FACTOR ANALYTIC INVESTIGATIONS OF ACADEMIC, SOCIAL AND PERSONAL ADJUSTMENT PROFILE DIFFERENCES FOR IMPROVED VERSUS NONIMPROVED LD ADOLESCENTS

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CHAPTER I

INTRODUCTION

Substantial recent research evidence suggests that directional tests of significance are insufficient indicators of the relationship between academic achievement and personal/social adjustment. The reason for the insufficiency seems to be related to the recent recognition that numerous variables simultaneously affect achievement and self-concept such that directional tests of significance give inconclusive, confounded results. The major focus of this investigation is to attempt to account for some of the factors which are involved in the personal and social growth of the LD adolescent. Sophisticated statistical techniques are utilized in an effort to identify and interpret significant differences in the factor loadings between achieving and nonachieving male LD students (females were omitted from the two groups sampled because of suspected confounding ceiling effects). The relationship between academic achievement and self-concept is complicated by the occurrence of underachievement phenomena within the LD population. Pearl, Bryan and Donahue (1980) investigated how the learning disabled child attributes success and failure. The authors found that underachievers tend to believe that a lack of effort played less of a role in their failures than those of control children. They believe that LD children may well devalue their influence over successful and unsuccessful outcomes (learned helplessness). Allen (1971) felt that underachievers need to be discriminated into subtypes

so they could be serviced on a more individual and thus relevant basis. Using this rationale, this research effort divided LD male students into two subgroups--achieving and nonachieving. The expectation was that the two groups would reveal differing profiles of personal and social adjustment. Regardless of whether such a profile exists between the two groups, the concept of discriminating LD students into subgroups has important implications for diagnostic prescriptive teaching and subsequent individualized educational programs. An additional issue is the efficacy of the behaviorally structured resource room concept in remediation of self-concept deficits. This investigation used students from behaviorally structured resource rooms because of the availability of objective measurement and replication of results (a description of the behaviorally structured resource room begins the review of the literature). The efficacy of the resource room in remediating achievement deficits has long been established (Glavin, Quay, Annesley & Werry, 1971; Quay, Glavin, Annesley & Werry, 1972; Glavin, 1974; Chamblee, 1977; Fuchs, 1978; and Schwarts, 1977). However, the data for efficacy of the resource room in remediating self-concept difficulties is not nearly so well established in that some studies have shown little or no change in self-concept (Jones, 1977; Walker, 1974) or negative change (Schwartz, 1977). This investigation will utilize directional tests of significance to explore this efficacy question more closely.

Purpose

The purpose of this study was to describe a factor structure for LD students who improve versus those who do not, and to explore the complex relationship between academic achievement and personal/social growth.

More specifically, the research aimed to determine whether LD students who improve have a different factor structure than students who do not exhibit improvement. The basic assumption underlying the research was that personal and social growth cannot be adequately investigated with directional tests of significance as the major indicator of the link between academic achievement and personal/social progress. Too many factors affect self-concept growth for simple tests of significance in a pre-post design to be sufficiently inclusive.

Substantial recent research evidence and several theoretical perspectives, when considered in combination, suggest that this is a pertinent topic for consideration, and of particular relevance for examination within the LD adolescent population as a whole. Numerous authors have expressed concern over the inconclusive and often contradictory nature of the relationship between achievement and emotional growth (Allen, 1971; Glavin, 1973; Glavin, 1974; Chamblee, 1977; Schwartz, 1977; Pearl et al., 1980). The fact that this relationship is more complex than a two-dimensional schema (inverse or direct) is readily obvious when one examines the contradictory findings of current investigations in the area. What has not been determined is the specific factors which are most (or least) affected by academic change (whether present or absent).

There are indications that young LD adolescent males may reflect a characteristic LD profile of sorts--at least with regard to certain aspects of achievement and underachievement (Greenstein, 1977; Pearl et al., 1980). The concern of more recent authors has repeatedly been that the nature of this relationship needs clearer definition and exploration (Chamblee, 1977; Schwartz, 1977; Smith & Rogers, 1977; Fuchs, 1978; Pearl et al., 1980).

Thus, there are numerous indications that the complexity of the relationship between academic achievement and self-concept, though somehow related, may be distinctly affected by underachievement or learned helplessness phenomena. Other as yet unknown factors might also affect the above relationship. More sophisticated methods of data analysis would seem to be the next logical step in the sequence of events.

Significance

This study provided for a more sophisticated assessment of the factors that influence self-concept formulation in LD adolescent males. As these factors are thought to contribute to the adolescent's formulation of attitudes, values, and expectations concerning himself and others, a further and more comprehensive description of achievement as it relates to self-concept was essential. The study intended to broaden the understanding of this relationship by contributing information from the LD adolescents' own perceptual framework.

The study represented a pioneering effort in that it provided not only an assessment of the LD adolescent self-concept as it related to academic gains, but also it provided a vehicle which might allow diagnostic prescriptive educators to actually prescribe for positive personal and social growth in addition to academic achievement gains. While intensive pre-post analyses have recently been conducted, the existing body of this research has not yet been sufficiently sophisticated to fully explore this relationship in its entirety. A comprehensive beginning has been made in this investigation. The findings of this study are of particular relevance to all who are concerned about the relationship between academic achievement and self-adjustment in the LD adolescent

male and to those who are concerned about the relevance of the diagnostic prescriptive process in the academic/affective development of exceptional youth.

CHAPTER II

THE LD RESOURCE ROOM: A SELECTED REVIEW

Of the first models of the resource room postulated, the behavioral model lends itself to objective study with relative ease. Commonly, academic grades or poker chips have been the medium of exchange in the LD resource room (McKenzie, Clark, Wolf, Kothera & Benson, 1968; Glavin, Quay, Annesley & Werry, 1971). "Play" or "free" time has been used as a positive primary reinforcer for desired study behavior or progress (Glavin et al., 1971; Quay, Glavin, Annesley & Werry, 1972; Glavin, 1973; Glavin, 1974). Additionally, diagnostic prescriptive teaching using explicitly stated behavioral objectives has been included in the behavioral resource room (Chamblee, 1977; Jenkins & Mayhall, 1973). Charts were used to plot daily progress. Praise, tokens, and free time act as primary and secondary positive reinforcers. Structured activities permitted students to practice their recently acquired modeled behaviors. Students in these resource rooms are usually limited in number. This provided for the increased educational advantage of small group and tutorial instruction widely noted in the literature (Harris, Sherman & Henderson, 1972; Jenkins & Mayhall, 1973; Jenkins, Mayhall, Peschka & Jenkins, 1974; Willis & Crowder, 1972) as opposed to the regular classroom.

Efficacy studies of the behavioral LD resource room concept began in the early 1970s. Most of the research can conveniently be divided into those studies which compare academic performance and those comparing

personal and social adjustment. The studies on academic achievement are largely experimental. Only the more recent studies on personal and social adjustment are experimental. Additionally, the correlational studies cited in this paper studied mildly retarded or EMR students (see reference note 2). Some studies appear in both discussions as both areas were jointly examined.

Academic Achievement: A Review of the Relevant Literature (Note 1)

Glavin, Quay, Annesley and Werry (1971) studied behaviorally disruptive and withdrawn students over the first year of a two-year program. Children were randomly selected and placed from referrals made by faculty at the three participating schools. The resource room utilized poker chips as secondary reinforcers. The chips acted as the medium of exchange to buy activity games, toys, and snack foods during "free time" segments. Graphs were utilized to chart student progress. Behavioral criterion measures were utilized to check student progress. The effects of the resource room on academic achievement were rather encouraging. Significant increases were noted in class attendance and significant decreases occurred in deviant classroom behavior. No halo effect from teacher attention in the regular classroom versus the resource room was noted. Significant improvements in reading comprehension and arithmetic fundamentals were obtained in the resource room group over the regular classroom group. The second year follow-up (Quay, Glavin, Annesley & Werry, 1972) revealed statistically significant gains in reading and mathematics. The experimental (resource room) group gained just slightly more than a year's improvement in arithmetic and almost a year's gain in reading over the

control (regular classroom) group. Significant improvements were also obtained in behavior appropriate to the classroom. Arguments for the behavioral resource room were advanced for other exceptional children.

In a one-year follow-up, Glavin (1973) documented that the behavioral changes made in the above two-year study remained in effect less than a year after the students left the resource room. He discussed the implications of his findings in terms of generalization phenomena and suggested regular classroom teachers needed further training in reinforcement techniques. The academic achievement gains did however continue to be reflected as statistically significant. However, Glavin's (1974) two-year postcheck on the terminated resource room project no longer found any significant academic achievement differences. He emphasized the need for continued placement in a resource room until more comprehensive remediation was accomplished than had been possible in his original two-year program.

Sabatino (1971) studied samples of three groups of LD students involved in various exposures to the resource room (self-contained, one hour a day, one half-hour twice a week). He obtained significant increases in all three experimental groups over the regular classrooms. He found the most practical and effective exposure to the resource room was the one-hour daily routine. He discussed how readily this plan adapted to individualized prescriptive teaching based on behavioral objectives for academic goals. Significant increases were also obtained in intelligence, memory, and audition for the three experimental groups with greater statistical increases occurring in the aforementioned resource room group than the other two experimental groups.

Affleck, Lehning and Brow (1973) made within-group comparisons on a randomly selected sample of LD adolescents. They studied their historical rates of improvement in the regular classroom and compared these rates to their obtained rate of improvement in the resource room over one academic school year. They obtained significant pre- to post-test gains in both groups, but found the resource room gains to be significantly greater than the regular classroom gains. Jenkins and Mayhall (1974) likewise studied improvement gains for reading only in the resource room over the course of one academic year. They found that the resource room group outgained the regular classroom group.

Chamblee (1977) studied the effects of diagnostic prescriptive teaching in the resource room. She found that LD students who received prescriptive instruction had significantly higher reading achievement scores than the regular classroom LD students at the completion of a sixteen-week period.

