

*SELF DESCRIPTION  
QUESTIONNAIRE - III*

*SDQ III*

*MANUAL*

*HERBERT W. MARSH*

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## Acknowledgments

I would like to thank the many colleagues and students who have contributed to the research described in this Manual. In particular I would like to acknowledge the support of Ian Smith, Jennifer Barnes, Raymond Debus, Samuel Ball, John Parker and Barbara Byrne. Above all, I would like to thank Richard Shavelson, whose theoretical model of self-concept was the basis for the instrument and research described in this Manual and who provided support and critical evaluation of the research.

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## The Self Description Questionnaire (SDQ) III:

A Theoretical and Empirical Basis For the Measurement of Multiple  
Dimensions of Late Adolescent Self-Concept: An Interim Test Manual  
and A Research Monograph

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PRELIMINARY DRAFT

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## CHAPTER 1 -- AN INTRODUCTION TO THE SELF DESCRIPTION QUESTIONNAIRE (SDQ) III

The SDQIII is one of a series of three instruments designed to measure self-concepts for preadolescents (SDQI; Marsh, 1988), young adolescents (SDQII; Marsh, in press), and late adolescents and young adults (SDQIII). The initial instrument, the SDQI, and its extensive research basis is described in the original SDQI monograph Marsh (1988). Because the SDQII and SDQIII are based upon the SDQI instrument and SDQ research, much of the background for these instruments is also contained in the SDQI monograph. Ultimately, the intention is to produce a single monograph that serves as a research manual and description of research with all three instruments. In that sense, the purpose of this monograph, the SDQIII monograph, is to serve as an interim test manual and description of research with the SDQIII.

The organization of this, the SDQIII monograph, closely follows that of the original SDQI monograph. The first three chapters are designed to provide: a) a brief overview of the SDQIII and research described in subsequent chapters (Chapter 1); b) instructions on how to administer and score the SDQIII (Chapter 2), and a description of the normative comparisons for SDQIII responses and how to interpret the SDQIII scores (Chapter 3). In addition, the potential test user is encouraged to study carefully the more detailed information presented in subsequent chapters and in the SDQI monograph in order to more fully understand the basis of the SDQIII and its strengths and limitations.

#### A General Description of the SDQIII and its Administration

The 136-item SDQIII can be completed in approximately 20-25 minutes. The SDQIII assesses 4 areas of academic self-concept, 8 areas of nonacademic self-concept, and a General-self scale derived from the Rosenberg (1965; 1979) self-esteem scale. The 13 scales of the SDQIII are listed in Table 1.1. On the SDQIII, late-adolescent children are asked to respond to simple declarative sentences (e.g., I am good looking; I worry a lot; I have trouble with most academic subjects) with one of 8 responses: Definitely False; False; Mostly False; More False Than True; More True Than False; Mostly True; True; Definitely True. Each of the 13 SDQIII scales is inferred on the basis of responses to 10 or 12 items, half of which are negatively worded.

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The SDQIII is typically administered to groups but it can also be administered individually. For group administration, the administrator typically reads the instructions on the front of the instrument and then each individual completes the instrument. No special training is required for the administration of the test. In fact the SDQIII is designed to be self-explanatory and can be completed by respondents without any additional instructions (e.g., as part of a mail survey). It typically takes respondents no more than 20 minutes to complete the SDQIII, though some respondents make take longer if not encouraged to complete the instrument within a given time limit.

The SDQIII was intended for use by late adolescents, generally in the age range of 16-25. Whereas the SDQIII may be suitable for even younger respondents, the reading level may be inappropriate and users are encouraged to consider the SDQI or SDQII. The SDQIII is also appropriate for older respondents, though there are important components of adult life that are not included on the SDQIII.

Norms based on responses by a total of 2,436 Australian subjects are presented for each of the SDQIII scales and for the total score (Appendix I). Since SDQIII responses vary somewhat according to age and sex, separate norm tables are also presented for each sex at age levels.

#### A Brief Summary of The Theoretical Basis of the SDQ Instruments

##### The Shavelson Model of Self-concept

The construct, self-concept, has been widely evoked to explain overt behaviors across a wide spectrum of situations, and the attainment of a positive self-concept has been posited as a desirable goal in education, in child and personality development, in clinical treatments, and in a wide variety of other settings. Its importance notwithstanding, reviews of research and evaluations using self-concept continue to point out important shortcomings such as the lack of a theoretical basis for defining and interpreting the construct and particularly the poor quality of measurement instruments used to assess it. In an attempt to remedy this situation, Shavelson, Hubner and Stanton (1976; see Chapter 5) posited a multifaceted, hierarchical model of self-concept, and reviewed well known criteria for evaluating the measurement of self-concept. This model served as the basis for all three SDQ instruments.

Self-concept is a hypothetical construct, the usefulness of which must be demonstrated by investigations of the construct validity of interpretations of scores on instruments designed to measure it. As argued by Marx & Winne (1978), the identification of theoretically consistent and distinguishable facets of self-concept (within-network studies) is a prerequisite to the study of how self-concept facets are related to other constructs (between-network studies). Within-network studies of self-concept focus on the development of theoretical models of self-concept and of measurement



instruments that are consistent with these models. Between-network studies correlate self-concept indices with, for example, measures of ability/performance, self-concept ratings inferred by external observers, behavioral observations, family background variables, experimental manipulations, and other self-report measures. Whereas within-network studies were the focus of most early SDQ research, more recent research has focused on between-network issues.

Systematic reviews of self-concept research have pointed to the lack of a theoretical basis for, and the poor quality of, the measurement instruments used in most studies (e.g., Burns, 1979; Shavelson, et al., 1976; Wells & Marwell, 1976; Wylie, 1974; 1979). Shavelson, et al. used their review as the basis for developing a self-concept model, one that incorporates aspects from most theoretical positions. For purposes of this monograph, the most important tenets of the Shavelson model are that self-concept is multidimensional, that the facets of self-concept become more distinct with age, and that the facets are hierarchically arranged.

#### The SDQI and the SDQIII

The original SDQI is a measure of preadolescent self-concept. It provided one basis for the design of the SDQIII described here. The SDQI was specifically designed to measure three areas of academic self-concept (Reading, Mathematics, and General-School) and four areas of nonacademic self-concept (Physical Abilities, Physical Appearance, Peer Relations, Parent Relations), all derived from the Shavelson model. Subsequently, based in part on SDQIII research, the SDQI was revised to contain a General self scale. These factors have been identified in independent factor analyses of responses by diverse populations of preadolescent children and SDQ responses are systematically related to a wide variety of validity criteria (see SDQI Manual).

The bulk of research on self-concept has been conducted on, and a majority of the measurement instruments have been designed for, preadolescent or early adolescent children (see Burns, 1979; Wylie, 1974; 1979). This is surprising for a number of reasons. First, many important and interesting theoretical questions in the study of self-concept can be studied more easily with older children who have better verbal skills. Second, a well developed instrument for late adolescents would be a valuable tool for the study of university students, for the evaluation of university programs, for use in university counseling centers, and for use in studies of late-adolescents who are not in university settings (see Chapter 9). Third, particularly in the United States, it appears that the most readily available pool of subjects for research is university students. Nevertheless, the self-concept research that has been conducted on this older age group has typically relied upon instruments that are not well standardized, that were developed for use with younger children, or that do not differentiate adequately between areas of self-concept felt by these students to be important.

The SDQIII is designed specifically for this late adolescent population, and the validity of interpretations of scores on this instrument are examined in this monograph. The SDQIII is based upon the Shavelson model and previous research with the SDQI. The first version of the SDQIII contained the seven scales from the original SDQI (except that the Peer scale was divided into Same Sex and Opposite Sex scales) and additional scales for Emotional Stability, Problem Solving/Creative Thinking, and a General-Self scale (based on the Rosenberg self-esteem scale described by Rosenberg (1965; 1979) and the modification by Bachman, 1970) that was subsequently incorporated into the SDQI as well. An item pool of 180 items used to represent these 11 facets of self-concept was administered to a sample of university students. These students were also asked to identify important areas not included in the survey. Item analysis and factor analysis of the students' responses to the 180 items confirmed the presence of 11 self-concept factors, and provided a basis for selecting items for the current version of the SDQIII. However, substantial numbers of students indicated that religion/spiritual values and honesty/trustworthiness were important to their self-conceptions, and noted that these areas were not represented on the questionnaire. Whereas moral components of self-concept such as these were not specifically posited on the Shavelson model, such components have been considered by self-concept researchers from the time of William James (1963/1980). Hence, additional items to measure these two areas were constructed and administered to a new sample of students. The addition of items for these two areas and the selection of the most effective of the items for the other 11 areas eventually resulted in the present version of the SDQIII containing 136 items and measuring 13 self-concept facets.

#### A Brief Description of Empirical Research With the SDQIII

Within-network research, the identification of the salient components of self-concept and how they are related to each other, was the initial focus of SDQIII research; the main empirical tools for this type of research are reliability analyses, factor analyses, and multitrait-multimethod analyses. The coefficient alpha estimates of reliability (Chapter 4) for each scale and for the total scores are substantial (median  $r_{xx} = .9$ ), whereas the average correlation among the factors is modest (median  $r = .2$ ). Numerous factor analyses of responses to the SDQIII have each identified the factors that the instrument is designed to measure (Chapter 5). Numerous applications of multitrait-multimethod analyses have further demonstrated the distinctiveness of the different factors (Chapters 10 & 11). These studies demonstrate that the SDQIII reliably measures distinct facets of self-concept. Self-concept in the Shavelson model is defined to be hierarchically-ordered, as well as multifaceted. Recent advances in the application of hierarchical factor analysis have been applied to test the hierarchical structure of responses to the SDQIII and are discussed in Chapter 5.

Self-concept is a theoretical construct and so it is appropriate to use a construct validation approach to testing the validity of responses to the SDQIII. Such an approach requires that SDQIII responses be related to a wide variety of external criteria, and that each of its factors be significantly correlated with other constructs to which it is logically related and less correlated with other constructs to which it is logically unrelated. In validity research to be described in subsequent chapters, responses to the SDQIII are related to: sex, age, student achievement in particular subject areas,

ratings of multiple self-concepts by significant others (i.e., inferred self-concepts), responses to other self-concept instruments and experimental interventions designed to enhance self-concept. SDQIII responses are systematically related to these external criteria in a way that is consistent with the theory, thus supporting the construct validity of interpretations of responses to the SDQIII.

Self-concept researchers and practitioners face an important dilemma in assessing changes in self-concept. From the perspective of measurement theory and, perhaps, mental health, it is important that self-concept is relatively stable over time. However, much of the interest in self-concept stems from proposed changes in self-concept due to naturally occurring developmental or environmental changes and particularly due to interventions specifically designed to enhance self-concept. In fact, self-concept is stable over time, and despite claims to the contrary, very few interventions are sufficiently powerful to have any measurable effect on self-concept. The failure of most interventions to show a measurable effect apparently stems from the use of interventions that are inherently weak, from the application of potentially powerful interventions to such a small number of subjects that changes cannot be reliably inferred, and from the use of self-concept instruments that do not measure specific components of self-concept that are logically related to the intended effects of the intervention. An important area of SDQIII research is the study of interventions, the effects of interventions on responses to the SDQIII, and the examination of alternative explanations of these effects (Chapter 9).



## CHAPTER 2 -- ADMINISTERING AND SCORING

### Administration Instructions

Instructions for completing the SDQIII are printed on the first page of each instrument. When the SDQIII is administered to a large group these instructions are typically read aloud by the administrator before respondents begin responding to the SDQIII items. Early experience indicated, however, that the SDQIII is self-explanatory for respondents who are at least 16 years old and have an adequate command of English. Thus, for example, Marsh, Richards, and Barnes (1986a; 1986b) used the SDQIII as part of a mail survey to participants in the Outward Bound program. The psychometric properties and factor structure for SDQIII responses from this mail survey were essentially the same as for a subsequent administration of the SDQIII to the same individuals by trained administrators. For this reason no special training is needed to administer the SDQIII.

As part of the instructions respondents are told that their responses will be kept confidential. It is the responsibility of the examiner to honor this promise. If some aspect of this assurance is not applicable, it should be omitted, but respondents should be told of these special circumstances. These circumstances may also affect student responses so that generalizations described in this Manual may not be appropriate.

The time taken to complete the SDQIII, because it is a self-paced instrument, will vary. Typically most respondents complete the SDQIII within 20 minutes, though a few may take 30 minutes or even longer. If the time available for completing the SDQIII is limited, then respondents should be informed of these limits and told the amount of time left to complete the instrument once or twice during the administration. It is recommended that respondents be given at least 30 minutes to complete the SDQIII.

