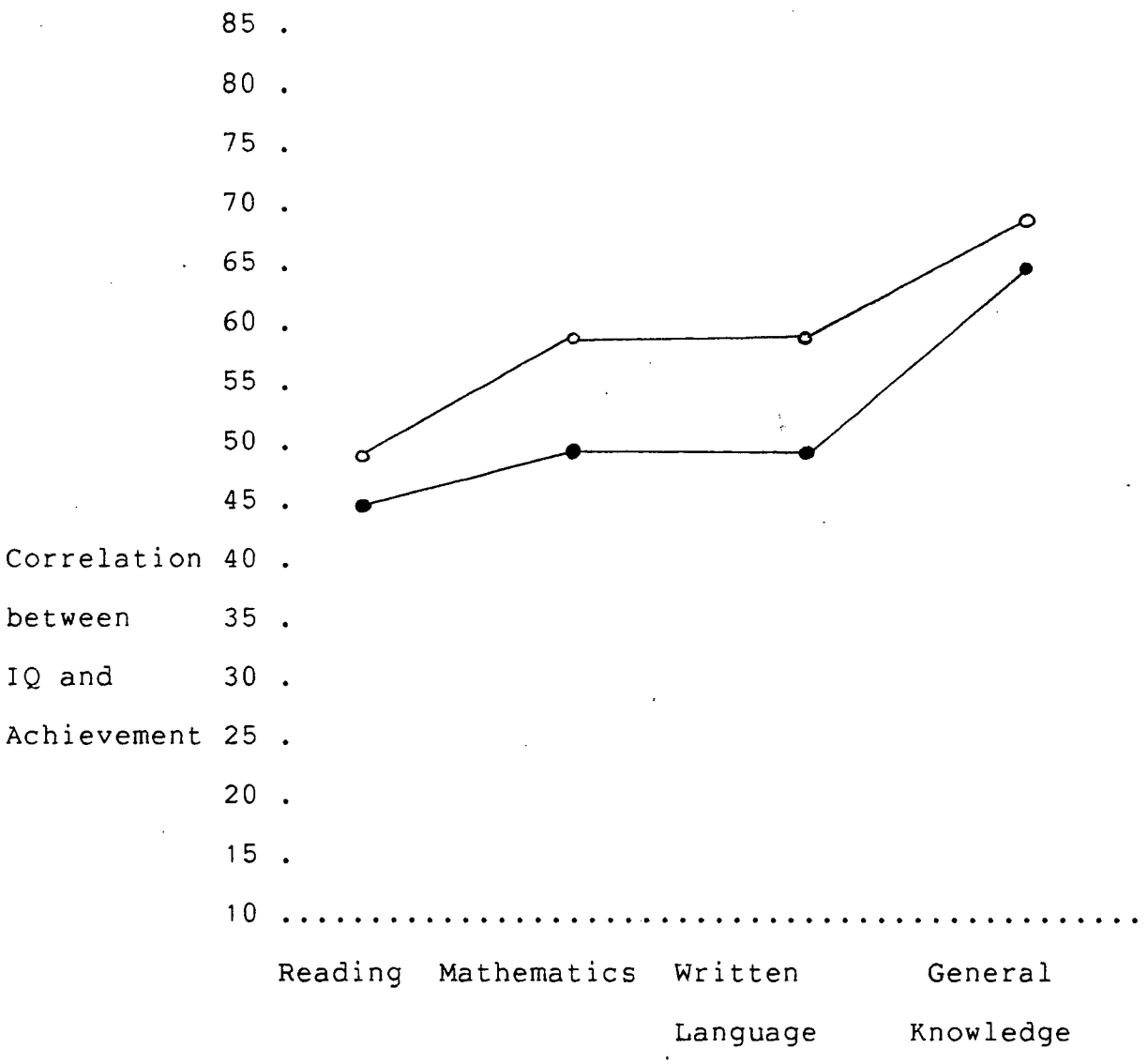
Figure 1 compares the correlation coefficients obtained from the Predictor Group to the values derived from the Study

Group. The correlation coefficients for Reading, Mathematics and Written Language were similar. The correlation coefficient between General Knowledge and WPPSI full Scale IQ differs by 17 points between the Predictor and Study Groups. The difference between these correlation coefficients was considered to be within reasonable limits.