Schwartz (1977) investigated reading, self-concept, attendance, and behavior measure over both one- and two-year intervals. He utilized three groups: regular classroom, resource room and self-contained special class. At the end of one year he found no significant differences in reading improvement for any of the three groups; however, at the end of the second year he found large significant improvements in reading for the resource room and special classroom. He found no significant differences in attendance for either year, but found numerous dysfunctional behavior improvements during both years of his resource room program over the regular classroom or the special classroom. Unlike previous studies, his resource room groups had significantly higher increases in reading achievement than the special class placement group. He argued

for the resource room concept as a clear advantage over either of the two alternatives he explored.

Fuchs (1978) duplicated many of the findings of Glavin et al. (1971) and Quay et al. (1972). He studied three general areas: (1) whether a learning disabled student's reading gains also improves his behavior in the classroom; (2) verification of reading performance gains of seriously disabled students enrolled in the resource room; and (3) assessment of the extent of transfer of improvements in conduct (if obtained) from the resource room to the regular classroom. Again, both the experimental and control groups had statistically significant gains in reading from pre- to post-treatment testing. The experimental group had statistically higher improvements than the control group. Two of the four categories of disturbing classroom behavior reflected significant improvement, but as noted in Glavin (1973) little or no transfer of behavioral improvements transferred to the regular classroom.

Finally, Hobbs and Lahey (1977) reviewed numerous studies all relevant to academic achievement in the resource room and found nearly unanimous statistical support for the efficacy of the behavioral resource room as opposed to traditional classroom instruction (traditional meaning that the instruction places emphasis on underlying etiological factors rather than on specific behavior which an individual needs to learn). They conclude in part,

> The efficacy of an approach diametrically opposed to the traditional theories (of instruction) has been well established. The use of good programmed texts, reinforcement for correct responding and specific behavior management techniques to control disruptive behavior may be sufficient to alter a vast number of learning disabilities (p. 10).

Personal and Social Adjustment: A Review of the Relevant Literature (Note 2)

There is a dearth of research in the personal/social growth areas specifically relevant to learning disabled populations. Therefore, a short review of the experimental studies which have investigated mildly retarded (EMR) students is in order. The implication has been made by several authors that LD students (indeed perhaps most exceptionalities) are similarly affected by resource rooms founded on behavioral principles (Jenkins & Mayhall, 1973; Gampel, 1974; Jenkins, Mayhall, Peschka & Jenkins, 1974; Budoff & Gottlieb, 1976; Hobbs & Lahey, 1977; and Smith, 1978).

The point these authors make is that the learning principles and reinforcement contingencies utilized are generally applicable to several exceptional populations. Though the actual increment of gain or loss cannot be predicted for any one population, the direction of gain or loss is fairly reliably predictable based on the principles of learning theory. This rationale holds for all areas of achievement--academic as well as self-concept.

Carroll (1967) studied a group of mildly retarded students using the behavioral approach in the resource room and in the self-contained special classroom format. He measured pre-post changes for both groups. Interestingly he found significant decreases in self-derogation for the resource room group. The self-contained groups reflected significant increases in self-derogation over one academic year. Also, the special class (self-contained) group made significantly more self-derogatory remarks than the resource room group. Carroll discussed the implications of his findings in terms of segregation providing opportunities for

feelings of alienation, inadequacy and inferiority in the self-contained classes as opposed to the more integrated resource room concept. Both groups scored increases in reading and math achievements. In fact, the self-contained group scored significantly higher gains in reading over the resource room placement group. Further discussion focused on the overall advantages of the resource room because of the incremental increases in self-concept. Carroll felt the emotional/personal growth should be the point of emphasis because reading gains, though not as large, did occur in the resource room.

Walker (1974) studied two groups of mildly retarded students (resource room, self-contained classroom) in much the same fashion as Carroll (1967). His students were studied over a two-year period with evaluations at the one- and two-year intervals. He measured self-concept growth and social adjustment. He found significant increases in the resource room group over the self-contained group. And though higher, the mean differences for the resource room were not statistically significant as compared to the self-contained classroom. Walker concluded that his study replicated Carroll's (1967) study for the most part, but did not account for the lack of significance in his groups. He again argued against the self-contained classroom for mildly retarded students. He likened the sample of students he sampled to slow learners and severely learning-disabled students.

Budoff and Gottlieb (1976) studied EMR students over a nine-month period. The students were divided into two groups as above and measured at two- and nine-month intervals. They found significant increases in social adjustment and personal growth in the resource room group over

the special class group after nine months only. The two-month interval reflected no significant differences in the two groups.

Glavin, Quay, Annesley, and Werry (1971) randomly assigned teacher-referred, behaviorally disruptive students to the resource room or the regular classroom. After one year they noted improved behavior in both groups and found significant increases in self-concept in the resource room group over the regular classroom group. Quay, Glavin, Annesley, and Werry (1972) looked at these same groups at the end of their second year of participation in the study. They did not find significant increases in self-concept this time. Glavin (1973) and Glavin (1974) followed up these same two groups at one- and two-year post-check intervals and again found no significant differences.

Jones (1977) randomly selected and assigned LD students in a public school system to one of two groups (resource room and regular classroom, regular classroom only). She found no statistically significant differences over the course of one semester. She concluded that the efficacy of the resource room with regard to self-concept and personal/social growth in the LD student was still an unanswered question and she noted the paucity of research in these areas.

Chamblee (1977) studied young LD students in a diagnostic prescriptive teaching resource room (functionally equivalent to the behaviorally structured resource room). She measured the students' personal and academic self-concept growth over sixteen weeks. Again, no significant differences in either measure were obtained. She mentioned that her program length was, in all likelihood, too brief to realize significant change in self-concept measures (the reader might note here that she did obtain significant increases in reading achievement).

Schwartz (1977) investigated the relationship between self-concept, attendance, reading, and dysfunctional behaviors consisting of ten separate discipline problems that teachers selected. He evaluated the students in his two groups (resource room, regular classroom) at the one- and two-year intervals. He found significant increases in self-concept of the resource room group over the regular classroom at both evaluation intervals. He found the special (self-contained) classroom students showed statistically significant decreases in self-concept for each evaluation interval. Once again the message seemed abundantly clear: special classroom placement tends to isolate, alienate, and undermine the personal growth of those who are placed in such programs.

Fuchs (1978) measured personal and social adjustment of his subjects by changes in their behavior. He studied two groups of students (resource room and regular classroom and regular classroom only) in much the same design as used in earlier studies. He found that the resource room group tended to behave better in the regular classroom, but the differences were not statistically significant. He did find that LD students behaved very much better while in the resource room than at any other time. He suggested several behavioral programs to provide greater generalization from the resource room to the regular classroom.

A synthesis of the current state of affairs for personal and social adjustment in exceptional populations is best stated by Deno (1973):

> Neither static assessment nor experimentation has established the efficacy of resource programming in improving the personal and social adjustment of children so placed. In fact, despite the substantial numbers of studies investigating this issue, only . . . (the mildest) . . . generalization can be derived. . . . The failure of this body of research to produce . . . (clearly) . . . generalizable conclusions may derive in part from the multitude of measures and constructs and the complexity of what is being measured (p. 45).

Research Questions

A number of predictions (stated in the form of research questions) were formulated regarding the general nature of the relationships between academic achievement and self-concept as follows:

1. Adolescent females will possess significantly higher personal and social self-regard. This finding, if confirmed, would be a confounding sex difference due to ceiling effects (see Discussion).

2. The pre-test means scores for each of the ten variables studied for adolescent males who improve versus those who do not improve will be significantly different. Due to the exploratory nature of the investigation of this area, directional predictions will not be possible.

3. The mean change scores for the improved group are predicted to be significantly higher than the mean change scores for the unimproved group on the measures utilized in this study.

4. Though generally related, the rotated factor structures for the improved and unimproved pre-test scores are predicted to contain specific differences within each of the obtained factors (e.g., the factor loading pattern will impart different "meanings" on the factors). These differences, if any, will be noted, discussed, and defined as clearly as possible.

5. Similarly, the rotated factor structures for the comparison of unimproved versus improved group change scores are predicted to contain specific differences within the factor loading patterns for each of the factors investigated. Again these differences will be noted and discussed as clearly as is possible.

CHAPTER III

METHOD

Subjects

The subjects were secondary-level students identified as learning disabled by the Oklahoma Child Service Demonstration Center Title VI-G Project. The students were randomly assigned for study. Both groups included LD students who were placed in the Resource Room from one to two hours per day for reading and/or mathematics instruction. LD students were mainstreamed into the regular classroom schedules at all other times.

The selected sample included a representative sample of the Native American population and were sampled from six area school districts. The parents of the sampled LD students included a broad range of professional and nonprofessional occupations, and socioeconomic levels, and were seen as a reasonably representative sample of secondary level LD students in rural Oklahoma. These students were diagnosed as learning disabled by a multi-disciplinary diagnostic team consisting of a psychometrist, a school psychologist, and a psychoeducational diagnostician. The students were identified as LD in accordance with the definition of learning disabilities as set forth by the Oklahoma State Department of Education. This definition placed major emphasis on a normal or potentially normal level of intellectual functioning accompanied by a deficit in reading and/or mathematics achievement. Pertinent sample characteristics are detailed in Table I.

TABLE I

DESCRIPTIVE CHARACTERISTICS OF THE RESEARCH PARTICIPANTS (N = 90, MALES ONLY)

	Independent Variable	Group 1 (n = 45)	Group 2 (n = 45)
Grade	Range	7-12	7-12
	Mean	9.6	9.3
Age (Years)	Mean	15.9	15.3
	S.D.	.54	.49
Race	White	37	35
	Black	5	7
	American Indian	3	3
Verbal IQ	Range	76-91	74-93
	Mean	84.20	85.31
	S.D.	8.49	8.53
Performance IQ	Range	92-114	94-118
	Mean	96.38	98.62
	S.D.	10.48	10.51
Full Scale IQ	Range	78-104	82-105
	Mean	92.88	91.79
	S.D.	9.46	9.28

Sample characteristics for 32 females are listed in Table II. Only males were included in the study so as to avoid ceiling effects due to the significantly higher raw scores made by the females (the reader is referred to Table III).