When the preadolescent version of the SDQ, the SDQI, is administered to young children it is recommended that all the items are read aloud. This "read aloud" procedure facilitates the administration for children with limited reading skills. For group administration it also standardized the time taken to administer the SDQI so that everyone finishes at the same time. This procedure is NOT recommended for the administration of the SDQIII. In some special circumstances -- for example with respondents with limited reading ability -- this approach may be useful. If this "read aloud" procedure is to be used, the administrator should refer to the SDQI manual for further instructions. Alternatively, the user may consider the use of the (early/middle adolescent) SDQII which is less verbally demanding than the SDQIII.

### Hand Scoring the SDQIII

#### Calculating Raw Scale and Total Scores

Responses to the SDQIII can be either hand-scored or computer-scored. Responses to the SDQIII may be scored conveniently using the SDQIII Scoring and Profile Booklet. The Booklet provides for the calculation of individual scale raw scores and a total raw score.

**Individual Scale and Total Raw Scores.** To compute these raw scores begin by copying the identification information from the front of the respondents SDQIII instrument to the top of the SDQIII Scoring and Profile Booklet.

Calculation of the individual raw scores and total raw score is done on the Score Calculation and Summary page in the Scoring and Profile Booklet. Begin by scoring the individual scales. In the first section of the Score Calculation and Summary page, under the name of each scale, there are: (a) a column of items numbers that comprise the scale, (b) asterisks indicating negatively worded items that are to be reverse scored, (c) blanks in which the respondent's item scores should be recorded, and (d) item means (in parentheses). Using the respondent's Questionnaire, find the respondent's response to item 1. For item 1 (and all subsequent items without an asterisk) convert the response to the item into one of the following scores: 1 = Definitely False, 2 = False, 3 = Mostly False, 4 = More False Than True, 5 = More True Than False, 6 = Mostly True, 7 = True, and 8 = Definitely True. Write the appropriate score for item 1 in the blank after the item number. Item 2 (and all subsequent items with an asterisk) is a negatively worded item and must be reverse scored. This can be conveniently done by subtracting the value of the item response from 9 so that 8 = Definitely False, 7 = False, 6 = Mostly False, 5 = More False Than True, 4 = More True Than False, 3 = Mostly True, 2 = True, and 1 = Definitely True. Thus, for example, the response of "True" for item 1 would be scored as "7" whereas a response of "True" for item 2 would be scored as a "2" since it is reverse scored. Repeat this procedure for the remaining items, making sure to reverse score items marked with asterisks.

If the respondent omits seven or fewer responses, the mean response for the missing item should be substituted for the missing item score. Item means are listed in parentheses following the blanks next to their respective item numbers on the Score Calculation and Summary page. If there are eight or more responses missing, the entire SDQIII instrument should not be scored at all or should be interpreted very cautiously.

After all the individual items have been recorded visually scan the scores for items in each column. Because the responses to the negatively worded items have been reverse scored, all the scores in each column will typically be reasonably similar. If there are any discrepant responses check to be sure that you have recorded the response correctly and that you have appropriately reverse scored the item if it is marked with an asterisk.

After checking the items, simply sum the scores in each column to arrive at the individual scale raw scores. For example, sum the scores for Items 1, 14, 27, 40, 53, 66, 79, 92, 105, and 118 to arrive at the raw score for the Math scale. Write the sum for each scale in the blanks labeled "Individual Raw Scores" that appear below each column of item numbers. [A hand-held calculator may facilitate these calculations.] When an item mean has been substituted for a missing value, the sum of the items for that scale will not be a whole number. For purposes of hand scoring it is recommended that the sum should be rounded to the nearest whole number.

Users are cautioned to make certain the each item has been translated into the correct score, has been appropriately reverse scored if the item is marked with an asterisk, and has been written in the blank next to correct item number. In addition, after summing the item responses for each scale, the scale score should be checked by recalculating it to avoid errors in addition. Note that for each score the lowest possible raw score is either 10 or 12, depending on whether the particular scale has 10 or 12 items, and that the highest possible raw score is either 80 or 96.

The individual scale raw scores are used to calculate the Total Self raw score. To calculate the Total Self score copy each of the raw scale scores in the appropriate blanks in the section labeled "Total Self-Concept." Then, sum the 13 scores and write the total in the space labeled "Total Self-Concept." [A hand-held calculator may facilitate this calculation.] Whether computed by hand or with a calculator, users are cautioned to double check their calculations to avoid errors in addition. The lowest possible total self-concept score is 136 whereas the highest possible score is 1088.

An example of a completely scored Score Calculation and Summary page from an SDQIII Scoring and Profile Booklet is provided in Figure 2.1.

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### Converting Raw Scores To Normative Scores

Raw scores for the SDQIII individual scales and their total may be converted to mid-interval percentile ranks and and standard scores -- in this case (non-normalized) T-scores. T-scores have a mean of 50 and a standard deviation of 10.

Normative comparisons are reported separately for males up to 21 years of age, males more than 21 years of age, females up to 21 years of age, and females more than 21 years of age (Appendix 1B-1E). A combined norm table (Appendix 1A), based on responses by males and females of all ages is also presented and may be useful in making group comparisons.

To use the norms tables, locate the appropriate row in the table for each raw score. Then find the column entries for the percentile or T-score for that scale (e.g., Math percentiles are in the first column of percentiles). Enter these normative values in the spaces provided at the bottom of the T-score Profile part of the Scoring and Profile booklet. Figure 2.1 is an example of a completed T-score Profile.

### The Computer Scoring the SDQIII

A detailed computer scoring program has been designed for scoring the SDQIII, but is not yet available. Users will be encouraged to use this program instead of the hand-scoring sheet if computer facilities are available and particularly if large numbers of responses are processed. The scoring program automatically computes the scores derived from the hand-scoring sheet, estimates the reliability of each SDQIII scale score and the total score comparable to those in Chapter 4, conducts a factor analysis like those presented in Chapter 5, computes factor scores based on the factor analysis of the users own data and computes factor scores based on a factor analysis of all SDQIII responses contained in the normative archive (see Table 5.1). Users interested in this facility are encouraged to make inquiries to the publisher as to when it will be available. In the meantime, each of these procedures is easily performed with statistical packages that are readily available to many researchers.

Factor analysis has played an important role in the development of the SDQIII, and much of the published research described later is based upon factor scores used to represent the SDQIII facets. These factor scores are based upon analytically weighted responses rather than the unweighted sums used to determine scale scores. While factor scores and the unweighted scale scores are substantially correlated, factor analytically derived scores distinguish better among the SDQIII facets than do the unweighted scale scores, and they are more clearly related to various criterion measures. It is anticipated that the SDQIII will often be used in large-scale research projects where the user has ready access to computers. In such instances, users are encouraged to use factor scores derived from factor analyses rather than -- or in addition to -- the raw scale scores, particularly when one focus of the research is to distinguish between different facets of self-concept.

Factor score coefficients based on a factor analysis of the entire SDQIII archive are presented in Appendix III. These factor score coefficients can be used to compute factor scores that are scaled in relation to responses to the normative archive and thus provide an additional normative basis of comparison. Because this factor analysis is based on such a large sample size and provides such good support for the SDQIII factor structure, the use of these factor scores is recommended even if the user also computes factor scores based on just their own data.



## CHAPTER 3 -- NORMS DEVELOPMENT AND INTERPRETATION

This chapter describes the standardization sample and the development of the norms contained in Appendix 1A - IE and presents guidelines for interpreting the SDQIII responses.

### Norms Development and Interpretation

In this initial publication, the norms are based on all sets of responses in a set of research studies conducted by the author and his colleagues in which subjects completed the entire SDQIII instrument (studies in which only selected scales were administered were excluded). The norms consist of 2,436 sets of responses by Australians between the ages of 13 and 48 (mean = 20.9, SD = 2.6, less than 1% were under 16, and 7% were older than 26). Approximately 2/3 of the responses were made by students so that this group may be over-represented in the norms. Only 37% of the responses were made by women so that the total group norms (but not norms tables for each sex) are not balanced in terms of sex. Whereas the studies using the SDQIII considered a wide and varied set of subjects, there are likely to be idiosyncratic characteristics associated with each of the different samples in the total normative group. Also, whereas there are a total of 2,436 sets of responses, Outward Bound participants completed the SDQIII as many as four different times during a 22 month period (Marsh, Richards & Barnes, 1986a, 1986b). Hence, this set of 2,436 responses represents only 1,093 different respondents. Because of these limitations in the normative sample, it is important that interpretations based on comparisons with the normative sample be interpreted cautiously.

### Rationale For the Use of Nonnormalized T-Scores

Norms for the SDQIII individual scale and total scores are presented as mid-interval percentiles and nonnormalized T-scores. This section presents an overview of the rationale for and underlying assumptions of the use of T-scores.

The comparison of scores for different groups, or scores for the same group at two points in time, is easily accomplished so long as comparisons are made on the same SDQIII scale. The form of the scores used to represent the particular SDQIII scale -- raw scores, nonnormalized T-scores, etc. -- will have little effect on the interpretation of such comparisons. This sort of comparison has been the basis of most SDQ research and will be the focus for many SDQIII users. Even when comparisons are made of different individuals, or the same individual at two points in time, the form of the score will not substantially affect the interpretation so long as the comparisons are made on the same scale. A very different situation, however, exists when comparisons are made between different SDQIII scales (e.g., verbal and math self-concepts) as might be the case in some diagnostic applications or in profile analyses. Such a question, for example, might be whether a respondent has a higher Math or Verbal self-concept. For this type of comparison, the form of the score is very important.

In order to compare different scales, it is necessary to equate the different scales. Except in special circumstances, this requires some sort of transformation. One type of transformation, such as z-scores and nonnormalized T-scores, equates the means and standard deviations of the different scores but does not affect the shapes of the distributions of scores. A second type of transformation, such as stanine scores and normalized T-scores, forces each distribution of scores to be normally distributed as well as having the same mean and standard deviation. Both types of transformations are based on implicit, typically untestable assumptions about the true underlying distributions of responses to different scales.

The use of the nonnormalized transformations (e.g., z-scores and nonnormalized T-scores) assume that the true underlying mean and standard deviation of each area of self-concept are really the same and that it is only the observed means and standard deviations that differ. Whereas this type of transformation is used widely in all areas of psychological testing, it may have important limitations. For example, this approach assumes that respondents do not have systematically higher Verbal self-concepts than Math self-concepts. For the (preadolescent) SDQI -- but not the SDQIII -- the wording of the items on the Reading and Math scales is strictly parallel except for the words "Reading" and "Mathematics." For this special case it might be justified to interpret differences in raw scale scores. Inspection of the raw scale scores for the SDQI indicates that Math self-concepts -- particularly for girls -- are systematically lower than Reading self-concepts. Based on intuition and discussions with students who have completed the SDQI, the author suggests that these raw score differences might be "real." If, however, scores are standardized to have the same mean (e.g., 50 for T-scores) than this possibly "real" difference between Math and Reading self-concepts would be lost. If scores are standardized separately for boys and girls, then the possibly "real" sex differences in Reading and Math self-concepts would also be lost. Whereas the use of such transformations is often justified and frequently the only practical solution, interpretations of these transformed scores should be made cautiously and should be made in relation to substantive considerations.

The use of normalized scores further assumes that the underlying distribution of self-concepts is the same and normally distributed. Again, this assumption needs to be considered carefully. Responses to each of the SDQIII scales

at least moderately skewed (-.04 to -.92; see Appendix 1A). Intuitively, the author suggests that the underlying self-concepts may actually be negatively skewed; that is, most respondents tend to feel positively about themselves, and only rarely does a respondent feel very negatively about himself or herself. For example, the most negatively skewed SDQIII scale is the Parents Relations scale. Whereas it is possible that some of this skew is due to the idiosyncratic wording of the items in this scale, it also appears to be the scale in which respondents self-concepts are most uniformly high. It is also interesting to note that the Parents scale for the (preadolescent) SDQI was much more negatively skewed (-1.7) than any of the other SDQI scales or the Parents scale on the SDQIII. Whereas there are many possible explanations, one having intuitive appeal is that as children grow into adulthood their perceptions of their relationships with their parents are less uniformly positive. If the underlying distributions of self-concepts are negatively skewed, then it may be inappropriate to normalize the response distributions.

In addition to problems in validating the implicit assumptions underlying these different transformations, there are also technical difficulties in applying them. For example the skewness may be so extreme as to preclude the appropriate use of normalized T-scores. For the preadolescent SDQI responses this was the case as skewness for the 8 specific scales varied from -.41 to -1.75 (median = -.79). SDQIII responses are much less skewed, -.04 to -.92 (median = -.52), but still sufficiently skewed that discrimination at the top end of the distributions is not very good for some of the scales. (For both the SDQI and SDQIII, the total scores are less skewed than the individual scales.)