Figure 1

A Comparison of Pearson Correlation Coefficients

between the Predictor and Study Groups



Tables 9 and 10 illustrate the intercorrelations between Reading, Mathematics, Written Language and General Knowledge for the Predictor and Study Groups respectively.

Within the Predictor Group, the highest correlations were obtained with Written Language. Written Language correlated .86 with Reading, .76 with Mathematics, and .70 with General Knowledge. All correlations were significantly different from 0 ($p < .01$).

With respect to the Study Group, the highest correlations were between Written Language and Reading (.80); and Mathematics and Reading (.71). General Knowledge correlated .57 with Written Language. All correlation coefficients were significantly different from 0 ($p < .001$).

Table 9

Intercorrelations between IQ and Achievement Scores for the Predictor Group (N=34)

	Full Scale IQ	Reading	Mathematics	Written Language	General Knowledge
Full Scale IQ		.51	.65	.60	.80
Reading			.65	.86	.57
Mathematics				.76	.58
Written Language					.70
General Knowledge					

$p < .01$

Table 10

Intercorrelations between IQ and Achievement Scores for the Study Group N=68

	Full Scale IQ	Reading	Math	Writ Lang	General Knowledge
Full Scale IQ		.49	.51	.51	.60
Reading			.71	.80	.58
Mathematics				.62	.47
Written Language					.57
General Knowledge					

$p < .001$

Regression Analysis

The correlations between WPPSI Full Scale IQ score and Reading, Mathematics, Written Language, and General Knowledge obtained from the Predictor Group were then used to build the parameters for the regression equations. Four regression equations were developed. One for each area of achievement. The parameters for each regression equation are presented in Table 11.

Table 11

Parameters Used to Build the Regression Equations in each Area of Achievement

	Slope	Intercept	Standard Error of Estimate
Reading	0.537	51.33	12.51
Mathematics	0.634	30.85	10.21
Written Language	0.607	39.03	11.14
General Knowledge	0.862	7.46	8.96

Results of the Regression Analysis. The results of the regression analysis are presented in Table 12. If the discrepancy between the subjects obtained score differed from his predicted score by -1.00 standard error of estimate, then he/she was identified as an underachiever in that subject area. Approximately 20% of the Study Group were found to be underachieving in at least two subject areas. Underachievers are indicated by an asterisk.

Table 12

Results of the Regression Analysis Reported in Standard Errors of Estimate

Subject	Reading Achieve	Mathematics Achievement	Written Lang Achievement	Gen. Knowledge Achievement	Full Scale IQ Score
1	-.10	.26	.68	.93	78
2	-.15	-1.12*	-.40	.22	83
3	0	.91	1.92	1.03	85
4	-.35	.09	-.15	-.71	95
5	-1.04*	-.68	-.67	-.44	98
6	-.04	.14	-.28	-.98	99
7	.28	.43	-.37	-.31	99
8	.11	-.28	-1.29*	.50	101
9	.47	.24	-.35	-.71	102
10	1.03	1.03	.63	1.07	102
11	.79	1.42	1.53	2.30	102
12	.99	1.36	.49	.64	103
13	-.50	.39	-1.38*	-1.43*	106
14	.22	.19	-.66	-1.88*	106
15	-.38	-.36	-.81	2.49	107
16	-.94	-.65	-1.79*	-.97	107
17	-.54	.03	-1.25*	1.93	107
18	-.63	-.29	.70	.06	107
19	-1.59*	-.78	-.74	-1.05*	109
20	-1.51*	-.49	-2.44*	.06	109
21	1.65	.24	1.09	-.43	110
22	-.43	1.02	.56	-.03	110
23	-.43	1.12	-.97	-.37	110
24	.08	-.41	-.49	1.21	111
25	.92	.11	.63	.45	112
26	.64	.64	.30	.24	113
27	.08	1.13	-.24	.35	113
28	-2.52*	-1.29*	-1.91*	-1.64*	114
29	1.47	1.46	.97	1.81	114
30	.07	.81	.28	-2.30*	115
31	.19	-.14	-1.12*	-1.39	115
32	-.57	-.07	-1.87*	-1.18*	116
33	-.37	-.92	-.76	.28	116
34	-.05	-1.41*	.23	-.05	116
35	.58	-.06	.39	-1.02*	118
36	1.62	.23	1.29	.54	118
37	-.38	-.06	-1.32*	-.58	118
38	-.42	-1.30*	-.38	.78	119
39	1.26	1.44	.07	.22	119
40	.62	.36	.69	.11	119
41	-.26	-.91	-1.37*	.22	119