The total subject pool available for study is described as follows: a total of 54 students qualified for placement in Group 1 (Unimproved); a total of 61 students qualified for placement in Group 2 (Improved); and a total of 83 male students improved from 6 to 12 months and were omitted from the study. There were 18 females available for placement in Group 1, 32 available for placement in Group 2, and 42 that were omitted. The total male subject pool was 198. The total female subject pool was 92.

Instruments

Durrell Analysis of Reading Difficulty

The Durrell Analysis of Reading Difficulty (DARD) was designed to assess weaknesses, strengths, or skills in reading. The DARD is a criterion-related measure of which only Oral Reading Test was used for the purposes of this study. The Oral Reading Test consists of eight paragraphs with comprehension questions in an effort to determine general reading level. The norms provided for the oral reading levels were utilized (Durrell, 1955).

Survey of Study Habits and Attitudes

The Survey of Study Habits and Attitudes Form H (SSHA-H) was one of the two primary dependent self-report measures utilized in this study.

TABLE II

DESCRIPTIVE CHARACTERISTICS OF THE RESEARCH PARTICIPANTS (N = 32, FEMALES ONLY)

	Independent Variable	Group 1 (n = 16)	Group 2 (n = 16)	Total*
Grade	Range	7-11	7-12	7-12
	Mean	9.1	9.6	9.4
Age	Range	12.3-17.4	12.8-18.1	12.3-18.1
	Mean	15.4	15.5	15.5
	S.D.	.42	.49	.45
Race	White	14	14	28
	Black	1	0	1
	American Indian	1	2	3
Verbal IQ	Range	78-98	77-101	
	Mean	86.34	87.51	
	S.D.	8.34	8.62	
Performance IQ	Range	89-110	93-114	
	Mean	96.21	98.46	
	S.D.	7.41	7.40	
Full Scale IQ	Range	84-101	82-108	82-108
	Mean	94.15	93.87	94.02
	S.D.	7.76	8.27	8.18

*Total figures were used only in the calculation of sex difference T-tests.

TABLE III

A COMPARISON OF THE SIGNIFICANCE OF THE DIFFERENCES BETWEEN MEANS AND THE RATIO OF THE EQUALITY BETWEEN VARIANCES OF MALES AND FEMALES FOR THE TEN VARIABLES (PRE-SCORES ONLY)

	Variables (Subscales)	Group 1 (Males, n = 90) T-Statistic	df	Group 2 (Females, n = 90) F-Statistic	df
1	(Delay Avoidance)	4.75*	120	1.02	89, 31
2	(Work Methods)	4.13*	120	1.68	89, 31
3	(Teacher Approval)	4.42*	120	1.28	89, 31
4	(Education Acceptance)	5.95*	120	1.17	89, 31
5	(Behavior)	2.43**	120	1.04	89, 31
6	(Intellectual and School Status)	.32	120	1.23	89, 31
7	(Physical Appearance and Attributes)	.52	120	1.30	89, 31
8	(Anxiety)	.21	120	1.40	89, 31
9	(Popularity)	.16	120	1.09	89, 31
10	(Happiness and Satisfaction)	2.67°	89[1]	2.38°	89, 31

*$p < .0001$
**$p < .001$
°$p < .01$

[1]Note that the df for the T-statistic is decreased. The variances for the two groups were statistically different, thus the variances could not be pooled.

The SSHA-H has been utilized repeatedly in research relevant to academic success (Brown & Holtzman, 1967). Its reliability and validity have been firmly established and it has been found to be compatible for inclusion with other scales in research investigation (Brown & Holtzman, 1967). The test includes four basic scales and two derived scales. The derived scales were not used in this investigation. The four basic scales are described as follows:

Delay Avoidance (DA). Promptness in completing academic assignments, lack of procrastination, and freedom from wasteful delay and distraction (Maximum raw score = 50).

Work Methods (WM). Use of effective study procedures, efficiency in doing academic assignments and how-to-study skills (Maximum raw score = 50).

Teacher Approval (TA). Opinion of teachers and their classroom behavior and methods (Maximum raw score = 50).

Education Acceptance (EA). Approval of educational objectives, practices, and requirements (Maximum raw score = 50).

Basic psychometric test construction data and norms have been provided by Brown and Holtzman (1967). The data are grouped according to grade levels 7 through 12.[3]

Piers-Harris Self-Concept Scale (P-HSCS)

The P-HSCS was designed primarily for research on the development of children's self attitudes and correlates of these attitudes (note 4).

Studies of reliability and validity have shown the P-HSCS to be a satisfactory instrument for measuring children's self-regard (Robinson & Shaver, 1973; Shavelson, Hubner & Stanton, 1976; Wylie, 1974; Smith

& Rogers, 1977). Some of these studies have shown that the P-HSCS has a verifiable "ceiling effect," e.g., children with high self-concept scores exhibit significantly less item instability (variability) than did children with middle- or low-level self-concept (Wylie, 1974; Smith & Rogers, 1977). However, in spite of these effects, the P-HSCS is probably the best single instrument available for measurement of children's self-regard (Wylie, 1974; Smith & Rogers, 1977). Smith and Rogers (1977) have clearly demonstrated that low scores on the P-HSCS are not confounded by unreliability of responding. Differential item instability was shown to be due only to the lack of upper range variability for children who scored as possessing high self-regard. In this investigation females were noted to generally fall into the high scorer category. Statistical verification of this phenomenon is closely tabled later in this study. Therefore, females were omitted to avoid the confounding effect of sex.

The six basic factor-derived subscales (called cluster scores) are described as follows:

I. Behavior. Self-report of overt behavior, obedience, trustworthiness (Maximum raw score = 18).

II. Intellectual and School Status. Self-report of intellect and scholastic ability (Maximum raw score = 17).

III. Physical Appearance and Attributes. Self-report of leadership abilities, physical characteristics, strength (Maximum raw score = 12).

IV. Anxiety. Self-report of tearfulness, worrisomeness, fearfulness (Maximum raw score = 13).

V. Popularity. Self-report of peer group status, social acceptance, social skills (Maximum raw score = 12).

VI. Happiness and Satisfaction. Self-report of usual affective state and of current satisfaction with self (Maximum score = 9).

The total score, a measure of overall self-concept, was not utilized. Piers and Harris (1969) warn that though the cluster scores have adequate statistical basis, their diagnostic/clinical significance remains largely unknown. The authors recommend the cluster scores be used in research settings only until further investigation determines acceptable clinical utility.

Procedures

All subjects in both groups were administered the psychometric instruments on a pre- and post-basis. The time interval was two full academic years. Appropriate scaled scores, standard scores, factor scores, and grade level scores were obtained. Change scores (pre-post difference scores) for each of the two groups were calculated for each scale on each instrument.

Utilizing the Durrell, students who score less than six months improvement over the two-year interval were randomly assigned to Group 1 (minimal or no improvement). Students who scored one or more years improvement for the two-year period were randomly assigned to Group 2 (improved). Students who scored between six months and one year improvement were deleted from the study. This procedure provided a distinct discontinuous and dichotomous grouping. The procedure was used to clearly, though artificially, differentiate the two groups in an effort to avoid controversy over what constitutes improvement.

Note that students were placed in the resource room for remediation of reading and/or mathematics learning disabilities. However, eligibility

for participation in this study was determined solely by a criterion-related measure of reading ability. Therefore, students who were receiving remedial instruction in mathematics alone were not included in the sample groups for the purposes of this study. T-tests were calculated to test for the significance between means for the following groups: males versus females; Group 1 versus Group 2 (pre-test scores); and Group 1 versus Group 2 (change scores). The significant difference between the variances of the above three comparisons were compared by means of the F-statistic.

Four factors were then extracted from a varimax rotation of the Principal Components Model (correlation values of 1.00 will be entered on the main diagonal of the correlation matrices; Varimax rotation of all factors having eigenvalues greater than 1.00 will be conducted) as follows: Group 1 pre-test scores; Group 2 pre-test scores; Group 1 change scores; and Group 2 change scores. Groups 1 and 2 pre-test score analyses were then statistically compared to reveal any of the significant differences in the factor structures. Finally, Group 1 versus Group 2 change score analyses were statistically compared to reveal any of the significant differences in the factor structures.

The statistical comparison of two different factor studies was first postulated by Kaiser (1971) in an effort to avoid the arbitrariness of matching factors (a process of arbitrary rotation of factor loadings until the factors "look" like they have achieved a "best" fit). Kaiser's procedure was followed in its entirety. The procedure utilized the correlation matrices for each of two studies. The first procedure involved using Kaiser's method to compare the factor loadings for unimproved and improved male change scores. Kaiser's method yields a measure of the

relationship between all factors of the two groups simultaneously--a measure which is interpreted identically to a correlation coefficient. These measures were calculated and utilized in this study.

CHAPTER IV

RESULTS

Research Question 1 directed an assessment of the sex differences between the mean pre-test scores of males versus females. This was accomplished through the use of a *t*-test for each of the ten variables studied (refer to Table III). Additionally, the F-statistics for the two groups (male and female) are listed in Table III. The means, standard deviations, and standard errors for each group within each variable (subscale) are listed in Table IV. Females scored significantly higher than males on six of the ten subscales. Variances were not pooled on the Happiness and Satisfaction subscale due to males and females having significantly different estimated population variances, $F_{(89, 29)} = 2.38$, $p < .01$.