For each SDQIII raw score, a standardized, nonnormalized T-score is generated by subtracting the mean and dividing by the standard deviation of raw scores for each scale, and then multiplying the resulting z-scores by 10 and adding 50 (Angoff, 1984). This is the same procedure used for the SDQI and SDQII, and used with other profiles such as for the MMPI. These standard T-scores are comparable in terms of standard deviation units such that 40T is one standard deviation below the normative mean and 60T is one standard deviation above the normative mean. The user should keep in mind, however, that because the individual scales have skewed distributions, the proportion of scores falling above the mean is greater than the proportion of scores falling below the mean. Thus 40T and 60T are not equidistant from the mean in terms of the percentile ranks.

### The Interpretation of the SDQIII Scores

#### The Comparison of Different Scales

The comparison of different scales for the same individual respondent provides a special set of problems in the appropriate scaling of SDQIII responses that is common to most areas of psychological measurement. Consider, for example, the question of whether a respondent has a higher Math or Verbal self-concept. The issue of the appropriate scores to answer this question is left to the informed reader. Three approaches could be used for SDQIII responses: the comparison of raw scale scores; the comparison of percentiles; and the comparison of standard scores (e.g., z-scores, nonnormalized T-scores) that equate the means and standard deviations for all scales in relation to responses to a normative sample. These approaches are discussed below.

Raw Scores. One approach is simply to compare the raw scale scores. This approach, however, is rarely defensible. For personality-type tests, minor wording changes in a few items on one scale could systematically increase or decrease all scores on that scale relative to scores on other scales. (A similar caution applies to the comparison of achievement test scores in different content areas). For this reason differences between two raw scale scores generally should not be used to infer underlying self-concept differences. [A possible exception to this generalization, as already discussed, is the comparison of the academic scales for the SDQI in which the wording of the items is strictly parallel. None of the SDQIII scales, however, have parallel wording and so this consideration does not apply to the SDQIII.]

Percentiles. When raw scores are converted to percentiles, the respondent's relative position in the standardization sample can be identified. The percentile is the percentage of respondents in the standardization sample whose scores fell below the respondent's scores. Since half the standardization necessarily had self-concepts falling between the 25th and 50th percentiles, scores in this range are neither particularly high nor particularly low. In addition, because responses are negatively skewed, small differences at the high end of the scale can result in large percentile differences. Even in the middle range it may only be reasonable to assume that a respondent has an average self-concept. From this perspective, scores at the low end of the scale may be more diagnostically meaningful.

T-scores. Because the total and individual scale scores vary in terms of their distributions, comparisons between T-scores for representing different scales should be made carefully. When the T-scores for two different scales are the same, the corresponding percentiles will only be the same if the two scales have the same distribution. In general, the more similar the distributions for any set of scales, the more reasonable it is to compare nonnormalized T-scores for those scales. Because most of the SDQIII scales are moderately skewed, the comparison of these specific scale scores may be reasonable.

#### The interpretation of specific SDQIII facets.

Most SDQ research has focused on the specific facets of self rather than the General-self or total scores. It is intended that these should be the primary basis for the interpretation of responses to the SDQIII. Each of these scales has high face validity, and the intended meaning of each scale is well-summarized by the verbal descriptions presented below.

The inferred meaning of each of the 13 SDQIII scales is briefly characterized as follows:



1. Math -- I have good mathematical skills/reasoning ability.
2. Verbal -- I have good verbal skills/reasoning ability.
3. General Academic -- I am a good student in most school subjects.
4. Problem Solving -- I am good at problem solving/creative thinking.
5. Physical Ability -- I am good at sports and physical activities.
6. Appearance -- I am physically attractive/good looking.
7. Relations With Same Sex -- I have good interactions/relationships with members of the same sex.
8. Relations With the Opposite Sex -- I have good interactions/relationships with members of the opposite sex.
9. Relations With Parents -- I have good interactions/relationships with my parents.
10. Religion/spirituality -- I am a religious/spiritual person.
11. Honesty -- I am an honest, reliable, trustworthy person.
12. Emotional Stability -- I am an emotionally stable person.
13. General-Self -- I have self-respect, self-confidence, self-acceptance, positive self-feelings and a good self-concept.

In most instances, high scores on each scale can be interpreted to mean that the respondent has a positive self-perspective in that area whereas low scores indicate negative self-perspectives. However, two special situations require further consideration.

First, a respondent may have a self-perspective that is quite unrealistic when compared to objective information. For example, a person may be poor at mathematics and yet have a positive Math self-concept. However, self-concept (see Chapter 5) is defined according to how a person does view him or herself, and not according to how a person should view him or herself. Insofar as the person has responded honestly, then his or her responses reflect a valid inference about self-concept even if they are unrealistic. Hence, when external indicators or the opinions of external observers differ from such self-responses, it is the external indicators that probably lack validity as measures of self-concept.

Second, interpretations of the SDQIII are based on the assumption that the subject is responding honestly. Because the SDQIII items and scales are straight-forward, it would be easy to respond so as to give a "good" or a "poor" impression. The strength of the psychometric properties of the SDQIII -- particularly the factor analyses and relations to external criteria -- imply that this is not typical in SDQIII research. However, SDQIII research has nearly always been conducted in a setting where subjects have little external incentive to respond dishonestly. In a setting where respondents are externally motivated to look good or bad, the responses must be always interpreted cautiously, as is the case with all self-evaluation and self-report instruments. Two approaches are typically taken in this situation. The first, the one recommended for use with the SDQIII, is to try to avoid this problem by assuring respondents of the confidentiality of their responses and by gaining their confidence that responding honestly will not be detrimental to them and will be of positive value. The second, sometimes used with other self-report instruments, is to construct a separate scale to measure some construct related to "social desirability responding." However, responding positively to socially desirable attributes is also the basis of self-concept inferences, and so such an approach is untenable in self-concept research (see SDQI monograph for further discussion).

#### Interpretation of the General-self Scale and the Total Self-concept Score.

Historically, self-concept research has emphasized a general or overall self-concept instead of specific facets of self. This general self was typically inferred on the basis of an unweighted sum of responses to a hodge-podge of self-referent items that was not balanced with respect to any theoretically defensible model of what the underlying facets of self were. Consequently, measures of general self were often idiosyncratic to a specific instrument (see Marsh & Shavelson, 1982). The Total Self-concept score and the General-self scale represent two possible alternatives to this apparently unjustified practice.

The total score for SDQIII responses are balanced in relation to theoretically defensible and empirically identified components of self. The SDQIII items have been shown to measure the 13 factors of self-concept that the instrument is intended to measure. These 13 facets of self-concept were based on the theoretically important Shavelson model of self-concept and subsequent empirical research designed to test the model (Shavelson, et al., 1976; Marsh & Shavelson, 1985; Marsh, Byrne & Shavelson, 1988). A further justification for the total score was based on the assumption that the 13 facets would be substantially correlated. Subsequent research, however, demonstrated that the facets are, in fact, surprisingly distinct. For example, considerable research with subjects at all ages has shown that academic and nonacademic components of self-concept are not substantially correlated and that even the Verbal and

Math scales are nearly uncorrelated. When based on factor analytically derived scores, the average correlation among all the SDQIII factors is only about .1. Thus, the usefulness of the total score as a summary of the different facets of self and its theoretical justification were considerably weakened. The Total score has been retained because it is, perhaps, most comparable to the scores from other self-concept instruments that do not emphasize the multidimensionality of self-concept and because it is an apparently defensible indicator of overall or general self-concept. Nevertheless, in their interpretation of SDQIII responses, users are encouraged to emphasize responses to the specific scales rather than the total score.

A second approach to the definition of overall or general self-concept has been the construction of relatively unidimensional scales that infer a superordinate construct called general self (or sometimes called Esteem). The most well-known scale of this sort is the Rosenberg (1965) scale that was used as the basis of the General-self scale on SDQ instruments (also see Harter, 1982). The General-self scale on the SDQIII, like the Rosenberg scale, infers a general or overall positive self-perspective that is not specific to any particular facet of self-concept but could be applied to each specific facet of self. Interpretations of general self-concept, and its theoretical and empirical bases, are discussed further in Chapter 5. Again it must be stressed, however, that because the specific facets of self-concept are so distinct, the diversity of self-concept cannot be adequately reflected in a single score. (see Chapter 5 for further discussion and other approaches).



## CHAPTER 4 -- RELIABILITY, STABILITY AND SYSTEMATIC CHANGE IN SDQIII RESPONSES

Reliability and stability are important psychometric properties of any measurement instrument. Even though stability is important, self-concept researchers are frequently interested in measuring change in self-concept. The primary purpose of this chapter is to examine these technical issues.

### Internal Consistency Estimates of Reliability

Reliability refers to the extent to which the responses are due to systematic sources of variance. The primary basis for estimating reliability in SDQIII research has been the internal consistency of responses to items in each of the SDQIII scales. Coefficient alpha estimates of reliability, based on the internal consistency of responses, have been presented in most of the published SDQIII studies listed in the References. For present purposes, the normative archive of 2,436 sets of responses to the SDQIII was used to compute coefficient alphas for the scores representing the 13 SDQIII factors (see Table 4.1). Coefficient alphas for the 13 factors vary from 0.76 to 0.95 (median = 0.89), and only the coefficient alpha of the Honesty/Trustworthiness factor is less than .84.

Correlations among responses to the 10 or 12 items designed to measure each SDQIII scale (Table 4.2), and corrected item-scale correlations (i.e., the correlation between an item and the sum of responses to other items in the same scale) are also presented in Table 4.1. These summary statistics further demonstrate that every individual item is significantly and substantially correlated with the other items designed to measure the same facet of self-concept.

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In summary, these results, coupled with those of factor analyses summarized in Chapter 5, demonstrate that responses to the SDQIII reliably measure facets of self-concept that are internally consistent and clearly distinguishable.

### Standard Error of Measurement

The standard error of measurements (SEM) for the 13 SDQIII scales and the total score are shown in Table 4.1. Separate SEMs are expressed in terms of raw total scores and T-score units. Thus, for example, the SEMs vary from 2.2 (Spiritual Values/Religion) to 4.9 (Honesty/Trustworthiness) when expressed in T-score units. In interpreting SDQIII scores, the user should keep in mind that error of measurement may be present and that a confidence interval of at least one SEM should be constructed on each side of the observed score. Differences of less than one SEM when based on responses by a single individual should be interpreted cautiously, since they could represent measurement error.

### Stability and Systematic Changes In Responses to the SDQ

Self-concept researchers face an important dilemma. Theoretically, and from the perspective of measurement theory, it is desirable that self-concept be relatively stable over time -- both in terms of mean shifts in the level of self-concept and in terms of stability coefficients. Some researchers also argue that it is important to a person's mental health that self-concept be stable over time. On the other hand: a) much of the interest in self-concept is directed toward changes in self-concept; b) logically, dramatic life events and more gradual life changes should be reflected in changes in self-concept; c) the improvement of self-concept is a frequent goal of experimental interventions; and d) it is often hypothesized that changes in self-concept will lead to changes in other desirable outcomes such as academic achievement. It is very difficult for any measure of self-concept to be perfectly stable and still be responsive to dramatic life events or systematic interventions, and herein lies the dilemma.

The stability of responses to the SDQIII and their responsiveness to systematic interventions was examined by Marsh, Richards, and Barnes (1986a; 1986b). In that investigation, 361 Outward Bound participants completed the SDQIII one month before (T1), the first day of (T2), the last day of (T3), and 18 months after completion (T4) of the Outward Bound program. Internal consistency estimates and stability across all intervals are summarized in Table 4.3 for the 229 subjects who completed responses on all 4 occasions. Internal consistency estimates for each occasion are nearly the same as those for the entire normative sample. Stability over the one-month control interval before the start of the program (median  $r = .87$ ) is highest and nearly as high as the internal consistency estimates (median  $r = .90$ ). Stability over the 18-month interval after the completion of the program was somewhat lower (median  $r = .74$ ), but still substantial. Particularly since these participants (mostly aged 16-25) frequently reported significant life changes during this 18 month interval (e.g., moving out of their family home, starting university or taking their first permanent job, getting married, etc.) the stability of the self-concept scores is remarkably high. Despite the stability of the SDQIII responses, however, there was also clear support for changes in the SDQIII responses due to participation in the Outward Bound program that are discussed in more detail in Chapter 10.