Table 13
Results of the Regression Analysis Reported in Standard Errors of Estimate
(continued)

42	-.46	-1.46*	-.44	-2.00*	120
43	.74	-.30	.28	-.55	120
44	.58	-.38	.73	-.32	120
45	.93	.73	.76	.36	121
44	.89	1.16	1.34	.15	123
47	.33	-.90	-.19	.93	122
48	-.43	.21	.21	1.40	123
49	1.32	.97	1.80	-.80	125
50	1.00	.19	.19	-1.14*	125
51	-.48	.12	-1.75	-.90	126
52	-1.28*	-1.54*	-1.66	-.57	126
53	.04	-.43	.26	.23	127
54	.12	-1.60*	-1.81*	-2.78*	127
55	.12	1.63	.26	-1.78*	127
56	.68	.36	-.01	-.66	127
57	-.36	.53	.35	-.66	127
58	-2.16*	-2.45*	-2.22*	-1.32*	128
59	-.05	-2.41*	.96	-.85	129
60	-1.49*	-1.34*	-1.11*	-3.42*	129
61	-1.53	.61	-2.24	-.95	130
62	1.06	.50	.40	.85	131
63	-.42	-1.72*	-.55	1.53	132
64	.94	.21	.95	.34	134
65	-.98	-1.55*	-.48	-1.67*	134
66	.81	.52	-.11	.61	137
67	-2.12*	-.75	-1.44	-3.81	140
68	.59	-.48	.88	.57	142

* indicates underachievement

Hypothesis One

The correlational relationship between WPPSI Verbal, Performance and Full Scale IQ scores and the Reading, Mathematics, Written Language and General Knowledge achievement clusters of the Woodcock-Johnson Achievement Battery are not significantly different from zero in a group of first graders.

Method of Analysis. Pearson's product moment correlation coefficient (r) was used to determine whether the correlation between WPPSI Verbal, Performance and Full Scale IQ scores and

the Woodcock-Johnson Achievement Battery differed significantly from zero.

Discussion of Findings. Table 14 presents the correlation coefficients between WPPSI Verbal, Performance and Full Scale IQ scores with the four achievement clusters of the Woodcock-Johnson Achievement Battery for the entire sample.

The highest correlations were between the WPPSI Verbal IQ score and General Knowledge (.69) closely followed by WPPSI Full Scale IQ and General Knowledge (.67). The correlation coefficients between WPPSI Verbal, Performance and Full Scale IQ and the Woodcock-Johnson Achievement Battery differ significantly from zero ($p < .01$). Table 15 compares the results of past studies correlating WPPSI IQ scores with other measures of reading achievement. The findings of the present investigation are comparable to past studies.

Table 14

Correlation Coefficients: Verbal Performance and Full Scale IQ Scores with the Woodcock-Johnson Achievement clusters N=102

	Achievement Area			
IQ Subtests	Reading	Math	Written Lang	G. Knowledge
Verbal	.43*	.50*	.47*	.69*
Performance	.46*	,49*	.47*	.47*
Full Scale	.50*	.57*	.54*	.67*

* $p < .05$

Table 15

A Comparison of WPPSI IQs and Reading Achievement Across Studies

Study and Reading Test	Verbal IQ	Performance IQ	Full Scale IQ
White & Jacobs, 1979 Gray Oral Reading	.54**	.51**	.58**
Feshbach et al 1975 Gates MacGinite	.47**	.44**	.38**
Lieblich & Shinar 1975 Israeli Objective Tests of School Achievement in Reading	.57**	.61**	.63**
Plant & Southern 1968 Stanford Achievement	.59 **	.55**	.43**
Kaufman 1973 Metropolitan Achievement			.36*
Kroft, Perks 1982 Woodcock-Johnson Achievement Battery	.43*	.46*	.50*

* $p < .05$

** $p < .01$

Note. From "The Prediction of First-Grade Reading Achievement from WPPSI scores of Preschool Children" by D. R. White

and E. Jacobs, Psychology in the Schools. 1979, 16, 129.

Hypothesis Two:

The incidence of underachievement among a group of grade one students does not exceed 15%.