Research Question 2 directed a similar examination of the differences between the pre-score means for Group 1 (unimproved) versus Group 2 (improved). The *F* and *t* statistics are listed in Table V. The means, standard deviations, and standard errors of the means are listed in Table VI. No significant differences were obtained. Subscales 1 and 4 (Delay Avoidance, Education Acceptance) were of borderline significance with the unimproved group, scoring slightly lower than the improved group. The differences are so weak as to not be particularly meaningful when compared to the numerous other nonsignificant differences noted.

TABLE IV

COMPARISONS OF MEANS, STANDARD DEVIATIONS, AND STANDARD ERRORS OF THE MEANS FOR MALES AND FEMALES FOR THE TEN VARIABLES (PRE-SCORES ONLY)

	Variables (Subscales)	Group 1--Males (n = 90)			Group 2--Females (n = 32)		
		Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
1	(Delay Avoidance)	12.73*	6.98	.74	19.53*	6.91	1.22
2	(Work Methods)	12.96*	7.04	.74	18.63*	5.43	.96
3	(Teacher Approval)	13.88*	10.07	1.06	22.78*	8.90	1.57
4	(Education Acceptance)	13.58*	8.37	.88	23.63*	7.74	1.37
5	(Behavior)	10.70**	4.67	.49	13.03**	4.58	.81
6	(Intellectural and School Status)	8.48	3.96	.41	8.21	4.39	.78
7	(Physical Appearance and Attributes)	5.71	3.17	.33	6.06	3.61	.64
8	(Anxiety)	7.42	3.45	.36	7.28	2.92	.52
9	(Popularity)	6.01	3.58	.38	6.13	3.42	.61
10	(Happiness and Satisfaction)	5.52**	3.09	.33	6.81**	2.01	.35

*$p < .0001$.

**$p < .01$.

TABLE V

A COMPARISON OF THE SIGNIFICANCE OF THE DIFFERENCES BETWEEN MEANS AND THE RATIO OF THE EQUALITY BETWEEN VARIANCES OF UNIMPROVED AND IMPROVED MALES FOR THE TEN VARIABLES (PRE-SCORES ONLY)

Variables (Subscales)	(Unimproved Males, n=45) t-Statistic	df	(Improved Males, n=45) F-Statistic	df
1 (Delay Avoidance)	1.87*	88	1.28	44, 44
2 (Work Methods)	1.55	88	1.13	44, 44
3 (Teacher Approval)	.78	88	1.34	44, 44
4 (Education Acceptance)	1.91*	88	1.29	44, 44
5 (Behavior)	.29	88	1.32	44, 44
6 (Intellectual & School Status)	1.07	88	1.17	44, 44
7 (Physical Appearance & Attributes)	.86	88	1.48	44, 44
8 (Anxiety)	.91	88	1.12	44, 44
9 (Popularity)	.62	88	1.05	44, 44
10 (Happiness & Satisfaction)	.44	88	1.17	44, 44

*$p < .10$.

TABLE VI

COMPARISONS OF MEANS, STANDARD DEVIATIONS, AND STANDARD ERRORS OF THE MEANS FOR UNIMPROVED MALES AND IMPROVED MALES FOR THE TEN VARIABLES (PRE-SCORES ONLY)

Variables (Subscales)	Group 1--Unimproved Males (n=45)		Group 2--Improved Males (n=45)	
	Mean	Standard Deviation	Mean	Standard Deviation
1 (Delay Avoidance)	11.38*	7.29	14.09*	6.45
2 (Work Methods)	11.82	7.20	14.11	6.76
3 (Teacher Approval)	14.71	9.34	13.04	10.79
4 (Education Acceptance)	11.91*	7.70	15.24*	8.75
5 (Behavior)	10.84	4.36	10.55	5.01
6 (Intellectual & School Status)	8.93	3.80	8.04	4.11
7 (Physical Appearance & Attributes)	6.00	3.47	5.42	2.85
8 (Anxiety)	7.76	3.56	7.09	3.36
9 (Popularity)	6.24	3.54	5.77	3.64
10 (Happiness & Satisfaction)	5.66	2.98	5.38	3.23

*$\underline{p} < .10$.

Research Question 3 directed the same assessment as in Questions 1 and 2; however, the change scores between the two groups were the focus of this question. Tables VII and VIII list the pertinent data. As is immediately apparent, students who improved scored significantly higher on every single subscale. In almost every case the difference between the means was quite significant. Only the Popularity subscale was moderately significant ($p < .04$). The Teacher Approval subscale included a slight pooling adjustment due to moderately different variance estimates for the two groups.

Research Question 4 was investigated through two consecutive Principal Components analysis of the pre-scores for the unimproved males and the improved males. The correlation matrixes, residual correlation matrices and eigenvalues for each of the two groups are tables in Appendices A and B, respectively. Although four factors were originally extracted, only three factors were tabled because the eigenvalues of the fourth factor decreased to an unacceptably low level as did the proportion of the variance extracted (refer to Table XV, Appendix A, and Table XVIII, Appendix B).

The factor loadings for Group 1 were remarkably well defined (Table IX):

1. The first rotated factor loaded on the SSHA-H subscales exclusively. This factor accounted for nearly 35 percent of the total variance (Table XV, Appendix A).

2. The second rotated factor loaded on the six subscales of the P-HSCS exclusively. The second factor accounted for an additional 30 percent of the total variance (Table XV, Appendix A).

TABLE VII

COMPARISONS OF MEANS, STANDARD DEVIATIONS, AND STANDARD ERRORS OF THE MEANS FOR UNIMPROVED MALES AND IMPROVED MALES FOR THE TEN VARIABLES (CHANGE SCORES)

Variables (Subscales)	Group 1--Unimproved Males (n=45)		Group 2--Improved Males (n=45)	
	Mean	Standard Deviation	Mean	Standard Deviation
1 (Delay Avoidance)	-3.22	5.35	3.22	5.27
2 (Work Methods)	-1.62	6.39	2.87	6.21
3 (Teacher Approval)	-4.02	9.54	2.67	6.84
4 (Education Acceptance)	-3.62	8.24	4.00	6.75
5 (Behavior)	-0.76	4.09	2.71	3.17
6 (Intellectual & School Status)	-1.51	3.95	1.36	3.91
7 (Physical Appearance Attributes)	-0.20	3.13	1.73	3.15
8 (Anxiety)	-0.17	3.46	1.71	2.96
9 (Popularity)	-0.15	3.57	1.47	3.84
10 (Happiness & Satisfaction)	-0.40	2.98	1.27	2.95

TABLE VIII

A COMPARISON OF THE SIGNIFICANCE OF THE DIFFERENCES BETWEEN MEANS AND THE RATIO OF THE EQUALITY BETWEEN VARIANCES OF UNIMPROVED AND IMPROVED MALES FOR THE TEN VARIABLES (CHANGE SCORES)

Variables (Subscales)	Group 1 (Unimproved Males, n = 45) t-Statistic	df	Versus	Group 2 (Improved Males, n = 45) F-Statistic	df
1 (Delay Avoidance)	5.76	88	$p<.0001$	1.03	44,44
2 (Work Methods)	3.38	88	$p<.001$	1.06	44,44
3 (Teacher Approval)	3.82	88**	$p<.0003$	1.94*	44,44
4 (Education Acceptance)	4.80	88	$p<.0001$	1.49	44,44
5 (Behavior)	4.50	88	$p<.0001$	1.67	44,44
6 (Intellectual & School Status)	3.46	88	$p<.0008$	1.02	44,44
7 (Physical Appearance & Attributes)	2.92	88	$p<.004$	1.01	44,44
8 (Anxiety)	2.78	88	$p<.007$	1.37	44,44
9 (Popularity)	2.08	88	$p<.04$	1.15	44,44
10 (Happiness & Satisfaction)	2.66	88	$p<.009$	1.02	44,44

*$p < .05$.

**df were slightly lower due to adjustments necessary to account for pooling differences due to slightly differing variances for the two groups.

TABLE IX

ROTATED LOADINGS ON THE FIRST THREE FACTORS OF THE VARIMAX ROTATED PRINCIPAL COMPONENTS SOLUTION AND THEIR SUBSEQUENT SORTED ROTATED PATTERNS FOR UNIMPROVED GROUP PRE-SCORES*

Subscales	Varimax Rotated Three Factors			Sorted Rotated Three Factors[1]		
	I	II	III	I	II	III
DA	704	092	-100	704	0	0
WM	874	-010	092	874	0	0
TA	884	052	-133	884	0	0
EA	929	-077	-045	929	0	0
B	-059	591	218	0	591	0
JSS	035	260	884	0	260	884
PAA	-184	297	795	0	297	795
A	007	825	132	0	825	0
P	078	728	473	0	728	473
HS	-005	833	253	0	833	253
VP**	2.949	2.428	1.803	2.949	2.428	1.803

*Decimals omitted, n = 45.

**VP is equivalent to the eigenvalue for that factor.

[1]Loadings less than .250 have been replaced by zero.

3. The third factor bordered on being trivial. Only 9 percent of the total variance was accounted for (Table XV, Appendix A). Loading occurred on subscales ISS, PAA, P, and HS. The fourth factor accounted for a trivial 6 percent of the variance and was not interpreted. After extraction of the third factor, the cumulative total of the variance extracted was 73 percent and any further interpretation would have had little utility.

The factor loadings for Group 2 were also well-defined (Table X).

1. The first rotated factor loaded heavily on the SSHA-H with moderate loadings on the Behavior and Intellectual & School status subscales. Approximately 50 percent of the total variance was accounted for (Table XVIII, Appendix B).

2. The second rotated factor loaded heavily on four of the six subscales of the P-HSCS (B, A, P, HS) and marginally on two subscales of the SSHA-T (TA, EA). Approximately 23 percent of the variance was accounted for (Table XVIII, Appendix B).