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The Marsh, Richards and Barnes (1986a; 1986b) study is one of the few to consider the long-term stability of clearly distinguished facets of self-concept, and so it is important to examine further this long-term stability. Marsh and Hocevar (1984) proposed the use of multitrait-multimethod (MTMM) analyses to test the stability of a multivariate structure over time. In the present application the 13 SDQIII factors are the multiple traits, the two testing occasions (T3 and T4) are the multiple methods, and the MTMM matrix (Table 4.4) is the 26 x 26 correlation matrix relating responses at T3 and T4. Convergence refers to the stability over time, while divergence refers to the specificity of agreement over time to particular facets of self. Thus the stability coefficients in Table 4.3 demonstrate the convergence of responses over time, but provide no evidence about divergence of the different areas of self-concept. The application of the four Campbell and Fiske criteria (1959; also see Marsh, 1989b; Marsh & Hocevar, 1983; 1984) indicates:

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- 1) Each of the 13 convergence (stability) coefficients ( $Mn r = .73$ ) is statistically significant, supporting their convergence over time.
- 2) Each convergence coefficient ( $Mn r = .73$ ) is higher than the other correlations in the same row and column of the square (heterotrait-heteromethod) submatrix ( $Mn r = .11$ ) for all 312 comparisons, supporting this aspect of their divergence.
- 3) Each convergence coefficient ( $Mn r = .73$ ) is higher than correlations in the same row and column of the triangular (heterotrait-monomethod) submatrices ( $Mn r = .15$ ) for all 312 comparisons, supporting this aspect of divergence.
- 4) By visual inspection the pattern of correlations at times 3 and 4 are similar, suggesting that the modest correlations that do exist among the factors are independent of when they were administered.

These findings provide extremely strong support for both the convergence and divergence of the responses to the SDQIII, and the stability of their multivariate structure over time. Since change is the inverse of stability, the findings also imply that changes in self-concept that do occur over this 18-month period are specific to particular facets of self-concept rather than to a generalized change that affects all areas similarly. Taken together, the results of the factor analyses summarized in the next chapter (see Table 5.1) and the MTMM analyses provide convincing support for the multidimensionality of self-concept, the proposed factor structure of the SDQIII, and also for the specificity of changes in multidimensional self-concepts. The clarification of these within-network issues is a logical prerequisite to the examination of between-network issues such as the relation between self-concept responses and systematic interventions that are considered in Chapter 10.



## CHAPTER 5 -- CONSTRUCT VALIDITY: THE THEORETICAL/EMPIRICAL BASIS FOR THE STRUCTURE AND DIMENSIONS OF THE SDQIII

The multidimensional of self-concept is a basic assumption of the Shavelson model that has important implications for understanding self-concept. Thus, for example, a person may have a positive self-concept for Opposite Sex Relations but still have a poor Math self-concept. Marsh (1988) argued that much of the confusion in substantive areas of self-concept research prior to the 1980s was due to the failure of researchers to take into account the multidimensionality of self-concept. The primary purpose of this chapter is to provide the theoretical and empirical justification for the assumption that self-concept is multidimensional.

The theoretical development of the SDQIII began with the Shavelson model briefly described below. The factors to be included on the SDQIII and those of the earlier SDQI were based in large part on the Shavelson model. Item pools for each factor were initially developed and preliminary analyses were used to refine the items designed to measure each scale. Once a suitable version of the SDQIII had been developed, additional research was conducted to examine characteristics of the SDQIII and to test assumptions of the Shavelson model. Hence, the development of the SDQIII represents an interplay between theory and empirical research.

### The Shavelson Model: A Multifaceted, Hierarchical Self-Concept.

Reviews of self-concept research have identified shortcomings no less dramatic than the lack of a theoretical basis for defining and interpreting the construct and the poor quality of measurement instruments used to measure it. In an attempt to remedy this situation, Shavelson, et al. (1976) evaluated existing research and self-concept instruments, and developed a multifaceted, hierarchical model of self-concept. Self-concept, broadly defined by Shavelson, is a person's perceptions of him/herself. These perceptions are formed through experience with and interpretations of one's environment. They are influenced especially by evaluations by significant others, reinforcements, and attributions for one's own behavior. The Shavelson model and its relation to SDQ research is reviewed in detail in the SDQI monograph and the reader is referred to it for further discussion.

Shavelson et al. (1976) also presented one possible representation of his hierarchical model where General-self appears at the apex and is divided into academic and nonacademic self-concepts at the next level. Academic self-concept is divided into self-concepts in particular subject areas (e.g., mathematics, English, etc.). Nonacademic self-concept is divided into three areas: Social self-concept which is divided into relations with peers and with significant others; Emotional self-concept; and Physical self-concept which is divided into physical ability and physical appearance. Further levels of division are hypothesized for each of these specific self-concepts so that at the base of the hierarchy self-concepts are of limited generality, quite specific, and more closely related to actual behavior. This model posits a structure of self-concept that resembles a hierarchical model of intellectual abilities where general self-concept (like Spearman's "g") is at the apex, and general self-concept can be divided into two components, and each of these into group and specific factors.

It should be emphasized that whereas the self-concept facets proposed in the Shavelson model, as well as their hypothesized structure, were heuristic and plausible, they were not empirically validated by Shavelson, et al. (1976) or by any of the research discussed in their review. Through the mid-1970's self-concept instruments typically consisted of a hodge-podge of self-referent items and "blind" applications of exploratory factor analyses typically failed to identify salient, replicable facets (Marsh & Smith, 1982). More recently, researchers have developed self-concept instruments to measure specific facets that are at least loosely based on an explicit theoretical model, and then used factor analysis to support these a priori facets (e.g., Boersma & Chapman, 1979; Dusek & Flaherty, 1981; Fleming & Courtney, 1984; Harter, 1982; Soares & Soares, 1982; and particularly research summarized here and in the SDQI monograph). Recent reviews of this research (Byrne, 1984; Marsh & Shavelson, 1985; Shavelson & Marsh, 1986) support the multifaceted structure of self-concept and indicate that self-concept cannot be adequately understood if its multidimensionality is ignored. In her review of self-concept models Byrne (1984, p. 449) concluded that: "Although no one model to date has been sufficiently supported empirically so as to lay sole claim to the within-network structure of the construct, many recent studies, in particular those of Marsh and his colleagues, are providing increasingly stronger support for the hierarchical model."

### Factor Analysis of Responses to the SDQIII.

The theoretical justification for the 13 SDQIII factors and their relation to the Shavelson model were briefly described earlier and is discussed in greater detail by Marsh and O'Neil (1984). Many factor analyses of responses to the SDQIII by diverse populations of subjects of different ages have each identified the 13 hypothesized factors. In order to facilitate consideration of this factor structure, a single factor analysis was performed on all 2,436 sets of responses to the SDQIII in the normative archive. For purposes of this analysis, and consistent with most SDQIII research, the 10 or 12 items from the 13 SDQIII scales were divided into 5 or 6 item pairs such that the first two items were assigned to the

first pair, the next two items to the next pair, and so on. A factor analysis was performed on responses to these 68 item pairs with the commercially available SPSSx program (SPSS, 1986). Technical specifications for the factor analysis included, using iterated communalities estimates, a Kaiser normalization, and an oblique rotation to a final solution with delta set to -2.0.

### The Use of Item-pairs in SDQ Research.

The rationale for using item pairs has been previously discussed by Marsh and O'Neil (1984). Factor analysis of 78 item pairs, instead of 136 items, is preferable for several reasons. First, a widely used guideline for factor analysis is that the number of subjects greatly exceed the number of variables. By using item pairs, the ratio of subjects to variables doubled. Second, the pairing of items to form "mini-scales" or item-parcels should result in more reliable variables that have a smaller component of unique variance than individual items. Third, factor loadings should be less affected by idiosyncrasies of individual items. Fourth, there will be a reduction in the costs of factor analysis because the number of variables is reduced. Finally, it is possible to use commercially available software (which sometimes limits the number of variables) and hardware (which has limits on memory capacity) to perform factor analyses that might not be possible if items were used instead of item-pairs.

The major disadvantages of using item pairs are that information on individual items is combined and lost, items must be homogeneous (which is not a problem for SDQIII items -- see Chapter 4), and factor scores may vary somewhat across different factor analyses. However, as Marsh and O'Neil (1984) have shown for SDQIII responses, the initial item pairings and a random pairing had factor scores that correlated a very high level (median  $r = .991$  across the 13 scales). Thus, the item pairing method appears to be an acceptable practice in the case of the SDQ instruments.

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### Results of the Factor Analyses.

The results of the total group factor analysis (see Table 5.1) clearly identify each of the SDQIII factors. The factor loadings for variables designed to measure each factor -- the target loadings -- are substantial, ranging from 0.44 to 0.94 (median = 0.71). The nontarget loadings are much smaller, ranging from -0.17 to 0.25 (median = 0.02). The correlations among the factors are modest, ranging from -.06 to 0.36 (median = 0.10), and much smaller than the coefficient alpha estimates of reliability (median = .89; see Chapter 4). The largest correlations occur between the General-academic and the other academic self-concepts, and between the General-self factor and other nonacademic factors. Despite the moderate correlation between General-School and Reading (0.31), and between General-School and Math (0.33), the correlation between Reading and Math self-concepts (-.01) is close to zero. This lack of correlation, though inconsistent with the original Shavelson model, is consistent with other SDQ research that led Marsh and Shavelson (1985) to propose a revision of the original model. Results of factor analyses of responses to the SDQIII, such as the one presented here, provide strong support for the multidimensionality of self-concept, and particularly for the facets hypothesized in the Shavelson model.

Factor analyses in studies 1-9 (Table 5.1) are based on responses by Australians, but study 10 is based on responses by introductory psychology students from a large Canadian university. The summary of the factor analysis in Study 10 and a more detailed inspection of the results indicated that the factor structure found for these North American students was very similar to those based on Australian responses.

The results of the factor analysis based on the entire normative sample are remarkably consistent with findings of eight previously published factor analyses of SDQIII responses that are summarized in Table 5.2. Because each of these samples is based on samples that differ systematically in terms of sex, age, SES, student/nonstudent status, and country, this set of results provides strong support for the generalizability of the SDQIII factor structure.

### The Similarity of Factor Structures Across Sex and Age.

A frequent concern of factor analytic studies is to demonstrate that factor structures are similar across subgroups. Such demonstrations provide support for the generality of the factors and may be necessary before scores across the subgroups can justifiably be compared. For each of the SDQ instruments, separate factor analyses of responses by males and females has demonstrated the the generality of the factor structures across sex (Marsh, 1987c, Byrne, in press). Using responses to 4 SDQIII (General self, Math, Verbal and General School), Byrne (in press) found strong support for the invariance of the SDQIII factor structure across gender. She concluded: "Overall, in light of the stringency of the LISREL CFA procedures, the SDQIII demonstrated exceptionally superior psychometric properties" (p. xx). Similarly, separate factor analyses conducted on responses by subjects differing in age have shown the generality of the factor structure across age. (For reviews see the other SDQ monographs, Marsh & Hocevar, 1985; Marsh, 1987b).

For purposes of the present monograph, the entire set of 2,436 SDQIII responses in the normative archive were divided into four groups representing younger and older males, and younger and older females. Four separate factor analyses like that conducted with the total group were conducted on each of the four subgroups. The general pattern of results for each of these four separate analyses (Table 5.3) was remarkably similar to that shown for the total group (Table 5.1).



In order to more fully evaluate the comparability of the factor structures, two sets of factor scores were derived for each subject. One was based on the total group analysis and the other was based on the factor analysis of the subgroups to which the student belonged (e.g., younger males). To the extent that the correlations among the matching factors in these two sets of factor scores are highly correlated, then there is support for the similarity of the factor analyses. In each of the four subgroups, the median correlation between the matching factor scores based on different analyses was over .99.

In summary, the results of the factor analyses of the four subgroups demonstrates the similarity of the SDQIII factor structure across sex and across age.

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#### Confirmatory Factor Analyses Using Structural Equation Modeling

Whereas exploratory factor analyses (EFA) such as the one in Table 5.1 are typically used to test the dimensionality of psychological instruments, there is a growing recognition of the value of confirmatory factor analysis (CFA) using structural equation modeling such as that embodied in LISREL (Joreskog, 1980; 1981; Joreskog & Sorbom, 1981). As typically used, researchers have limited ability to control the structure to be tested with EFA. Thus, if the empirical solution does not correspond with the hypothesized solution, then there is no basis for determining how well the hypothesized solution would have fit the data. In contrast, with CFA the researcher specifies the form of the hypothesized model and empirical solution is derived subject to these constraints. Here, the focus is on the ability of the model to fit the data according to goodness-of-fit criteria and in relation to alternative models as well as the actual parameter estimates.