Method of Analysis. The Chi Square Goodness-of-Fit Test was used to determine if the incidence of underachievement exceeded the expected number of 15 percent.

Discussion of Findings. The results presented in Table 17 indicate that the null hypothesis should be rejected. Twenty percent of the sample were identified as underachievers. This finding was significant at the .05 level of statistical significance.

Table 16

Incidence of Underachievement in the Study Sample (N=68)

Underachievers	Normal & Overachievers	Total
14	54	68

Test Results: $x^2 = 6.71$ ($p < .05$)

Hypothesis Three

There are no significant differences (p=.05) in the incidence or frequency of underachievement among an Intellectually Superior (IQ 120+), Bright (IQ 110-119) and Average (IQ 80-109) group of first graders (p = .05).

Method of Analysis The Chi Square Goodness-of-Fit Test was used to determine whether underachievement occurs more frequently in any one group.

Discussion of Findings The results presented in Table 17 support the acceptance of the null hypothesis. There were no significant differences in the number of underachievers across three ability groupings.

Table 17

Incidence of Underachievement across Three Ability Groupings

	Average	Bright	Superior	Total
Underachiever	10	9	13	32

Test Result: $x^2 = .81$ ($p > .05$)

Hypothesis Four

There are no significant differences in the correlational relationship between WPPSI Full Scale IQ scores and each of the achievement clusters of the Woodcock-Johnson, namely, Reading, Mathematics, Written Language and General Knowledge for an Intellectually Superior (IQ 120+), Bright (IQ 110-119) and Average (IQ 80-109) group of first graders.

Method of Analysis The appropriate t-test was used to determine whether there were significant differences in the correlational relationships between IQ and Achievement across the three ability groupings for the Achievement areas shown to be significantly different from zero.

Discussion of Findings An analysis of the data indicated that there was a significant difference in the

correlational relationship between IQ and Mathematics in the Average and Superior ability groupings, $t(.95) = 2.41$, $p < .05$. Conversely, the data also indicated that there was no significant difference in the correlational relationship between IQ and General Knowledge across the three ability groupings $t(.95) = 7.25$, $p < .05$ and $t(.95) = 1.45$, $p > 1.64$ respectively. These findings suggest that the null hypothesis should be rejected for Mathematics and Reading. The null hypothesis is supported for both Written Language and General Knowledge. This mixed finding tends to support the results of hypothesis three, namely, that underachievement is equally distributed throughout the ability ranges.

Table 18

Relationship between Full Scale IQ Score and Area of Achievement Across three Ability Groupings (n=102)

	Achievement Area			
Ability Grouping	Reading	Mathematics	Written Lang	Knowledge
Average (IQ 85-109) N=31	.13	.57***	.024	.50**
Bright (IQ 110-119) N=30	.33*	.04	.17	.41*
Superior(IQ 120-144) N=41	.11	.27*	.20	.32*

* $p < .05$

** $p < .01$

*** $p < .001$

Hypothesis Five

There are no statistically significant sex differences in the incidence or frequency of underachievement among a group of first graders.

Method of Analysis. The Chi Square Statistical Test

of Association was used to determine whether underachievement occurred more frequently in boys or girls.

Discussion of Findings. The results presented in Table 19 support the acceptance of the null hypothesis. There were no significant differences in the incidence of underachievement between males and females.

Table 19

Incidence of Underachievement in Males and Females

	Males	Females	Total
Underachievers	8	6	14

Test Result: $x^2 = .28$ ($p > .05$)

Table 20 illustrates the number of male and female underachievers in each ability grouping. Underachievement was equally represented across all ability groupings.

Table 20

Incidence of Underachievement in Males and Females across Four Ability Levels

Ability Level	N	Male Underachievers	Female Underachievers
Very Superior (130+)	8	2	1
Superior (120-129)	19	3	2
Bright (110-119)	21	1	2
Average (90-109)	20	2	1
Total	68	8	6

Hypothesis Six

There is no significant difference in the mean WPPSI Performance or non-verbal IQ score between an Achieving and Underachieving group of first graders.

Method of Analysis. A t-test was conducted on the mean Performance scores of Achieving and Underachieving groups in order to determine whether they were

significantly different.

Discussion of Findings The results are presented in Table 21. The data indicates that the null hypothesis should be accepted. There was no significant difference between the mean performance score of Achievers and Underachievers.