3. The third factor accounted for only 11 percent of the total variance (Table XVIII, Appendix B). This factor loaded on the same variables that the third factor for Group 1 had loaded on (ISS, PAA, P, and HS). After the third factor has been extracted, 83 percent of the total variance was accounted for. Again, the fourth factor was judged to be unacceptably trivial and the eigenvalue for that factor was unacceptably low, so its usefulness was judged to be negligible.

The test correlation coefficients for the three factors are listed in Table XI. These correlations indicate overall that the factor structures for unimproved and improved LD students' pre-scores are quite similar. The only subscales which do not reflect satisfactory correlations

TABLE X

ROTATED LOADINGS ON THE FIRST THREE FACTORS OF THE VARIMAX ROTATED PRINCIPAL COMPONENTS SOLUTION AND THEIR SUBSEQUENT SORTED ROTATED PATTERNS FOR IMPROVED GROUP PRE-SCORES*

Subscales	Varimax Rotated Three Factors			Sorted Rotated Three Factors[1]		
	I	II	III	I	II	III
DA	906	094	092	906	0	0
WM	901	-043	100	901	0	0
TA	843	261	060	843	261	0
EA	906	262	117	906	262	0
B	454	806	-057	454	806	0
ISS	295	206	859	295	0	859
PAA	-006	203	889	0	0	889
A	171	565	225	0	565	0
P	-105	832	420	0	832	420
HS	244	810	313	0	810	313
VP**	3.558	2.561	1.893	3.558	2.561	1.893

*Decimals omitted, n = 45.

**VP is the variance explained by that factor (after rotation).

[1]Loadings less than .250 have been replaced by zeros.

TABLE XI

SIMULTANEOUS TEST CORRELATIONS ON THE FACTOR STRUCTURES FOR THE UNIMPROVED AND IMPROVED GROUP PRE-SCORES

(Subscales)	Test R[1] (Unrotated Loadings)	Test R (Rotated Loadings)
1 (Delay Avoidance)	.9537	.9538
2 (Work Methods)	.9984	.9985
3 (Teacher Approval)	.9447	.9442
4 (Education Acceptance)	.8293*	.8286*
5 (Behavior)	.6846*	.6849*
6 (Intellectual & School Status)	.9284	.9285
7 (Physical Appearance & Attributes)	.9695	.9696
8 (Anxiety)	.8958	.8960
9 (Popularity)	.9829	.9827
10 (Happiness & Satisfaction)	.9639	.9636

*Using Kaiser's (1971) criterion, the content of "meaning" of the factors derived in the two analyses differs primarily in terms of their determination of these tests (test correlations less than .900 indicate that the variable under consideration has a differential factor loading between each of the two factor structures).

[1]Unrotated and rotated loadings are listed to show that Kaiser's "Factor Relate" statistics do not vary by reason of rotation and remain quite stable.

(a correlation of .90 or higher) are Education Acceptance (.83) and Behavior (.68). Thus, the factor structures are functionally identical except for the differences in "meaning" associated with these two subscales (further elucidation is included later). The cosine matrix for the rotated factor vectors of the two structures is listed in Appendix E. The unrotated matrix is not listed because it is not as clear a representation of the relationship between factors after the two sets of test vectors have been aligned for maximum contiguity.

Research Question 5 mandated a statistical investigation which was functionally identical to the investigation performed for Question 4. Again, two consecutive Principal Component analyses were run utilizing the change scores (pre-post difference scores) for the unimproved and improved groups of LD male adolescents. The correlation matrices, residual correlation matrices, and eigenvalues for each of the groups are tabled in Appendices C and D, respectively. Again, four factors were extracted; however, all four factors were judged to have sufficiently met the minimum statistical requirements for meaningful interpretations.

The factor loadings for Group 1 (unimproved change scores) were as follows (all loadings are listed in Table XII):

1. The first rotated factor loaded on five of the six subscales of the P-HSCS. Only the Happiness and Satisfaction subscale was omitted. Additionally, 31 percent of the total variance was accounted for by the first factor (Table XXI, Appendix C).

2. The second rotated factor loaded on all of the subscales of the SSHA-H and on the Behavior subscales of the P-HSCS. Further, a marginal negative loading (-.264) was noted for the Physical Appearance and

TABLE XII

ROTATED LOADINGS ON THE FIRST FOUR FACTORS OF THE VARIMAX ROTATED PRINCIPAL COMPONENTS SOLUTION AND THEIR SUBSEQUENT SORTED ROTATED PATTERNS FOR UNIMPROVED GROUP CHANGE SCORES*

Sub-Scales	Varimax Rotated Four Factors				Sorted Rotated Four Factors[1]			
	I	II	III	IV	I	II	III	IV
DA	266	284	075	829	266	284	0	829
WM	015	755	143	255	0	755	0	255
TA	054	873	-040	185	0	873	0	0
EA	-083	799	-197	224	0	799	0	0
B	780	283	002	-057	780	283	0	0
ISS	738	008	396	202	738	0	396	0
PAA	817	-264	153	091	817	-264	0	0
A	504	-198	509	040	504	0	509	0
P	564	106	256	-589	564	0	256	-589
HS	171	019	912	-048	0	0	912	0
VP**	2.503	2.252	1.403	1.239	2.503	2.252	1.403	1.239

*Decimals omitted, n = 45.

**VP is the variance explained by that factor (after rotation).

[1]Loadings less than .250 have been replaced by zeros.

Attributes subscale. An additional 24 percent of the total variance was accounted for (Table XXI, Appendix C).

3. The third rotated factor loaded on four of the six subscales of the P-HSCS (ISS, A, P, HS). A total of 11 percent of the variance was accounted for (Table XXI, Appendix C).

4. The fourth rotated factor loaded on Delay Avoidance and Work Methods. A negative loading of -.489 occurred on Happiness and Satisfaction. Although the fourth factor accounted for only 8 percent of the total variance, only 66 percent of the total variance was accounted for by the first three factors. Therefore, the fourth factor, though marginal, was judged to be meaningful enough for interpretation.

The Principal Components analysis of the improved group change scores was analyzed next. Again, the fourth factor was judged to be meaningful enough for interpretation. The factors are detailed as follows (actual loadings are listed in Table XIII):

1. The first rotated factor comprised loadings on the four subscales of the SSHA-H. Just over 37 percent of the total variance was accounted for (Table XXIV, Appendix D).

2. The second rotated factor loaded on the Behavior, Anxiety, Popularity, and Happiness and Satisfaction subscales of the P-HSCS and on Teacher Approval and Education Acceptance of the SSHA-H. Almost 19 percent of the total variance was accounted for (Table XXIV, Appendix D).

3. The third rotated factor loaded on subscales Teacher Approval, Intellectual and School Status, Physical Appearance, and Attributes and Popularity. Just over 12 percent of the total variance was accounted for (Table XXIV, Appendix D).

TABLE XIII

ROTATED LOADINGS ON THE FIRST FOUR FACTORS OF THE VARIMAX ROTATED PRINCIPAL COMPONENTS SOLUTION AND THEIR SUBSEQUENT SORTED ROTATED PATTERNS FOR IMPROVED GROUP CHANGE SCORES*

Sub-Scales	Varimax Rotated Four Factors				Sorted Rotated Four Factors[1]			
	I	II	III	IV	I	II	III	IV
DA	881	-109	095	040	881	0	0	0
WM	847	-014	028	163	847	0	0	0
TA	656	385	302	-104	656	385	302	0
EA	828	211	056	171	828	0	0	0
B	-062	812	-053	373	0	812	0	373
ISS	096	090	868	-111	0	0	868	0
PAA	186	004	779	404	0	0	779	404
A	225	244	149	871	0	0	0	871
P	-005	558	583	243	0	558	583	0
HS	202	822	153	-030	0	822	0	0
VP**	2.742	1.918	1.852	1.201	2.742	1.918	1.852	1.201

*Decimals omitted, n = 45.

**VP is equivalent to the eigenvalue for that factor.

[1]Loadings less than .250 have been replaced by zeros.

4. The fourth rotated factor loaded on subscales Behavior, Physical Appearance and Attributes, and Anxiety. Again, only a small portion of the variance was accounted for by this factor (9%); however, only 69 percent of the total variance had been accounted for by the first three factors (Table XXIV, Appendix D). The judgment was made to interpret the fourth factor so that at least 75 percent of the variance was accounted for.

The test correlations for the four factors are listed in Table XIV. These correlations indicate that the factor structures for unimproved and improved LD adolescents' change scores are not nearly as similar as the factor structures for the pre-scores. Though there is some similarity, a number of the subscales differ in the two factor structures. Specifically, Teacher Approval (.80), Education Acceptance (.73), Behavior (.22), Intellectual and School Status (.64), and finally Happiness and Satisfaction (.72) do not relate closely enough to be referred to as having the same meaning for the two factor structures. The cosine matrix for the rotated factor vectors of the two structures is listed in Appendix E. Again, the unrotated matrix is not listed because it is not as clear a representation of the relationship between factors after the two sets of test vectors have been aligned for maximum contiguity.

TABLE XIV

SIMULTANEOUS TEST CORRELATIONS ON THE FACTOR STRUCTURES FOR THE UNIMPROVED AND IMPROVED GROUP CHANGE SCORES

Subscales	Test R[1] (Unrotated Loadings)	Test R (Rotated Loadings)
1 (Delay Avoidance)	.8573	.8852*
2 (Work Methods)	.9240	.9319
3 (Teacher Approval)	.8640*	.7965*
4 (Education Acceptance)	.7777*	.7258*
5 (Behavior)	.2787*	.2188*
6 (Intellectual & School Status)	.6187*	.6390*
7 (Physical Appearance & Attributes)	.9382	.9199
8 (Anxiety)	.8807	.9477
9 (Popularity)	.9187	.8687
10 (Happiness & Satisfaction)	.5847*	.7169*

*Using Kaiser's (1971) criterion, the content or "meaning" of the factors derived in the two analyses differs primarily in terms of their determination of these tests (test correlations less than .900 indicate that the variable under consideration has a differential factor loading between each of the two factor structures).