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A particularly demanding -- but frequently employed -- CFA model is referred to here as the simple structure model. For the simple structure model, each measured variable is allowed to load only on the factor it is designed to measure and all other factor loadings are required to be zero. That is, target loadings are freely estimated but all nontarget loadings are fixed to be zero. Parameter estimates of a CFA described by Marsh (1987d) are presented in Table 5.4 and goodness-of-fit indices from five previously published CFAs based on such a simple structure model are summarized in Table 5.5. In two of the CFAs, analyses were based on correlations among responses to 68 item pairs like that considered in Table 5.1. In two of the CFAs, items from each of the 13 SDQIII scales were used to define 3 subscales and analyses were based on correlations among these 39 measured variables. In one of the CFAs, analyses were based on responses by significant others who were asked to complete the SDQIII as the subject would complete it. Whereas a technical discussion of goodness-of-fit is beyond the scope of this monograph (see Bentler & Bonett, 1980; Long, 1983; Marsh, Balla & McDonald, 1988), conventional rules of thumb (e.g., a Tucker-Lewis index of less than .9 suggests that the simple structure model provides a reasonable fit in each of these analyses. Similarly, the actual parameter estimates for each of these CFAs indicate that all of the 13 SDQIII factors are well-defined in that all factor loadings are large and statistically significant, whereas correlations among the first-order factors are typically modest (see Table 5.4).

#### The Hierarchical Structure of SDQIII Factors

Material presented in this section is based largely on a study by Marsh (1987d) that emphasized both the substantive issues that are discussed here and technical issues related to the application of CFA. In that study response by 361 Outward bound participants who completed the SDQIII one month before the start of the course (T1) and on the first day of the course (T2) were reanalyzed (see Marsh, Richards & Barnes, 1986a; 1986b; and Chapter 9). Particular in relation to technical issues about the application of CFA, the reader is referred to Marsh (1987d).

Whereas the Shavelson model is often depicted as the set of factors used to represent the model, Shavelson et al. (1976) actually placed more emphasis on the multifaceted, hierarchical structure than on the number and content of the specific facets. In contrast to a hierarchical structure, Coopersmith (1967) and Marx and Winne (1978) argued that facets of self-concept are so heavily dominated by a general factor that separate components could not be readily differentiated, whereas Soares and Soares (1977) argued that facets are so distinct that no hierarchical ordering existed. While both these extremes are actually consistent with a hierarchical model, the model's value is dubious if the hierarchy is so strong that components can barely be distinguished or so weak that components are nearly independent.

Marsh and Hocevar (1985; also see Marsh & Shavelson, 1985) examined the hierarchical structure of responses to the SDQI for preadolescents. Consistent with the Shavelson model, the first-order factors were well-defined, but neither a single higher-order factor defined by all first-order facets, nor two higher-order factors defined by academic and nonacademic facets was able to fit the data. The best fit was obtained for a model with three higher-order factors: a nonacademic factor consisting of social and physical facets, a reading/academic factor, and a math/academic factor. The results of that hierarchical CFA (HCFA), and other research (e.g., Marsh, 1986c), led Shavelson and Marsh (Marsh & Shavelson, 1985) to propose a revision of the Shavelson model such that self-concepts in specific academic areas define two higher-order academic self-concepts instead of just one. These findings support the contention that self-concept is multifaceted, hierarchical construct, though they also suggest that the hierarchy may be more complicated than originally proposed by Shavelson.

The term "general self-concept" has been used in different ways (see Marsh, 1986b and SDQI monograph), two of which are particularly relevant for the present discussion: a) a "hierarchical general self-concept" inferred from lower-order facets as in the Shavelson model; and b) a "general self-esteem" that is inferred from a single scale, is relatively unidimensional, and is superordinate to specific facets of self-concept (e.g., Harter, 1982; Rosenberg, 1965; 1979; and the General-self scales from the SDQ instruments). While both the hierarchical general self-concept and the general self-esteem are superordinate facets, the theoretical relation between them is unclear and the role of general self-esteem is not specified in the Shavelson model. Marsh and Shavelson (1985) indicated the need for study of the relation between these two conceptualizations of general self-concept.

#### The Hypothesized Factor Structure For SDQIII Responses

The 13 SDQIII facets consist of academic (Math, Verbal, General Academic, and Problem Solving), nonacademic (Physical Ability, Appearance, Same Sex Relations, Opposite Sex Relations, Parent Relations, Religion/Spiritual values, Honesty, and Emotional), and general (Esteem) factors. Following the Shavelson model and its revision, it is proposed that: a) the 4 academic facets define 2 second-order academic factors -- math/academic and verbal/academic; b) the 7 nonacademic facets define 3 second-order factors -- physical (Physical Ability and Appearance), social (Same Sex Relations, Opposite Sex Relations, and Parent Relations), and moral (Religion/Spiritual Values and Honesty); and c) a third-order, hierarchical general self-concept will be defined by the Esteem and Emotional first-order factors, and by the math/academic, verbal/academic, physical, social, and moral second-order factors. This hierarchy differs somewhat from that proposed by Shavelson, but Shavelson et al. (1976) emphasized their model rather than the representation used to illustrate the model, and the hierarchy proposed here is certainly consistent with the Shavelson model.

#### The Application of CFA and HCFA

The application of CFA and its advantages over exploratory factor analysis are well documented, and these advantages are especially important for examining hierarchical structures (Marsh, 1985b; 1987d; Marsh & Hocevar, 1985). In particular, HCFA allows the researcher to: specifically define and test the a priori structure of first-order factors; formulate and test alternative higher-order models; uniquely estimate parameters to fit each model; test the ability of each model to fit the data; and compare the goodness of fit of the alternative models (see Bagozzi, 1980; Huba & Bentler, 1982; Marsh, 1985b; 1987d; Marsh & Hocevar, 1985; Joreskog, 1980; 1981; Joreskog & Sorbom, 1981; Long, 1983; Tanaka & Huba, 1984). In the analyses presented below, a set of CFA and HCFA models (see Table 5.6 for a summary of the models; also see Figure 5.1 in the Results section) are tested with the commercially available LISREL V program (Joreskog & Sorbom, 1981). Initially a first-order model -- like the one in Table 5.4 -- is proposed to test the a priori structure of 13 SDQIII factors and to examine the correlations among these factors. Then a set of higher-order factor structures is formulated to explain relations among first-order factors that are used to infer the second-order factors.

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The existence of a well-defined, a priori, first-order factor structure is a prerequisite to testing higher-order structures because: a) subsequent higher-order models are based on it; and b) its goodness of fit is the upper limit for the goodness of fit of higher-order models. Hence, the theoretical rationale for the first-order factor structure, its ability to fit the data, and the parameter estimates based on it should be examined carefully in HCFA studies. For the first-order model considered here (Model 1A in Table 5.6) every factor loading and every factor variance is large and statistically significant. Factor correlations vary from -.02 to .71 (median = .26) and none approaches 1.0. These results provide good support for the a priori model. The chi-square for the first-order factor model is large and statistically significant, but the chi-square/df ratio (2.14) and other goodness-of-fit indices (e.g., TLI = .919) suggest that the goodness of fit is reasonable. The chi-square/df ratio (2.00) and other indices were similar or slightly better when Model 1A was fit to data based on responses by the same subjects collected at time 2 (see Marsh, 1987d).

Factor covariances were standardized to facilitate their interpretation (Table 5.4), and their inspection is valuable as a preliminary examination of higher-order models. In support of the original Shavelson model, correlations among the 4 academic facets and among the 8 nonacademic facets are generally larger than correlations between the academic and nonacademic factors. Correlations among the 4 academic factors, however, support the existence of two second-order academic factors as posited in Marsh/Shavelson revision. Whereas the Academic and Problem Solving factors are each substantially correlated with Math and Verbal self-concepts, and with each other (rs between 0.48 & 0.62), the Math and Verbal self-concepts are relatively uncorrelated ( $r = .12$ ) with each other.

Correlations among the nonacademic factors do not clearly support the physical, social, and moral second-order factors that were posited. Although Physical Ability and Physical Appearance are substantially correlated (.43), Physical Ability is more highly correlated with Same Sex Relations (.62) and Physical Appearance is as highly correlated with Opposite Sex Relations (.42). While the three social facets are substantially correlated with each other (rs between .32 and .52), they are also substantially correlated with the two physical facets. Although Religion/Spiritual Values is more highly correlated with Honesty than with other factors, the size of the correlation (.27) is modest. This pattern of correlations suggests that support for the higher-order factors defined by nonacademic factors may be more problematic than that for those defined by academic facets.

Testing higher-order factor models. For each HCFA model (Table 5.6), the first-order factors were defined as in Model 1A (Table 5.4) except that the covariances among first-order factors are explained in terms of higher-order



factors. For the second- and third-order models, the higher-order factor loadings and lower-order factor residuals were estimated. For example, in Model 6A a total of 19 (13 first-order, 5 second-order, and 1 third-order) factors were specified. Complicated HCFA models should always be evaluated in relation to less complicated models. If the goodness of fit for two models are comparable, then the more parsimonious model -- the one that requires fewer parameters and has a larger df -- is preferred. However, alternative HCFA models are often nested such that the more parsimonious model cannot fit the data any better than the less parsimonious model, and will usually be rejected in a strict statistical sense. Thus the problems of evaluating goodness of fit are important for comparing alternative HCFA models.

In order to apply the rule of parsimony in the present investigation, a series of a priori HCFA models (Table 5.5) was tested. The rationale was: a) first to test the most parsimonious models, those with only one (Model 2A) or two (3A) higher-order factors; b) next to test the structure of the higher-order academic factors (4A); c) then to test the structure of the nonacademic factors (5A & 6A); d) to replicate the results from time 1 with data from time 2; and e) finally, if necessary, to develop and test a posteriori models (7A) suggested by the results of the earlier analyses. If the goodness of fit of Model 2A, with only one higher-order factor, approaches that of a more complicated model, then this provides evidence against the more complicated model.

#### Tests of the Higher-Order Factor Models.

The most parsimonious models. In Model 2A only one second-order factor was proposed to explain relations among all 13 first-order factors. For this model 12 of the 13 factors, all but Religion/Spiritual Values, load significantly on the general factor. The difference in chi-square values for models 2A and 1A is statistically significant when evaluated against the difference in df (Table 5.6), indicating that there is substantial covariation among the first-order factors that is unexplained by Model 2A. Model 2A is, however, able to explain nearly much of this covariation among first-order factors. The factor loadings (Figure 5.1) indicate that the 4 academic and 2 moral facets are poorly represented by the general factor. For example, whereas the first-order Math factor is well-defined, only about 15% of its variance can be explained by the higher-order factor.

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Model 3A (Figure 5.1), with two second-order factors (academic self-concept and nonacademic self-concept), has a significantly better chi-square than Model 2A even though it uses only two additional df (Table 5.6). The 4 academic facets are also better represented in Model 3A than in 2A while there is little change in representation of the nonacademic facets. These results indicate the superiority of Model 3A over 2A, and support the separation of academic and nonacademic facets.

The hierarchical structure of academic facets. In Model 4A the second-order academic factor from Model 3A is divided into math/academic and verbal/academic factors as proposed by Marsh and Shavelson (1985). A third-order, hierarchical general self is defined by the three second-order factors, and the first-order Esteem factor. The chi-square for Model 4A is significantly smaller than the chi-square for 3A, and the goodness-of-fit indices are better. The first-order Math and Verbal factors are better represented by the higher-order factors in Model 4A than in Model 3A. However, this is due to variance explained by the two second-order academic factors and not the third-order general factor. Inspection of the factor loadings on the third-order factor (Figure 5.1) indicate that neither the academic nor the moral factors are well represented by the third-order factor. Covariances among the four lower-order factors that define the third-order factor are well described by the higher-order factor. These findings demonstrate the superiority of Model 4A over more parsimonious models, and provide support for the Marsh and Shavelson (1985) revision of the original Shavelson model.

The hierarchical structure of nonacademic facets. Model 5A (figure 5.1) differs from Model 4A in that two new second-order factors are defined; one for the two physical self-concepts and one for the three social self-concepts. The fit of Model 5A, however, is only slightly better than Model 4A. The factor loadings for the second-order factors on the third-order factor indicate that physical and social factors are well represented by the general factor while the academic and the moral factors are not. Further analyses suggested that a significant proportion of the covariation among the lower-order factors is not represented by the hierarchical general self. This apparently occurs because the modest correlation ( $r = .27$ ) between Religion/Spiritual and Honesty factors, and the large correlation between the second-order physical and social factors ( $r = .94$ ), are not adequately explained in terms of the third-order factor.

Model 6A is most like the structure originally proposed to explain responses to the SDQIII. It differs from Model 5A in that one new second-order factor is defined by the two moral facets. The chi-square and goodness-of-fit indices are marginally better for Model 6A (Table 5.6). The factor loadings on the third-order factor again show that the third-order factor represents primarily physical, social, emotional, and Esteem factors, but not the academic and moral factors. Further analyses suggested that the addition of the second-order moral factor accounts for the correlation between Religion/Spiritual and Honesty factors, even though this second-order factor is poorly represented in the hierarchical general self-concept. However, even though the second-order physical and social components are well represented by the hierarchical general self-concept, the extremely high correlation between the two second-order factors is still not explained in terms of the third-order factor.