Table 21

Comparison of Mean Performance Scores (t-test)

	N	Mean Performance Score
Achievers	54	114.83
Underachievers	14	121.93

Test Result: $t = .08$ ($p > .05$)

Summary

Chapter four began with a presentation of the descriptive statistics (sample, means, standard deviations and correlation coefficients) used to build the parameters for the regression equations. The results of the regression analysis were presented followed by a restatement of the research hypotheses and the results of the data analysis.

CHAPTER V: DISCUSSION, SUMMARY AND CONCLUSIONS

The final chapter of this paper is divided into three sections. The first section focuses on a discussion of the research findings. The next section summarizes the objectives and research hypotheses. The final section includes the limitations of the study, conclusions and suggestions for future research investigations.

Research Findings

Hypothesis One. The correlational relationships between WPPSI Verbal, Performance and Full Scale IQ scores and the Reading, Mathematics, Written Language and General Knowledge achievement clusters of the Woodcock-Johnson Achievement Battery are not significantly different from zero in a group of first graders

Result. The null hypothesis was rejected. All correlations between WPPSI IQ scores and the Woodcock-Johnson Achievement clusters were significantly different from zero.

Discussion and implications. No reported studies have examined the correlations between the Wechsler Preschool and Primary scale of Intelligence (WPPSI) and the Woodcock-Johnson Achievement Battery. The correlations obtained were comparable to other measures of early school achievement (White & Jacobs, 1979; Feshbach, 1975).

The Woodcock-Johnson has two advantages over other measures of early school achievement. First, the test covers a wide age range and accomodates a high ceiling. This is particularly advantageous when assessing the early school achievement of

intellectually superior children since these children may perform several years beyond their chronological age in particular subject areas (Terman, 1947; Whitmore, 1980). In addition, the test covers a broader range of scholastic achievement. Past studies (Woo-Sam & Zimmerman, 1973; Kaufman, 1973; Feshbach, 1975) have achieved their highest correlations between WPPSI Verbal IQ Scores and Reading (.59). In the present study the researcher found the highest correlations between WPPSI Verbal IQ and General Knowledge (.69). However, few tests of early school achievement assess general knowledge. To the extent that one of the early intellectual characteristics of superior children is their "remarkable memory for facts and events and an amazing repertoire of knowledge in one or more areas of expertise on special topics" (Whitmore, 1980, p. 65-66), it would seem useful to obtain an index of this aspect of their achievement.

The Woodcock-Johnson Achievement Battery therefore appears to be a valuable instrument for assessing the early school achievement of superior children due to its high correlations with the WPPSI, its high ceiling and broad range of content areas.

Hypothesis two. The incidence of underachievement among a group of grade one students does not exceed 15%.

Result. The Null hypothesis is rejected. The researcher found that 20% of the sample were underachieving in at least two subject areas, x^2 (65) = 6.71, $p < .05$.

Discussion and implications. These findings provide an

indication of both when the pattern of underachievement begins and the extent to which it exists at the grade one level. Moreover, the results lend support to the hypothesis of Shaw & McCuen (1960) that "the predisposition to underachieve academically is present when the underachiever enters school" (p. 106). A knowledge of the magnitude of the problem will alert educators to the need for the early identification of underachievement. As several researchers have stressed, the early intervention and remediation of the underachievement pattern is critical "before they become too well adapted to their own poor work and study patterns" (O'Shea, 1970, p. 257, Goldberg, 1958; Shaw & McCuen, 1960; Pringle, 1970; Whitmore, 1980).

Hypothesis three. There are no statistically significant differences in the relative incidence or frequency of underachievement among an Intellectually Superior (IQ 120+), Bright (IQ 110-119) and Average (IQ 80-109) group of first graders ($p = .05$).

Result The null hypothesis was accepted. The incidence of underachievement did not occur more frequently within a particular ability grouping, x^2 (65) = .81, $p < .05$.

Discussion and implications Although the literature suggests that the incidence of underachievement occurs more frequently among students of superior intellectual abilities, no known studies have attempted to confirm this hypothesis. The evidence of the present investigation suggests that the incidence of underachievement in a group of grade one students

is not associated with ability. This finding supports the suggestion of Lavin (1965) and Thorndike (1963). In their review of the identification procedures used to select underachievers these researchers comment that the preponderance of underachievers identified at the upper end of the intelligence distribution may be due to a statistical artifact, and the failure to consider the effects of regression. The failure of past researchers to consider a regression effect may have incorrectly magnified the degree to which the intellectually superior student appears to underachieve. These results support the conclusions of past researchers which emphasized the need for the adoption of the linear regression model as the standard method for identifying underachievers (Farquhar & Payne, 1964; Annesley, et al., 1970; Pippert & Archer, 1963; Thorndike, 1963; Davis, 1959; Rutter, 1975).