[1]Unrotated and rotated loadings are listed to show that Kaiser's "Factor Relate" statistics do not vary by reason of rotation and remain quite stable.

CHAPTER V

DISCUSSION

The following provides a review of the implications of the statistical results for each of the study's research questions.

Research Question 1

The first prediction was confirmed: females did, for the most part, possess significantly higher personal and social self-regard. The comparison simply validated concerns by this investigator that females might be susceptible to a ceiling effect (Smith & Rogers, 1977). The comparison showed quite clearly that large sex differences were indeed present. Females scored significantly higher than males in both groups on six of the ten subscales, namely: Delay Avoidance, Work Methods, Teacher Approval, Education Acceptance, Behavior, Happiness, and Satisfaction. These findings were therefore consistent with the rationale previously expressed in choosing not to include females in the study samples. Overall, LD adolescent females appear to have several significantly higher academic, personal, and social aspects of their self-concept than their male peers. Given these higher pre-scores, the instruments selected for this investigation might well have reflected few significant gains over the two-year period for females. The lack of significance would not necessarily be an indication that females would not show improvement because their scores were already in the upper ranges (Wylie, 1974; Smith & Rogers, 1977).

The lack of upper range of the P-HSCS and the SSHA-H would thus be providing little room for incremental changes in self-growth. If females had been included in the study, many of the gains made by males might well have been cancelled out and thus confounded by the lack of incremental gains made by females.

Research Question 2

The prediction of significant differences between the two groups for the mean pre-test scores was not confirmed. No significant differences were noted between the unimproved male pre-scores and the improved male pre-scores. The implications of these findings are that solely utilizing pre-scores upon entry into a resource room--at least for the measures of academic, personal, and social self-concept included in this investigation--will shed absolutely no light on which LD students might be expected to improve or not improve over the course of their enrollment in the resource room. Thus, utilizing pre-scores alone, LD students who improve cannot be differentiated from LD students who do not improve. One clear implication of this finding is that the two measures chosen in this study do not discriminate between those LD students who later improve in the resource room and those who do not relative to their scores at entry (pre-scores). Because there are no distinctive group differences, it follows that the two measures (P-HSCS, SSHA-H) have no diagnostic prescriptive utility relative to initial placement of the LD students into the resource room. In other words, the initial test scores of personal, social, and academic adjustment selected by this investigator may well have no relationship to academic achievement and thus no predictive utility. This is not to say that the diagnostic prescriptive process

itself is useless, but it does emphasize the point that test scores are not always sufficient to make a valid prediction. If, indeed, there is any sort of distinctive relationship between self-concept and academic achievement that has predictive utility for the resource room, measures of self-concept other than those used in this study would have to be found.

Research Question 3

Adolescent LD students who improved on a measure of reading achievement had significantly higher self-concept change scores than LD students who did not improve, thus confirming the third prediction. In fact, LD students who did not improve over the two-year period actually showed a decrement on all subscale measures of academic, personal, and social self-concept. Large increments of positive self-concept growth were noted in LD students who improved versus those who did not. As previously noted by other authors, much of the so-called contradictory evidence in studies thus far may be due in large part to the relatively short period of time over which these studies sampled (Jones, 1977; Chamblee, 1977). Indeed, the link between academic achievement and growth in personal and social adjustment may be much more simple than originally hypothesized at the beginning of this study.

The decrement in self-concept for the unimproved LD males is consistent with the findings of prior authors (Pearl, Bryan & Donahue, 1980):

> Children who do not consider achievement outcomes to be under their control have been demonstrated to show 'learned helplessness,' or lack of persistence, in the face of failure. . . . To the extent that learning disabled children hold such maladaptive beliefs, their performance may not only fail to reflect the abilities they do possess, but may even deteriorate over time as they face new challenges unconvinced that any effort they expend will have an influence on the outcome (p. 7).

In other words, learning disabled children, like underachievers, ascribe success as being due to externally controlled phenomena (ease of the task, good luck, etc.) and ascribe failure internally (e.g., lack of ability). Thus, students with learning problems may react to the inevitable occasioal failure with an impaired performance, even in areas in which they do not have a specific disability. The effect of these attributions make LD students more pessimistic about their ability to influence outcomes.

These results have implications for what educators can do to optimize the performance of learning disabled students who, like underachievers, do not perform as well as IQ measures would predict. While past approaches suggested providing the student with more opportunities to experience success as a means of instilling a more postive approach to academic tasks, research has shown this to be ineffective in ameliorating the debilitating effect of a failure on students who underplay the importance of effort. A more successful procedure would be to directly induce the students to change their attributions for failure when they do in fact possess the skills required for success. Thus, by suggesting to the student that he/she could overcome a failure by persisting--and then making sure that success is achieved through further effort--it may be possible to foster more adaptive attributions in students with learning problems.

These findings also suggest that in areas where learning disabled students experience difficulty, it may not be enough simply to teach them new skills. If the students continue to interpret a failure as indicating that their attempts at mastery are useless, such an approach is unlikely to yield major long-term effects. The results of this study suggest that successful intervention for learning disabled students may need explicitly to teach strategies for dealing with failure--as well as success.

Research Question 4

Predictions concerning the factor structure differences for the pre-scores of the unimproved and improved groups were not confirmed. Rather than being different, the three factors clearly showed that the LD students in both groups have exceedingly similar pre-score patterns. The first two factors for both structures were simply separate but nearly identical validations of the two test instruments. Factor I simply validates the grouping of the SSHA-H subscales. Factor II validates the P-HSCS subscale grouping. Factor III loaded on identical subscales in an almost identically similar pattern. The loadings were on Intellectual and School Status, Physical Appearance and Attributes, Popularity and Happiness, and Satisfaction. Factor III would seem then to be a subset within the six primary subscales for the P-HSCS. Factor I is easily identifiable as involving Academic Attitudes; Factor II is best termed Personal and Social Attitudes; and Factor III could be conveniently thought of as Ego Needs (Status, Beauty, Popularity and Happiness). The subscales in both groups exhibit a largely identical pattern. Only two subscales (Education Acceptance and Behavior) have a different loading pattern in each of the two factor structures. Education Acceptance loads on Factor I only for the unimproved males. For improved males, Education Acceptance has an additional secondary loading on Factor II (Personal and Social Attitudes). The differences are minor and no significant meaning is attached. Also, the Behavior subscale loads only on Factor II for the unimproved group and on Factors II and I, respectively, for the improved group of males. Again, the difference is relatively minor at best and has no particular interpretive significance because of the strength of

the relationship between the two overall factor structures. Thus, no useful predictive or differentiating information for the two groups of pre-scores was revealed through the use of the statistical procedures pertinent to this research question.

Research Question 2 clearly revealed that the means of the pre-scores for the ten variables were not significantly different. Research Question 4 further revealed that there were no factor structure (profile) differences for the two groups using pre-score data alone. So, not only are the test scores themselves without predictive utility, but also the pattern of the factor loadings for the two groups are so similar as to be indistinguishable. This investigation intentionally identified two distinct groups of LD students with regard to academic achievement. Although the two groups are dichotomous in one respect (reading achievement gains), they remain indistinguishable on several measures of personal and social adjustment. Two possibilities are suggested to account for this phenomenon.

First, the measures used in this investigation are not sophisticated enough to appropriately reflect the relationship between academic achievement and self-concept. The self-concept scales used, though reliable and constructively valid, are known to have deficits. The range sampled is too narrow and restricted. Some of the subscales have too few items and sample from too narrow a theme. Thus, the complexity of the relationship between academic achievement and self-concept may not fully be appreciated without a much broader range of instruments than was utilized in this study.

Second, the attempt made by this investigation to classify subgroups of LD adolescents may not be valid. No research yet exists to lend

scientific support to the notion that achieving and nonachieving LD students can be discriminated. Conceptually, one can discuss the differences between the two groups, but realistically the subgroups may well not exist as identifiable entities. Interestingly, Chamblee (1980) attempted to differentiate between high and how achieving LD children (again on the basis of reading achievement) utilizing a self-concept inventory (not dissimilar from the Pier-Harris Self-Concept Scale) as her dependent measure. She employed diagnostic prescriptive instruction based on behavioral principles in an effort to remediate achievement and affective deficits. She also found no significant differences between the two groups on any of the various subscales of the self-concept measure. Thus, the complexity of the relationship between academic achievement and self-concept may well not lend itself to measurement by current "state-of-the-art" instruments available, or the relationship is such that subgroups within the LD population do not exist as identifiable wholes.

Research Question 5

The factor structures for the LD achievement change scores were not nearly so similar as the structures for the pre-scores, thus confirming predictions about the factor loading pattern for these two groups. The unimproved group change scores was a fair approximation of the two factor structures noted in Research Question 4. The subscales of the P-HSCS and then the SSHA-H were the first two factors, respectively. The third factor seemed to be mainly effective in nature (e.g., Status, Anxiety, Happiness). The fourth minor factor revealed an inverse relationship between Delay Avoidance and Popularity (loadings were .829 and -.589, respectively).

Thus, the clarity of this structure seems adequately clear and reasonably similar to those obtained earlier. However, the comparison to the improved male change scores is not nearly so familiar or tidy.

The second factor structure (improved change scores) differs markedly from the unimproved group factor pattern. Factor I is clearly a validation of the academic aspects of the self-concept in that the four subscales of the SSHA-H received the major loadings. The main features for Factor II would seem to be a dimension relative to the behavioral acceptance of and by others (Behavior, Happiness and Satisfaction, Popularity, Teacher Approval). Factor III seems to be a measure of status needs (Intellectual and School Status, Physical Appearance and Attributes, Popularity). Factor IV might be best described as a measure of overt anxiety (Anxiety, Physical Appearance and Attributes, Behavior).