In summary, the more elaborate HCFA models designed to explain the structure of nonacademic facets provide only a slight improvement over Model 4A. With the exception of the moral factors, these nonacademic factors are substantially correlated and contribute substantially to the hierarchical general self-concept, but support for the particular hierarchical ordering proposed here is not strong.

Tests of models for data from time 2. Each of the models described above was also tested with data from time 2. Though not a major focus of the study, parameter estimates for time 2 were similar and the goodness-of-fit tests were slightly better than for time 1. The chi-square and goodness-of-fit indicators for Models 4A, 5A and 6A were nearly identical to each other and, perhaps even more emphatically than time 1 analyses, suggest that these three models are equally able to explain the data.

An additional a posteriori model. The formulation of the models described above was a priori. However, the previous discussion and empirical findings suggest additional alternatives. The very high correlation observed between the second-order physical and social factors could not be explained adequately in terms of the third-order factor. Also, Problem Solving was more highly correlated with the hierarchical general self than could be explained by its relation to the second-order academic factors. In order to explore these observations, Model 6A was altered so that the 3 social and 2 physical facets defined only one second-order factor instead of two, and this produced a smaller chi-square (1501,  $df = 686$ ). Then, in a subsequent analysis, the Problem Solving facet was allowed to contribute directly to the hierarchical general self-concept, and this further improved the chi-square (1477,  $df = 685$ ). The a posteriori model based on both of these alterations is presented as Model 7A in Table 5.6 and Figure 5.1. The a posteriori nature of Model 7A suggests that it must be interpreted cautiously, but comparable improvements were found for time 2 data which provides additional support for Model 7A.

#### Discussion and Implications

The Shavelson model posits self-concept to be multifaceted, and this contention is supported. The a priori, first-order factors that the SDQIII is designed to measure were clearly identified in the first-order factor model, and even the simple structure imposed in that model provided a reasonable fit to the data. The Shavelson model posits that self-concept is hierarchically ordered, and this proposal is also supported in that hierarchical models are able to explain much of the covariation among first-order factors. Finally, Shavelson et al. (1976) proposed one possible representation of the hierarchical ordering of self-concept facets in his model. Though the hierarchy tested here differed from that representation in a number of ways that are discussed below, the empirical findings suggest that the hierarchy is more complicated and weaker than originally anticipated.

Marsh and Shavelson (1985) revised the academic portion of the original hierarchy. That revision is supported here in that two second-order academic facets -- math/academic and verbal/academic -- were required instead of just one as originally proposed by Shavelson. As before, this was necessary because of the lack of correlation between Math and Verbal self-concepts (also see Marsh, 1986c). Since the earlier study was based on responses by preadolescent students to the SDQI, the results of the present investigation based on responses to the SDQIII by late-adolescents in a nonacademic setting support the generality of the earlier finding.

Support for the second-order facets proposed to explain the physical and social facets is more tenuous, and this was not completely unexpected. Correlations between some physical and some social facets were higher than correlations among the physical and among the social factors (Table 5.3), and similar results have been found with responses by younger adolescents to the SDQ II (Marsh, Parker & Barnes, 1985) and by preadolescents to the SDQI (see SDQI monograph). This problem was also illustrated by the extremely high correlation (.94) between the second-order physical and social factors that could not be explained in terms of the third-order general self. Finally, there is an intuitive consistency to the pattern of correlations among the physical and social factors that may be inconsistent with the logic of the Shavelson model. It seems reasonable that Physical Appearance is as strongly related to Opposite Sex Relations as to Physical Abilities and, perhaps, that Physical Abilities is as strongly related to Same Sex Relations as to Physical Appearance. Support for Model 7A, where the second-order physical and social factors were collapsed into a single second-order factor, provides further support for these observations. It should also be noted that for the best fitting model proposed by Marsh and Shavelson (1985; Marsh & Hocevar, 1985), two physical factors and two social factors were incorporated into a single second-order factor and no attempt was made to test for separate physical and social second-order factors. In this respect, their model was more like Model 7A than 6A. Although further research is clearly warranted and alternative formulations may exist, these findings suggest that second-order social and physical facets may not be as clearly differentiated as originally proposed by Shavelson et al.

Support for the second-order moral factor defined by Religion/Spiritual Values and Honesty, must also be interpreted cautiously. Although these facets were not proposed by Shavelson, such facets have frequently been posited by other self-concept theorists starting as early as William James (1890) and were well-defined in the present investigation. While the inclusion of these facets may be theoretically and empirically justified, their combination into a second-order factor is more problematic. Although these factors tend to be more highly correlated with each other than with other factors, the size of the correlation is modest. Nevertheless, only the hierarchical models that incorporated this second-order factor were able to explain the correlation between the two facets. In this respect their incorporation into a second-order factor may be justified.

The hierarchy described here also differs from those previously examined, or even proposed, in that it includes both a first-order Esteem factor and a hierarchical general self-concept. It was hypothesized that Esteem contributes directly to the hierarchical general self-concept, and that most of the covariation between Esteem and other first-order factors can be explained by this formulation. Esteem consistently had the largest loading on the hierarchical general self-concept, and the correlation between them was about .9 in each of the hierarchical models. These findings support the proposed model, and demonstrate that Esteem and the hierarchical general self-concept based on the SDQIII responses are highly correlated.



In each of the HCFA models there was strong support for a hierarchical ordering of the SDQIII facets; most of the covariation among the first-order facets could be explained in terms of the hierarchy, and the hierarchical general self-concept was well defined. However, even this finding must be interpreted cautiously. First, while the hierarchical models were able to explain much of the covariation, there was not a lot of covariation to explain. Even though correlations among some facets were substantial and the model positing no correlations among the first-order facets (1B) was clearly unacceptable, this model of uncorrelated first-order factors did surprisingly well. Second, many of the first-order factors were not well represented by the hierarchical general self-concept. Even after correction for unreliability, the hierarchical general self was unable to explain even half the variance in any factors except Esteem and Emotional Stability. The covariation among the four academic factors was well represented by the two second-order academic factors, but these second-order factors contributed little to the hierarchical general factor. Similarly, the modest covariation among the two moral factors was well represented by a second-order factor, but it contributed little to the hierarchical general self. Even though the second-order social/physical factor was substantially correlated with the hierarchical general self-concept, correlations between the five factors that defined this second-order factor and the third-order factor ranged from .50 to .64. From a practical perspective, the hierarchy is sufficiently weak that it is clearly not justified to infer the first-order facets of self-concepts on the basis of higher-order facets.

The theoretical implications of the weak hierarchy may depend on the proposed direction of the causal ordering between the first- and higher-order facets of self-concept. For purposes of this study, as in the original Shavelson model, no causal ordering was specified between lower- and higher-order facets. Consistent with this perspective it is likely that the relations are reciprocal such that the hierarchical general self-concept has some influence on specific facets and specific facets have some impact on the hierarchical construct. However, the results of this study suggest that many facets contribute little to, or are little influenced by, the hierarchical general self-concept. The results may have more negative consequences for a top-down model that makes the stronger theoretical assumption that the hierarchical general self "causes" the lower-order facets. If a hierarchical general self is posited to cause a lower-order factor but the two are nearly uncorrelated, then the postulated causal relation is not supported. Since less than half of the reliable variance in all but 2 of the 13 first-order factors could be explained by the hierarchical general self, the top-down hierarchical model appears to be untenable. It should also be noted that while HCFA models are often depicted in path analytic terms such that a higher-order factor causes a lower-order factor, this is not necessary and may not be consistent with the substantive nature of the particular application.

#### The Marsh/Shavelson Revision of the Shavelson Model

Shavelson, et al., (1976) posited self-concept to be a multifaceted, hierarchical construct. In their model self-concepts in particular academic content areas were posited to form a single higher-order facet of academic self-concept. Marsh and Shavelson (1985) tested the Shavelson model with responses by Australian preadolescents to the SDQ, but found that the hierarchy proved to be more complicated than anticipated and led to a revision of the original model. In particular, Verbal and Math self-concepts were nearly uncorrelated with each other, and did not combine with General Academic self-concept to form a single, second-order academic factor. Instead there were two second-order academic factors representing verbal/academic and math/academic self-concepts that were nearly uncorrelated. Support for this revision was also found with responses to the SDQIII presented in the last section. This support, however, has been limited to responses by Australians to one of the SDQ instruments. The purpose of the research described in this section is to test the generality of the findings that led to the revision with responses to other self-concept instruments by non-Australian respondents.

#### The Canadian High School Study

Marsh, Byrne and Shavelson (1988) analyzed responses by 896 Canadian high school students in 11th and 12th grades. Analyses summarized here are presented in greater detail in that study. In that study, Verbal, Math, and General academic self-concepts were each measured by the SDQIII, the Self-concept of Ability Scales (SCA; Brookover, 1962), and the Affective Perception Inventory (API; Soares & Soares, 1982) instruments. The 9 scales (3 Verbal, 3 Math, and 3 General-academic self-concepts) were represented by 27 subscales by randomly dividing the items designed to measure each of the 9 scales into three groups. HCFA models were fit with LISREL V using specifications similar to those described in last section. The purpose of HCFA models is to explain covariation among the first-order factors -- the 9 self-concept scales in this study -- with one or more higher-order factors. In the present investigation alternative HCFA models posited one (general academic), two (verbal/academic and math/academic), or three (verbal, math, and school) higher-order factors to account for covariation among the nine first-order factors.

#### First-order Model

Verbal, Math, and General-academic self-concept were measured with three different self-concept instruments and the purpose of the first-order factor model (Model 1 in Tables 5.7 and 5.8) was to test the ability of a nine-factor model to explain these responses. Factor loadings and factor variances were all large and statistically significant. Factor correlations varied from -.01 to .94 but those between matching factors from different instruments were highest (.65 to .94,  $Md = .78$ ), those between General academic facets and the other two academic facets were intermediate (.39 to .56,  $Md = .49$ ), and those between Verbal self-concept and Math self-concept were lowest (-.01 to .14,  $Md = .05$ ). This pattern of correlations provides support for the construct validity of the self-concept responses, the lack of correlation between Verbal self-concept and Math self-concept, and the Marsh/Shavelson revision. The chi-square for the first-order factor model (Table 5.8) is large, due in part to the large sample size, but the TLI (.93) suggests that the fit is reasonable.

Insert Tables 5.7 and 5.8 About Here

#### Higher-order Models

A series of HCFA models was posited to explain the 27 correlations among the nine first-order factors (see Figure 5.2 and Table 5.8). Model 2, the simplest, posits a single higher-order factor; a general academic self-concept defined by all nine first-order factors. Model 3 posits two higher-order factors; math/academic defined by the Math and General-academic self-concept factors and verbal/academic defined by the Verbal and General-academic self-concept scales. Model 4 posits three higher-order factors defined by the Verbal self-concept, the Math self-concept, and the General-academic self-concept scales respectively. The higher-order models differ substantially in their ability to fit the data (Table 5.8). Whereas Model 2 provides a relatively poorer fit ( $TLI = .80$ ), Models 3 and 4 differ only modestly in their ability to fit the data ( $TLIs = .90$  and  $.91$  respectively). Higher-order factor loadings and factor correlations for both Models 3 and 4 (Figure 5.2) support the interpretation of the posited factors. In Model 3 both higher-order factors are well defined, but the correlation between these math/academic and verbal/academic factors is not significantly different from zero. Model 4 provides a slightly better fit to the data than Model 3 but the difference is small and complicated by the fact that the two models are not nested. The major focus of the present investigation is on the relative ability of one general academic ability factor (Model 2) and two higher-order factors (Model 3) to explain correlations among the first-order factors. For this comparison Model 3 is clearly superior.

Insert Figure 5.2 About Here

#### Summary and Implications

Self-concept, like many other psychological constructs, suffers in that "everyone knows what it is," and researchers do not feel compelled to provide any theoretical definition of what they are measuring nor even the psychometric properties of the instrument used to measure self-concept. Although many thousands of studies have been published in this area, most of the research emphasized other theoretical constructs, and the interest in self-concept comes from its assumed relevance to these other constructs. These observations help explain why reviews of self-concept research (e.g., Burns, 1979; Shavelson, et al., 1976; Wells & Marwell, 1976; Wylie, 1974; 1979) typically emphasize the lack of theoretical basis and the poor quality of measurement instruments used in most self-concept research.