Hypothesis four. There are no significant differences in the correlational relationship between WPPSI Full Scale IQ scores and each of the achievement clusters of Woodcock-Johnson, namely, Reading, Mathematics, Written Language and General Knowledge for an Intellectually Superior (IQ 120+), Bright (IQ 110-119) and Average (80-109) group of first graders.

Result. The findings indicated that the null hypothesis should be rejected for Mathematics and Reading, $t(.95) = 2.41$. Conversely, the data indicated that the null hypothesis is supported for Written Language and General Knowledge, $t(.95) = 1.45$.

Discussion and implications. These findings lend further

support to the results obtained for hypothesis three. If underachievement occurred more frequently within a group of Intellectually Superior students, then one might expect the correlations between ability and achievement to be uniformly lower for this group. However, since underachievers were found with equal frequency throughout the ability distribution, the correlations between IQ and achievement within each group do not form a consistent pattern, that is they were not consistently high or low.

Hypothesis five. There are no significant sex differences in the incidence or frequency of underachievement among a group of first graders.

Results. The null hypothesis is supported. The incidence of underachievement occurred with equal frequency in males and females, $\underline{x}^2$ (65) = .28, $\underline{p} > .05$.

Discussion and implications. The results of the present study disagree with those of past researchers (Shaw, 1961; Gowan, 1964). Gowan (1964) has suggested that the disproportionate number of male underachievers may be partly influenced by "the fact that more is expected of boys in the sense of increased college going and entrance to professions (p. 299). The failure of the current investigation to identify a greater number of male underachievers may reflect changing societal attitudes and expectations of females. It may be that females and males are now equally vulnerable to the pressures of achievement. Furthermore, the notion that underachievement is primarily a male problem (Shaw, 1961) should be reconsidered in

light of the results presented.

Hypothesis six. There is no significant difference in the mean WPPSI Performance or non-verbal IQ score between an Achieving and Underachieving group of first graders.

Result. The null hypothesis is accepted. There were no statistically significant differences in the mean Performance IQ scores of achieving and underachieving group of grade one students, t (65) = .08, p > .05.

Discussion and implications. Contrary to the findings of Norman, Clarke & Bessemer, (1962), the current investigator failed to discover a significant difference between the Performance IQ scores of underachieving and achieving students. One might speculate that the failure to replicate this finding may be influenced by the particular characteristics of each sample as well as the use of different instruments to conduct the research.

Summary

The current investigation followed up Perks' doctoral dissertation project entitled "The Identification of Academically Able Kindergarten Children" (University of British Columbia dissertation in progress). In the follow-up study the researcher investigated whether a pattern of underachievement could be identified as early as the first grade and if so to what extent does the problem exist? In addition, using a regression analysis model the investigator attempted to replicate the major findings and confirm the hypothesis of past researchers. To this end, the researcher sought to replicate

whether a disproportionate number of males and female underachievers would be identified and whether underachievers demonstrate a higher non-verbal IQ score relative to their adequately achieving peers. The researcher attempted to confirm the hypothesis that the incidence of underachievement occurs more frequently among children of superior intellectual ability relative to their peers.

Hypotheses. Six null hypotheses were tested. Each hypothesis, followed by its corresponding statistical finding is listed below.

1. The correlational relationships between WPPSI Verbal, Performance and Full Scale IQ scores and the Reading, Mathematics, Written Language and General Knowledge achievement clusters of the Woodcock-Johnson Achievement Battery are not significantly different from zero in a group of first graders. (Rejected, $p < .05$).

2. The incidence of underachievement among a group of grade one students does not exceed 15%. (Rejected, $p < .05$).

3. There are no significant differences in the relative incidence or frequency of underachievement among an Intellectually Superior (IQ 120+), Bright (IQ 110-119) and Average (80-109) group of first graders ($p = .05$) (Accepted, $p > .05$).