The test correlations for relating the ten subscales revealed just how different the actual factor patterns of the two structures were. Five of the ten subscales had unacceptably low factor relate correlations. These five correlations ranged from extremely low (Subscale 5, .22) to moderate (Subscale 3, .80). It is therefore accurate to state that these five subscales (TA, EA, B, ISS, HS) necessarily provide that the interpretations drawn from the two factor structures must be different. Referring to Tables XII and XIII, several of these similarities/differences are immediately apparent. Factors I and II for the two groups are similar, although the order of extraction is reversed. Factor I for the unimproved group change scores compares favorably to Factor II for the improved group change scores and vice versa.

Factor III requires further explanation because of the differences of the loadings for the two groups. The improved group loadings (ISS,

Intellectual and School Status; PAA, Physical Appearance and Attributes; P, Popularity; and TA, Teacher Approval) primarily reflect the achieving LD student's greater concern with his appearance and self-worth over the non-achieving LD student. The loadings of non-achieving students indicate a much more short-term, affective perspective. It is as if the experience of success is broadening the achieving LD student's perspective. He is becoming more aware of others and their opinions. The LD non-achiever continues to have a very shortsighted perspective. He is only concerned with his current feelings of happiness or anxiety; Factor III in the unimproved group contains primary loadings on Happiness and Satisfaction, and Anxiety.

Factor IV allows an even greater understanding of this process. For the LD achiever, his increasing concern over the opinions and attitudes of others is reflected as overt anxiety and perhaps guilt. Seemingly, as his anxiety increases so too does his motivation to achieve and to be regarded by others favorably. The LD underachiever's view is quite different. He perceives his popularity as dependent on acting impulsively. He is in effect stating that he misperceives himself to be more popular when he acts out in class rather than the reverse.

Factors III and IV indicate that the process of achievement gains would seem to provide concomitant change in the LD achiever's socialization. His perspective broadens, his concern over his behavior in relation to others increases, but so too do his anxiety and guilt increase over the prospect of failure. The LD underachiever is not developing increased perspectives or anxiety-induced motivation for achievement. Rather he remains concerned only that he receives immediate recognition through self-defeating, impulsive behavior.

Also, the unimproved group overall factor structure seems indicative of another aspect of the achievement process. Allen (1971) refers to the anxious underachiever as one who is self-disparaging and anxious. He speaks of this type of underachiever as being unable, for psychological reasons, to experience success. Interestingly, Factors III and IV for the unimproved group change scores seem to be implying just such a psychological (or internal) focus. Factor clusters that include such subscales as teacher approval illustrate that the achieving LD adolescent may be more interactive with his environment and tends to withdraw less when stymied by occasional failure. The factor loadings for the improved group cluster around the achieving LD student's interaction with his environment (acceptance of and by others, status needs and overt anxiety). This "shift" of focus is actually descriptive of the improvement process itself. Pearl et al. (1980) spoke of achieving LD children as gaining a measure of persistence and an ability to tolerate frustration without internally attributing failure to lack of ability. This shift necessarily widens the perspective of the achieving LD student. He becomes increasingly able to experience occasional failure without coincident decreases in persistence.

The differences in the two change score factor structures may also be interpreted as being a function of the direction of the changes in self-concept for the unimproved versus the improved groups. The direction of change that occurred for each of two groups of LD adolescent males was quite large. Earlier it was clearly demonstrated that the improved change scores were significantly higher on all measures of academic, personal, and social aspects of the self-concept as measured in this investigation (Research Question 3). Further, the unimproved group

change scores were all negative, indicative of the fact that minimal to moderate decrements in self-concept had occurred for the unimproved group. Therefore, the belief of this investigator is that the mere presence of these large changes in the two factor structures may, in part, be responsible for the factor pattern differences. In other words, the reason why the two factor structures differ is because the unimproved group showed little change of any nature, whereas the improved groups showed large positive changes. This would also partially explain why the factor structure for the unimproved group was similar to the pre-score factor structures. The implication is merely that the factor structures differ in at least five of the subscale measures and the factor patterns are also different only because the improved group change scores had increased over the two-year period, while the unimproved group change scores had remained stable.

The significance of the differences noted above has little predictive utility because the differences noted occurred in change scores after two years of remedial/tutorial aid in the resource room. These differences may in future research help in understanding how LD students react to lack of success in resource rooms; but the nature of these factor pattern differences remains of little help in predicting (at entry) whether an LD student will improve after placement in the resource room These differences are merely descriptive explanations speculatively postulated to account for the differing change score factor structures. Gorsuch (1974) warns against further interpretation of the factors of exploratory factor analytic studies in part because:

> Once a factor has been named, there is a tendency to reify it. It is assumed that the name is completely accurate and that the factor "explains" the variables. . . . Further research

> after the exploratory factor analysis is always necessary before one can begin to state legitimate operational representations of the construct. Manipulative experimental or quasi-experimental studies involving scores om the factor are . . . necessary before the factor can be interpreted. . . (p. 67).

Summary and Synthesis

The following serves to highlight and synthesize some of the findings of the study. It appears that females must be carefully examined on measures of self-concept that have restricted upper ranges due to their tendency to score substantially higher than males on the various subscales. When females score higher on these measures of self-concept, it then becomes necessary to omit them from cross-sex research on LD adolescents, because a ceiling effect may occur that might confound and cancel pre-post differences. Further, there may be adequate justification for differentiating between the instructional programs for LD males and LD females. Females do not possess the same degree of impairment in their self-concept as males. The prescriptive process may need to recognize these differences when devising individualized educational programs.

Concerning LD students' scores at entry into the resource room, no significant differences were found between students who later improve versus those who do not. Thus, at least for the measures used in this study, there was no basis upon which to predict which LD students who will show improvement and those who will not. The implication is that test scores alone are not necessarily sufficient indices of achievement to use in writing diagnostic prescriptive instructional programs. The factor structures of the two groups were substantially equivalent and therefore provided no basis for further inquiry into the nature of characteristic differences between achieving and nonachieving LD students.

Either the measures selected for use in this investigation are not sampling the relationship between academic achievement and personal and social adjustment, or a distinctive profile for achieving versus non-achieving LD adolescents does not exist.

Further research using different measures of self-concept may well find significant differences that would begin to establish a basis upon which a priori predictions of LD student performance could be made. The idea of being able to predict underachievement in the LD student remains intriguing but unfortunately beyond the reach of this study.

The findings of significant differences between the change scores of improved over unimproved LD adolescent males clearly establishes a strong claim for the efficacy of the resource room in providing for self-concept growth as well as academic achievement. Decrements in self-concept change scores for the unimproved group were consistent with external attribution of success and inrernal attribution of failure. The implcation is that teaching strategies may need to focus on teaching strategies of coping with failure. The factor structures were also shown to be substantially different. These differences clearly demonstrate that the LD student who improves is different not only from the LD student at entry but more importantly from LD students who do not improve. It was speculated that the differences noted might be due to a shift in the achieving LD student's locus of control attributions over the non-achieving LD student. Thus, the achieving LD students may be less inclined to interpret failure as lack of personal ability. Also, differences may have occurred merely because of the variability of the process of change (the improved group scores changed and the unimproved group scores did not change).

The implication was made that current reference testing is not adequately predictive of achievement. The current emphasis on achievement gains may well be inappropriately narrow. This study suggests that LD students require more than just academic tutoring--they need to be taught how to form appropriate, situation-specific loci of control. The resource room needs to foster increased independence and the LD underachiever needs to become more concerned over the opinions others have of him. In effect, he needs to become more anxious when he does not achieve. These statements require answers far different than current traditional diagnostic test batteries provide.

Suggestions for Further Research

The differences between the LD achiever and the LD nonachiever noted in this study point to several areas worthy of further inquiry. First, a measure of self-concept which does not possess the disadvantages of restricted range needs to be devised. Second, the relationship of academic achievement and self-concept might best be explored by several additional instruments in order to allow a more comprehensive understanding of the process of achievement within the LD population. For example, the motivation of the LD student needs to be assessed. Also, a structured interview could be utilized to measure the importance of effort, ability, task difficulty, and luck to LD achievers versus nonachievers. Finally, the LD student's perception of control in achievement situation (internal and external) needs to be measured.

REFERENCE NOTES

1. Numerous other studies have been published establishing the efficacy of the resource room with samples of mildly retarded or educably mentally retarded students (Carroll, 1967; Smith & Kennedy, 1967; Walker, 1974; Budoff & Gottlieb, 1976).
2. Several correlational studies have looked at personal/social adjustment for mildly retarded (EMR) students. Those studies which found significant pre-post gains were: Lapp, 1957; Flynn & Flynn, 1970; Guerin & Szatlocky, 1974; Flynn, 1974. One study did not obtain significant differences (Bruininks, Rynders & Gross, 1974).
3. Validity data on pages 19-21; reliability data on page 23 in the manual (Brown & Holtzman, 1967).
4. Validity data on pages 5-7, 16-17; reliability data on pages 4-5 in the manual (Piers & Harris, 1969).
5. The Oral Reading Test of the DARD was utilized to differentiate the students into their respective groups.

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APPENDIX A

PRINCIPLE COMPONENTS DATA FOR UNIMPROVED GROUP PRE-SCORES

TABLE XV

AVERAGE VARIANCE ATTRIBUTABLE TO SUCCESSIVE UNROTATED FACTOR EXTRACTIONS FOR UNIMPROVED GROUP PRE-SCORES*

Factor	Variance Explained	Cumulative Proportion of Total Variance
1	3.464	.346
2	3.009	.647
3	.871	.734
4	.673	.802
5	.610	.863
6	.432	.906
7	.361	.942
8	.291	.971
9	.163	.987
10	.125	1.000

*The variance explained by each factor is the eigenvalue for that factor. Total variance is defined as the sum of the diagonal elements of the correlation matrix.