The multifaceted, hierarchical conceptualization of self-concept apparently is consistent with the perspectives of many researchers, even though it was not reflected in many previously developed instruments. In contrast to the SDQ instruments, most instruments used to measure self-concept have no clearly articulated theoretical basis, and this makes the examination of the construct validity difficult. One approach to this problem has been to take responses to existing, largely atheoretical instruments, and to attempt to test hypotheses from theoretical models (e.g., Marx & Winne, 1978). Because of the poor quality of measurement instruments for this purpose, the approach is dubious, and the generally inconsistent results may be due to poor theory, poor instrument construction, or both. In the development of the SDQ instruments it was reasoned that the determination of whether theoretically consistent and distinguishable facets of self-concept exist, and their content and structure if they do exist, should be prerequisite to the study of how these facets, or overall self-concept, are related to other variables. In adopting such an approach, atheoretical and/or purely empirical approaches to developing and refining measurement instruments were rejected. Instead, an explicit theoretical model was taken to be the starting point for instrument construction, and empirical results were used to support, refute or revise the instrument and the theory upon which it is based. In applying this approach, the Shavelson model was judged to be the best theoretical model of self-concept. Implicit in this approach is the edict that theory building and instrument construction are inexorably intertwined, and that each will suffer if the two are separated. In this sense the SDQIII is based on a strong empirical foundation and a good theoretical model.



## CHAPTER 6 -- DO POSITIVELY AND NEGATIVELY WORDED ITEMS MEASURE SUBSTANTIVELY DIFFERENT COMPONENTS OF SELF-CONCEPT? : A CONSTRUCT VALIDITY APPROACH

Test construction specialists argue that the number of positively and negatively worded items should be balanced on personality, attitude and other rating scales in order to disrupt possible response sets. This recommendation assumes that positively and negatively worded items measure the same construct, but this assumption is rarely tested and its validity may be dubious in some situations. Benson and Hocevar (1985) and Marsh (1986a), for example, argued that negatively worded items produce systematic biases in the responses by young children. Marsh showed that this influence was age-related, and related to verbal skills when age was held constant. He concluded that this influence of negative items was response bias that had a cognitive developmental basis, and recommended against the use of negatively worded items for young children.

More generally, the tendency for subjects to respond to rating items independently of item content is referred to as response set, response bias, response style, or a method/halo effect. Different approaches emphasize the nonsubstantive or substantively irrelevant components of responses to structured items, arguing that content is what is left over after sources of style and method have been removed through approaches such as regression and factor analysis. A negative-item bias produced by cognitive developmental influences qualifies as a response bias, but it is not the only basis for the effect of negatively worded items. Older respondents are generally able to cope with the cognitive demands of negatively worded items, but researchers still report that positively and negatively worded items designed to measure the same construct are empirically distinct. Marsh (1987b) in a review of self-concept research that found factors defined primarily by negatively worded items for a wide variety of different self-concept instruments -- including the most frequently used instruments -- and for respondents of different ages. The existence of factors defined by negatively worded items is apparently very prevalent in self-concept research. Because the basis of the distinction between such positive and negative item factors is not easily identified, there is ambiguity in deciding whether the distinction is substantively important or a substantively irrelevant artifact of response bias.

Whereas researchers have found or claim to measure distinguishable self-concept factors measured by positively and negatively worded items, there is disagreement on their interpretation. In a few self-concept instruments positive and negative scales are posited, apparently without sufficient empirical justification. In many exploratory factor analysis studies, factors defined primarily by positively worded or by negatively worded items are simply interpreted in terms of item content without regard to the positive or negative wording of the items. Marsh (1986a) concluded that his negative item factor for responses by young children represented a cognitive-developmental bias and recommended that such items should not be used for preadolescents. Some researchers argue that distinguishable factors comprised of positively and negatively worded items represent a substantively unimportant method factor. Still other researchers treat factors defined by positively and negatively worded items as substantively different constructs. Cowen (1954), for example, specifically argues that self-criticism and self-praise are qualitatively different processes in self-concept formation.

A variety of approaches can be used to determine whether scales defined by positively and negatively worded items are distinguishable. The simplest, perhaps, is to determine whether correlations between such factors differs significantly from 1.0 after correction for unreliability, though traditional estimates of reliability may be inappropriate when nonrandom measurement error is posited. The most frequently used technique appears to be exploratory factor analysis, though confirmatory factor analysis (e.g., Marsh, 1986a) appears to be more suitable. Alternatively, MTMM analyses of the positive and negative item scales from the same instrument may be appropriate for this problem (see Marsh, 1987b). Whereas each of these procedures may be suitable for demonstrating that factors defined by negatively worded items are distinguishable from those based on positively worded items, each suffers an important weakness. None provides a basis for determining whether the separation is substantively important or a substantively irrelevant artifact of response bias, and this is the focus of the present investigation.

### The Construct Validity Approach

Carmines and Zeller (1979) found that positively and negatively worded items from the Rosenberg (1979) self-esteem scale define clearly distinguishable factors and they proposed two alternative interpretations: (a) there are separate components of positive and negative self-esteem that are substantively meaningful; and (b) the separation of the two factors is an artifact of nonrandom measurement error. Using a construct validity approach, they reasoned that if the positive and negative item subscales measure substantively different constructs then they should be differentially related to external criteria, whereas if the distinction is due to an artifact then they should be similarly related to external criteria. Because positive and negative item subscales were similarly related to a set of external criteria, Carmines and Zeller concluded that the empirically distinguishable factors were "a function of a single theoretical dimension of self-esteem that is contaminated by a method artifact, response set" (p. 69).

One purpose of analyses summarized here is to develop more fully the potentially useful construct validity approach for distinguishing between the alternative interpretations posited by Carmines and Zeller. There are at least two sets of problems with their approach. First, they based their conclusions on the observation that positive and negative item subscales were similarly correlated to external criteria, but this comparison may be uninterpretable because: (a) the similarity in the correlations does not mean that each of the factors accounts for the same criterion variance, nor that some empirically weighted combination of the two would not perform substantially better than either considered separately or their unweighted combination; and (b) systematic differences in the correlations do not mean that the separation of positive and negative item subscales is substantively justified, because this would be expected if, for example, the negative wording produced a systematic method effect that was independent of external criteria. A better approach, one that is consistent with Carmines and Zeller's logic if not their analyses, is to compare empirically weighted and unweighted combinations of the positive and negative item subscales. If the unweighted sum of the positive and negative subscales is as highly related to appropriate validity criteria as an empirically optimum weighting of the two subscales, then it is unlikely that the separation of the two subscales is substantively important.

The second set of potential problems concerns the generalizability of Carmines and Zeller's findings to self-concept research. They correlated their positive and negative item subscales with "a set of theoretically relevant external variables" (p. 67), but in fact most of these variables were nearly uncorrelated with either esteem subscale (only 1 of 16 variables correlated higher than .25 with either subscale). A better approach would be to use more carefully selected validity criteria that were more systematically related to esteem on the basis of theory and previous research. Frequently used external validity criteria in self-concept research are the observations of significant others (e.g., Marsh, Barnes & Hocevar, 1985; Wylie, 1979) and academic achievement (e.g., Byrne, 1984; Hansford & Hattie, 1982; Marsh, 1986c; Wylie, 1979). Furthermore, Carmines and Zeller's conclusions were based on a single dimension of self-concept as measured by one specific set of items. More recently self-concept researchers have emphasized the multidimensionality of self-concept (e.g., Byrne, 1984; Marsh, Barnes & Hocevar, 1985; Marsh & Shavelson, 1985). Even though Carmines and Zeller emphasized their methodological approach rather than the generality of their findings to other self-concept research, the generality of their results needs to be tested with different criteria and different self-concept instruments.

### The Present Investigation

In order to develop more fully the construct validity approach and to further test Carmines and Zeller's conclusions the results from three published studies using the SDQIII were reanalyzed.

1) Study 1 consisted of the sample of 151 Australian university students (mean age = 21.9, 79% female) described by Marsh, Barnes and Hocevar (1985; also see Marsh & O'Neill, 1984, Study 2 and Chapter 10 in this monograph). As part of that study, subjects asked the person who knew them the best to complete the SDQIII as if they were the person who had given it to them (i.e., they were to predict what the subject had said). For this study, the generality (validity) of the influence of positively and negatively worded items was tested across self-responses and responses-by-others.

2) Study 2 consisted of the 361 Outward Bound participants (mean age = 21.3, 76% males) described by Marsh, Richards and Barnes (1986a; 1986b). For present purposes, responses completed one month before the start of the



program and on the last day of the program are considered. For this study, the generality (stability) of the influence of positively and negatively worded items was tested over time.

3) Group 3 consisted of the 296 year-11 girls (mean age = 16.7) from two private catholic girls schools described by Marsh and O'Niell (1984). In addition to the self-concept responses, standardized measures of academic achievement were considered in that study. For this study, the positive and negative items for each scale were divided in half and the generality (internal consistency) of the influence of positively and negatively worded items was tested over these split halves. In the third study, the relation between academic achievement and academic self-concepts based on positively and negatively worded items was also examined.

#### Statistical Analysis

For all three studies there were: two sets of 13 scale scores representing an unweighted average of responses to positively and negatively worded items (Tot1 and Tot2); two sets of 13 subscale scores representing just positively worded items (P1 and P2); and two sets of 13 subscale scores representing just negatively worded items (N1 and N2). The corresponding positive and negative item subscales were defined by the same number of items, had similar standard deviations, and had similar coefficient alpha estimates of reliability. The two sets of scores considered in the different studies consisted of: self-responses and responses-by-others (Study 1); responses by the respondents at Times 1 and 2 (Study 2); and responses by the respondents to items in the first and second halves of the SDQIII (Study 3). For all three studies: simple correlation was used to relate Tot1 to Tot2, P1 to P2, and N1 to N2; multiple regression was used to relate Tot1 to the optimally weighted combination of P2 and N2, and Tot2 to the optimally weighted combination of P1 and N1; and canonical correlation was used to relate the optimally weighted combination of P1 and N1 to the optimally weighted combination of P2 and N2. The canonical correlation must necessarily be as large as or larger than either of the multiple Rs, and the multiple Rs must necessarily be as large or larger than the correlation between Tot1 and Tot2. To the extent that these differences are trivial, differentially weighting the positive and negative item subscales makes no difference and the results would provide no substantive support for the separation of the subscales. To the extent that these differences are large, there may be support for the separation of the subscales. (The SDQIII scores used in the present investigation were computed as the unweighted sum of responses to items in each scale whereas corresponding results summarized in the original studies and in other parts of this monograph are typically based on factor analytically derived scores so that there might be minor discrepancies.)

#### Results and Discussion.

##### Study 1 -- Self-other agreement

In Study 1 each respondent completed the SDQIII and a significant other inferred the multiple self-concepts of the same person on SDQIII. Previous research (Marsh, Barnes & Hocevar, 1985; also see Chapter 10) demonstrated that there was good self-other agreement based on total scores for each of the 13 self-concept scales. The purpose of this reanalysis is to determine if this agreement is better when positive and negative item subscales of each scale are considered separately or differentially weighted.

Agreement on the 13 total scores for self-responses and responses-by-others (.57; see Tot1 with Tot2 in Table 6.1 for Study 1) is modestly higher than agreement on the 13 positive item subscales (.54) and the 13 negative item subscales (.52). More importantly, this agreement on the 13 total scores (.57) is virtually unimproved by differentially weighting the positive and negative item subscales for the self-responses, for the responses-by-others, or for both. The average agreement is .57, .58 and .59 respectively when the positive and negative item subscales are differentially weighted for the responses-by-others (Tot1 with P2 and N2), for self-responses (Tot2 with P1 and N1), and for both self-responses and responses-by-others (P1 and N1 with P2 and N2). It is important to reiterate that agreement on the (unweighted) total scores represents an absolute lower bound for agreement on the differentially weighted components. Hence, differentially weighting the subscales produces surprisingly little improvement, and this lack of improvement is consistent across all 13 SDQIII scales. If a substantively meaningful distinction between positive and negative item subscales exists for self-report responses to any of the 13 SDQIII scales, this distinction is not paralleled in the corresponding responses by significant others. These results provide no support for the separation of any of the 13 self-concept scales into positive and negative item subscales.

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Insert Table 6.1 About Here  
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##### Study 2 -- Stability

In Study 1 no support was found for the separation of positive and negative item subscales. However, the conclusions were based on agreement between self-responses and responses-by-others, and support for the separation of the subscales might be found if other validity criteria were used. Because it is impossible to test the generality of the conclusions with all potential validity criteria, an alternative approach was sought. It may be possible to find a criterion for which the lack of support would be so convincing that it would be unlikely that support would be found for other criteria. This logic is based on the expectation that strength of support for the separation based on internal reliability-like criteria provide a logical upper-bound for strength of support for external validity-like criteria. Such an internal reliability-like criterion, the stability of responses by the same person to the same instrument over a short period of time is the basis of Study 2. It must be emphasized that support for the separation of positive and negative item subscales based on their short-term stability would not provide convincing support for the validity of their separation, but that the

lack of support for their separation using this criterion would provide convincing evidence against the validity of this separation.