4. There are no significant differences in the correlational relationship between WPPSI Full Scale IQ scores and each of the achievement clusters of the Woodcock-Johnson, namely, Reading, Mathematics, Written Language and General

Knowledge for an intellectually Superior (IQ 120+), Bright (IQ 110-119) and Average (IQ 80-109) group of first graders. (Partially Rejected, $p > .05$, Partially Accepted, $p < .05$).

5. There are no significant sex differences in the incidence or frequency of underachievement among a group of first graders. (Supported, $p < .05$).

6. There is no significant difference in the mean WPPSI Performance or non-verbal IQ score between an Achieving and Underachieving group of first graders. (Supported, $p < .05$).

Conclusions

Major findings. In this study, the researcher has confirmed the suggestions of past investigators that the onset of the underachievement pattern is evident as early as the first grade. Moreover, 20 % of the children studied were found to be underachieving in at least two subject areas.

To a large extent, the evidence presented challenges the findings of past research. Shaw's (1961) assertion that "the most universally agreed finding is that underachievement is predominantly a male problem" (p. 22) was not supported by the current investigation.

More striking perhaps is the failure of the present investigator to discover a higher incidence of underachievement in children of superior ability relative to their peers. This finding supports Lavin's (1965) assertion that in studies which fail to control for the effects of regression "students of very high ability will be over-represented in the underachiever group" (p. 27). One might speculate that the disproportionate

number of underachievers in an intellectually superior group of students is due in large measure to a statistical artifact born of faulty design and selection procedures used to identify underachievers. The present investigator found the incidence of underachievement equally represented throughout the ability distribution.

Limitations of the investigation. The current research sample was restricted to subjects who agreed to participate on a volunteer basis. This may have biased the sample towards including children from families where academic achievement is valued and encouraged. According to Shaw (1961), "underachievers tend to come from homes where the parents have less education than achievers ... and their values tend to be either neutral or negative with respect to education while the parents of achievers tend to value education positively" (p. 22). One might speculate that parents who consented to the participation of their children in this research project value education positively.

Under ideal circumstances, Perks' entire sample of 160 children would have been included in the follow-up study in order to assess the incidence of underachievement within a larger population.

Lavin (1965) suggests that "ability and school performance are more highly correlated for females than for males." Due to the limited sample size, the current investigator did not analyze the correlations between IQ and achievement for boys and girls separately. According to Lavin (ibid), "this means that

when males and females are not separated in analysis, the magnitude of correlations between ability and school performance will not accurately reflect the true level for the sexes separately" (p. 44).

If the sample size in the current investigation were larger, separate regression equations in each of the four achievement areas would have been calculated separately for each sex, yielding a total of eight regression analyses. This approach would serve to increase the accuracy in identifying the incidence of male and female underachievers.

In her programme for "gifted" underachievers, Whitmore (1980) comments that the beginning of the underachievement pattern may be caused by delays in the development of visual-motor perception, directionality and dominance. "These physical, maturational deficits, which may interfere with the mastery of basic skills in the primary grades are the most common and subtle difficulties that may contribute to early failure experiences" (p. 184).

These data fail to distinguish between the child who underachieves due to delays in development from the underachiever whose maturational development is commensurate with his chronological age.

The current investigation was further limited in that only one variable (IQ) was used to predict achievement. The variable of intelligence is only one factor influencing achievement. The predictive power of the study would have been increased if nonintellective variables such as social, emotional,

motivational and familial characteristics were used in the prediction of achievement.

Suggestions for future research. It would be of value for future investigators to continue following the development of the children in this study in order to determine the stability of the underachievement pattern and to assess the early social, emotional and motivational correlates of underachievement. In addition, it would be of interest to examine whether the factors responsible for underachievement in males are different or operate differently from the factors responsible for underachievement in females (Lavin, 1965).

Future investigators may develop several programmes of intervention for the children identified as underachievers and assess the differential effectiveness of each.

It would be of interest to this investigator to follow the achievement of these same children in order to assess whether the relative incidence of underachievement remains equally distributed throughout the ability distribution over time or whether underachievement begins to predominate within a particular ability level. Future investigators might examine whether students continue to underachieve in the same subject areas or whether underachievement becomes more widespread and worsens in severity in successive school years.

Summary

Chapter five began with a discussion of the research findings and examined the implications of each finding. The chapter continued with a summary of the research investigation

and concluded with a discussion of the limitations of the investigation and suggestions for future research.

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