TABLE XVI

CORRELATION MATRIX FOR UNIMPROVED GROUP PRE-SCORES

Subscales		1	2	3	4	5	6	7	8	9	10
DA	2	1.000									
WM	3	0.736	1.000								
TA	4	0.454	0.661	1.000							
EA	5	0.558	0.724	0.804	1.000						
B	6	0.085	0.110	-0.024	-0.115	1.000					
ISS	7	-0.039	0.146	-0.103	-0.029	0.401	1.000				
PAA	8	-0.109	-0.130	0.215	0.231	0.306	0.609	1.000			
A	9	0.168	0.066	-0.053	-0.035	0.466	0.356	0.411	1.000		
P	10	-0.006	0.026	0.041	-0.001	0.405	0.564	0.524	0.549	1.000	
HS	11	0.097	0.056	0.012	0.127	0.491	0.471	0.421	0.596	0.647	1.000

TABLE XVII

RESIDUAL CORRELATION MATRIX FOR UNIMPROVED GROUP PRE-SCORES*

Subscales	1	2	3	4	5	6	7	8	9	10
DA	211									
WM	051	107								
TA	077	026	154							
EA	038	048	042	118						
B	181	035	136	051	325					
ISS	051	002	009	009	005	140				
PAA	076	037	037	002	050	164	247			
A	014	002	050	045	137	008	064	274		
P	061	015	060	026	017	019	055	070	167	
HS	028	030	010	043	078	027	027	132	068	240

*Decimals have been omitted.

APPENDIX B

PRINCIPLE COMPONENTS DATA FOR IMPROVED GROUP PRE-SCORES

TABLE XVIII

AVERAGE VARIANCE ATTRIBUTABLE TO SUCCESSIVE UNROTATED FACTOR EXTRACTIONS FOR IMPROVED GROUP PRE-SCORES*

Factor	Variance Explained	Cumulative Proportion of Total Variance
1	4.969	.497
2	2.259	.723
3	1.076	.831
4	.503	.881
5	.314	.912
6	.237	.936
7	.231	.959
8	.198	.979
9	.140	.993
10	.069	1.000

*The variance explained by each factor is the eigenvalue for that factor. Total variance is defined as the sum of the diagonal elements of the correlation matrix.

TABLE XIX

CORRELATION MATRIX FOR IMPROVED GROUP PRE-SCORES

Subscales										
DA	1.000									
WM	0.799	1.000								
TA	0.680	0.678	1.000							
EA	0.881	0.769	0.792	1.000						
B	0.526	0.396	0.528	0.611	1.000					
ISS	0.335	0.318	0.349	0.425	0.281	1.000				
PAA	0.148	0.092	0.095	0.164	0.190	0.698	1.000			
A	0.301	0.219	0.224	0.398	0.672	0.351	0.474	1.000		
P	0.077	-0.040	0.102	0.179	0.579	0.491	0.542	0.547	1.000	
HS	0.343	0.271	0.365	0.482	0.743	0.498	0.489	0.662	0.720	1.000

TABLE XX

RESIDUAL CORRELATION MATRIX FOR IMPROVED GROUP PRE-SCORES

Subscales	1	2	3	4	5	6	7	8	9	10
DA	132									
WM	045	159								
TA	079	049	174							
EA	009	060	027	089						
B	004	004	013	027	085					
ISS	018	012	031	003	026	111				
PAA	007	017	051	011	017	088	097			
A	051	028	071	003	020	040	035	070		
P	051	046	047	005	026	034	007	016	120	
HS	012	032	033	003	044	019	001	036	064	155

*Decimals have been omitted.

APPENDIX C

PRINCIPLE COMPONENTS DATA FOR UNIMPROVED GROUP CHANGE SCORES

TABLE XXI

AVERAGE VARIANCE ATTRIBUTABLE TO SUCCESSIVE UNROTATED FACTOR EXTRACTIONS FOR UNIMPROVED GROUP CHANGE SCORES*

Factor	Variance Explained	Cumulative Proportion of Total Variance
1	3.107	.311
2	2.369	.548
3	1.237	.661
4	.994	.740
5	.658	.806
6	.570	.863
7	.447	.907
8	.396	.947
9	.317	.979
10	.214	1.000

*The variance explained by each factor is the eigenvalue for that factor. Total variance is defined as the sum of the diagonal element of the correlation matrix.

TABLE XXII

CORRELATION MATRIX FOR UNIMPROVED GROUP CHANGE SCORES

Subscales	1	2	3	4	5	6	7	8	9	10
DA	1.000									
WM	0.371	1.000								
TA	0.113	0.478	1.000							
EA	0.357	0.479	0.611	1.000						
B	0.198	0.216	0.236	0.075	1.000					
ISS	0.317	0.095	0.059	-0.129	0.533	1.000				
PAA	0.198	-0.145	-0.172	-0.206	0.412	0.637	1.000			
A	0.131	0.008	0.161	-0.238	0.287	0.451	0.475	1.000		
P	-0.137	0.011	0.129	-0.114	0.363	0.315	0.416	0.376	1.000	
HS	0.081	0.022	0.000	-0.143	0.232	0.475	0.313	0.368	0.306	1.000

TABLE XXIII

RESIDUAL CORRELATION MATRIX FOR UNIMPROVED GROUP CHANGE SCORES*

Subscales										
DA	157									
WM	069	344								
TA	007	129	200							
EA	018	152	049	265						
B	043	005	063	073	308					
ISS	079	030	066	042	034	257				
PAA	034	002	038	083	145	043	230			
A	018	051	013	053	048	129	070	446		
P	152	036	092	030	140	084	002	007	259	
HS	002	112	001	047	089	004	043	177	055	136

*Decimals have been omitted.

APPENDIX D

PRINCIPLE COMPONENTS DATA FOR IMPROVED GROUP CHANGE SCORES

TABLE XXIV

AVERAGE VARIANCE ATTRIBUTABLE TO SUCCESSIVE UNROTATED FACTOR EXTRACTIONS FOR IMPROVED GROUP CHANGE SCORES*

Factor	Variance Explained	Cumulative Proportion of Total Variance
1	3.738	.373
2	1.899	.564
3	1.248	.688
4	1.034	.772
5	.698	.832
6	.463	.878
7	.379	.916
8	.319	.948
9	.285	.976
10	.237	1.000

*The variance explained by each factor is the eigenvalue for that factor. Total variance is defined as the sum of the diagonal elements of the correlation matrix.

TABLE XXV

CORRELATION MATRIX FOR IMPROVED GROUP CHANGE SCORES

Subscales	1	2	3	4	5	6	7	8	9	10
DA	1.000									
WM	0.687	1.000								
TA	0.500	0.415	1.000							
EA	0.635	0.618	0.601	1.000						
B	-0.096	-0.009	0.244	0.170	1.000					
ISS	0.147	0.108	0.303	0.154	0.051	1.000				
PAA	0.227	0.272	0.323	0.247	0.117	0.519	1.000			
A	0.213	0.293	0.241	0.381	0.442	0.153	0.411	1.000		
P	0.060	0.036	0.341	0.200	0.423	0.398	0.494	0.393	1.000	
HS	0.101	0.261	0.326	0.283	0.510	0.224	0.199	0.269	0.473	1.000

TABLE XXVI

RESIDUAL CORRELATION MATRIX FOR IMPROVED GROUP CHANGE SCORES*

Subscales	1	2	3	4	5	6	7	8	9	10
DA	202									
WM	070	256								
TA	060	127	320							
EA	084	110	022	238						
B	038	004	027	010	194					
ISS	005	021	068	027	072	218				
PAA	028	026	009	019	023	129	195			
A	008	040	045	014	059	076	098	109		
P	060	008	022	012	090	131	056	041	289	
HS	000	102	172	061	126	004	057	027	066	260

*Decimals have been omitted.

APPENDIX E

COSINE MATRICES FOR FACTOR VECTORS

TABLE XXVII

COSINE MATRIX FOR THE FACTOR VECTORS OF THE UNIMPROVED AND IMPROVED ROTATED FACTOR STRUCTURES (PRE-SCORES ONLY)*

Subscales		Factor 1	Factor 2	Factor 3
1	(DA)	.8301	.1546	.0591
2	(WM)	.8292	.0119	.1027
3	(TA)	.8806	.2159	.0505
4	(EA)	.8605	.2961	.1166
5	(B)	.4132	.8491	-.0553
6	(ISS)	.3292	.2085	.8539
7	(PAA)	-.0589	.2636	.8958
8	(A)	-.0024	.7385	.2439
9	(P)	-.0600	.8056	.4158
10	(HS)	.2315	.8321	.3131

*The cosine matrix represents the relationship between the factors after the two sets of test vectors have been aligned for maximum contiguity. The test correlations are determined by pre-multiplying this matrix and the factor structure cosine matrix. This process "rotates" the factor axes to the position of maximum contiguity and prints ten test correlations.

TABLE XXVIII

COSINE MATRIX FOR THE FACTOR VECTORS OF THE UNIMPROVED AND IMPROVED ROTATED FACTOR STRUCTURES (CHANGE SCORES ONLY)*

Subscales	Factor 1	2	3	4
1 (DA)	.0805	.6389	.1012	.6230
2 (WM)	.0587	.6052	.2752	.6046
3 (TA)	.3007	.6872	.2425	.0996
4 (EA)	.1149	.6701	.4287	.4540
5 (B)	.1377	.1181	.8686	-.3638
6 (ISS)	.7722	.0930	-.1850	-.0504
7 (PAA)	.7903	-.0622	.2070	.3278
8 (A)	.3535	-.0728	.8959	.4289
9 (P)	.6515	.0733	.4687	-.2298
10 (HS)	.2386	.4725	.5523	-.4162

*The cosine matrix represents the relationships between the factors after the two sets of test vectors have been aligned for maximum contiguity. The test correlations are determined by pre-multiplying this matrix and the factor structure cosine matrix. This process "rotates" the factor axes to the position of maximum contiguity and prints ten test correlations.

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