In Study 2 each respondent completed the SDQIII before and after a one-month control interval, and previous research (Marsh, Richards & Barnes, 1986a; 1986b; also see Chapters 5 and 9) demonstrated that there was good Time 1/Time 2 agreement on total scores for each of the 13 SDQIII scales. The purpose of this reanalysis is to determine if this agreement is improved when positive and negative item subscales are differentially weighted.

Agreement on the 13 total scores for Time 1 and Time 2 (.87; see Tot1 with Tot2 in Table 6.1 for Study 2) is modestly higher than agreement on the 13 positive item subscales (.84) and 13 negative item subscales (.83). More importantly, this agreement on the 13 total scores (.87) is unimproved by differentially weighting the positive and negative item components of either Time 1 or Time 2 responses. The average agreement is .87, .87, and .87 respectively when the positive and negative item subscales are differentially weighted for Time 2 responses, for Time 1 responses, and for both Time 1 and 2 responses. Hence, differentially weighting the scales produces no improvement, and this lack of improvement is consistent across all 13 SDQIII scales. If a substantively meaningful distinction between positive and negative item subscales exists for responses to any of the 13 SDQIII scales collected at either time, this distinction is not paralleled in the corresponding responses at the other time. These results provide no support for the separation of any of the 13 self-concept scales into positive and negative item subscales.

##### Study 3 -- Internal Consistency and Academic Achievement

The logic of Study 3 is similar to that of Study 2. In Study 2 the short-term stability of the responses to the same items was considered in order to test the validity of the separation of the positive and negative item subscales. In Study 3 the consistency of responses across different sets of items administered at the same time is considered. As in Study 2, support for the separation of positive and negative item subscales based on their split-half consistency would not provide convincing support for the validity of their separation, but the lack of support of their separation would provide convincing against the validity of their separation.

In Study 3 each respondent completed the SDQIII only once, and the 10 or 12 items from each scale were divided into four subscales -- positive items from the first half of the SDQIII, negative items from the first half, positive items from the second half, and negative items from the second half. Thus, although the analyses are the same as those in Studies 1 and 2, the total scores (Tot1 and Tot2) and positive and negative item scores (P1, P2, N1 and N2) are each based on only half as many items as in Studies 1 and 2.

Agreement on the 13 total scores for first-half and second-half responses (.77; see Tot1 with Tot2 in Table 6.1 for Study 3) is modestly higher than agreement on the 13 sets of positively worded items (.70) and negatively worded items (.62). More importantly, this agreement on the 13 total scores (.77) is virtually unchanged by differentially weighting the positive and negative item components of either the first-half or the second-half responses. The average agreement is .77, .78, and .78 respectively when the positive and negative item subscales are differentially weighted for second-half responses, for first-half responses, and for both first-half and second-half responses. Differentially weighting the positive and negative item subscales produces surprisingly little improvement, and this lack of improvement is consistent across all 13 areas of self-concept measured by the SDQIII. If a substantively meaningful distinction between positive and negative item subscales exists for responses to either random split half of any of the 13 SDQIII scales, this distinction is not paralleled in the responses to the other random split half. These results provide no support for the separation of any of the 13 self-concept scales into positive and negative item subscales.

In Study 3 the verbal and mathematical achievement scores provide particularly relevant criteria for Math and Verbal self-concept responses. Marsh and O'Niell (1984; also see Marsh, 1986c) found that the corresponding measures of academic achievement and academic self-concept were substantially correlated, and that the agreement was quite specific to matching areas of academic achievement and self-concept. For present purposes, total scores were computed for all the Math and all the Verbal self-concept items, and subscale scores were computed for the corresponding positively and negatively worded items. The total scores were as highly correlated with achievement scores (.58 and .37 for Math and Verbal) as the positive item subscales (.57 and .32) or the negative item subscales (.53 and .37). Furthermore, this agreement based on the total scores was virtually unimproved by differentially weighting the positive and negative item subscales (.58 and .38 for Math and Verbal). If a substantively meaningful distinction between positive and negative item subscales exists for either the Math or Verbal scales of the SDQIII, this distinction is not paralleled in the corresponding achievement measures. These results provide no support for the separation on the Math and Verbal self-concept scales into positive and negative item subscales.

##### Summary, Potential Limitations, and Broader Applications

A considerable body of research, particularly self-concept research, suggests that subscales of the same construct defined by negatively and positively worded items may be distinguishable. There is disagreement, however, as to whether this effect is substantively important or a substantively irrelevant method effect. The purpose of the present investigation was to develop more fully a construct validity approach to test whether the separation of positive and negative item subscales was substantively justified for responses to the SDQIII. No support for the separation of any of the 13 SDQIII scales was found in the prediction of self-concepts inferred by significant others, in the prediction of mathematical and verbal achievement, in the short-term stability of self-concept, and in the consistency of self-concept responses across split-half sets of items. Two features of this research enhance the generality of the findings to other self-concept research and, perhaps, to other areas of personality research. First, the results were very consistent across



the 13 SDQIII scales so that the results are unlikely to be idiosyncratic to a particular area of self-concept or the wording of items used to infer a particular SDQIII scale. Second, the construct validity approach developed in this investigation and the choice of criteria make it unlikely that the separation of positive and negative item subscales for the SDQIII would be justified by consideration of other validity criteria. The results do not preclude the possibility that the separation is substantively meaningful for other psychological instruments, but does provide a procedure for testing such claims.

#### Potential Limitations of the Construct Validity Approach

Dependence on the null hypothesis. The fundamental test in the construct validity approach is to determine whether differentially weighting positive and negative item subscales produces a meaningful improvement in the prediction of suitable validity criteria. Support for the conclusion that differences are substantively unimportant rests on support of the null hypothesis. From a traditional hypothesis testing perspective this is a weak basis of inference. The approach used here is, however, consistent with modeling approaches (e.g., confirmatory factor analysis and covariance structural analysis) in which the researcher posits a theoretically defensible and parsimonious model. The ability of the hypothesized model to fit the data is then tested and compared to the fit of other models. A model positing that positively and negatively worded scales are equally weighted is more parsimonious than one that allows the scales to be differentially weighted, and the analyses presented here constitute a strong test of this more parsimonious model. The use of covariance structure analysis may enhance the usefulness of the construct validity approach, but will not alter the basic logic of the approach.

Differential weighting and capitalizing on chance. Least-squares and other statistical approaches used to optimally weight criteria are known to capitalize on chance. The extent of this bias depends, for example, on the number of parameters being estimated and sample size. Some researchers have suggested that equal weights may be preferable if empirically derived weights are unstable. This contention is based in part on the finding that empirically derived differential weights may perform no better, or even worse, than equal weights in cross-validation studies. The approach proposed here is responsive to this problem in that differential weighting is systematically compared to the results of equal weights. The approach is also conservative in relation to support for equal weighting. The use of correction techniques to control for prediction biases and the cross-validation of empirically derived weights with additional data may enhance the usefulness of the construct validity approach, but will not alter the basic logic of the approach.

When differential weighting does enhance the prediction of validity-like criteria, then further examination of the results is required. If the regression weights are unreasonable or have very large standard errors, then the results should be viewed cautiously. In such examples, more robust estimation procedures such as ridge regression may be useful. It should be noted, however, that predictions based on differential weights are unlikely to perform substantially better than the more parsimonious model of equal weights when the regression weights are very unstable.

The use of reliability-like and validity-like criteria. In psychological measurement, levels of generality are sometimes depicted as falling along a continuum for which reliability and validity are the end-points. A useful, though not perfect generalization is that reliability constitutes a logical upper-bound for validity. This same logic is the basis for testing the separation of positive and negative item scales with both external validity-like criteria and internal reliability-like criteria. In the present study, for example, no support for the separation of positive and negative item subscales was found in the prediction of self-concepts inferred by significant others and with academic achievement -- two of the most frequently used validity criteria in self-concept research. A lack of support for differentially weighting positive and negative item scales based on any particular external validity criterion, however, does not imply a lack of support based on other, perhaps more appropriate criteria. Whereas in may be possible to support such a claim on the basis of logical analyses, an alternative approach was presented here.

In the present investigation, support for the separation of positive and negative item subscales did not generalize over a short time interval when raters and stimulus materials were constant, or over split-halves of the positive and negative item subscales administered at the same time. Because there is no support for the separation of positive and negative item subscales for internal, reliability-like criteria such as these, there is unlikely to be support for the separation for external, validity-like criteria. That is, the strength of support for the separation based on these reliability-like criteria provides a logical upper-bound for the strength of support based on validity-like criteria. It is important to emphasize that even if differentially weighting positive and negative item scales is supported with such reliability-like criteria, support for the generality of this separation is weak in the same way that reliability does not imply validity. Testing the separation of positive and negative scales against both reliability-like criteria and validity-like criteria in the same study provides a stronger basis of inference than the consideration of either type of criteria alone (see Marsh, 1987b; 1989b; Marsh, Barnes & Hocevar, 1985; for further discussion).

Alternative explanations. Even when differentially weighting positive and negative item subscales does improve the prediction of validity criteria, there may be viable counter explanations. One such counter explanation might be the proportions of true score variance in responses to positively and to negatively worded items. If these proportions are not similar, then this may account for the differential weighting. Whereas a comparison of the reliabilities of the positive and negative item subscales provides a test of this counter-explanation, these reliability estimates may be complicated by the existence of nonrandom measurement error. Both random and nonrandom measurement error can be controlled in appropriate covariance structure models by positing correlated uniquenesses (e.g., Bachman & O'Malley, 1986; Marsh & Hocevar, 1985) or method factors (e.g., Marsh, 1986a; Marsh & Hocevar, 1983).

A particularly troublesome problem occurs when nonrandom measurement error is systematically related to the validity criterion. For example, Marsh (1986a) reported a negative-item bias that produced systematically lower self-concepts for younger children and for children with poorer reading skills. This bias, however, actually increased the correlation between Reading self-concept and reading achievement because the bias was systematically related to the validity criterion. Similarly, if a validity criterion consisted of a self-report measure consisting of all negatively worded items, then a negative item subscale might be more highly correlated to it than would a positive item subscale. The resulting support for differential weighting, however, might reflect a response bias that affected both the criterion and the negative item subscale.

In summary, the construct validity approach can lead to wrong conclusions if not carefully applied. As is the case with all construct validity studies, interpretations should be based on theory and the accumulated empirical results from diverse studies that use different measurement instruments, different validity criteria, and different experimental approaches.



## CHAPTER 7 -- AGE AND SEX EFFECTS IN SDQIII RESPONSES

A frequent concern of self-concept researchers is the examination of how self-concept varies with age and with sex (see Wylie, 1974; 1979). SDQ research on sex and age effects has focused primarily on theoretical implications, but the findings also are relevant for the construction of appropriate normative comparison tables (see Chapter 3).

The effect of age on self-concept, particularly for preadolescents, is reviewed in the SDQI monograph (also see Marsh, 1985a; Marsh, 1989a; Marsh, Barnes, Cairns & Tidman, 1984; Marsh, Parker & Barnes, 1985) and will be summarized here only briefly. Consistent with other studies, SDQ research has found that there is a primarily linear decline in self-concept during preadolescent years that continues into early adolescent years. Whereas the magnitude of this decline varies with the component of self-concept, the general pattern is consistent across all the SDQ factors. SDQII research with high school students has consistently shown that self-concepts declines between grades 7 and 9, levels out, and then increases in subsequent high school years. Whereas this pattern characterizes most of the SDQII factors and the total score, the effect does vary with the particular facet. For example, Opposite Sex Relations shows a primarily linear increase during these high school years whereas Parent Relations tend to decline.

The effect of sex on self-concept, particularly for preadolescents, is reviewed in the SDQI monograph (also see Marsh, Barnes, Cairns & Tidman, 1984; Marsh, 1989a; Marsh, 1985a; Marsh, Parker & Barnes, 1985) and will also be summarized here only briefly. For both SDQI and SDQII studies, sex differences in the total scores are very small, and account for less than 1% of variance. There are, however, systematic sex differences in particular self-facets, some favoring girls and some favoring boys. In general, these differences are consistent with traditional sex stereotypes. For the SDQ, the largest sex differences were for Physical Abilities (favoring boys) and Reading (favoring girls). For the SDQII, the largest sex differences favoring girls were for Verbal, Same Sex Relations, and Honesty/trustworthiness, whereas the largest differences favoring boys were for Math, Physical Appearance and Ability, and, perhaps, General Esteem and Emotional Stability. It is interesting to note that whereas there were little or no sex differences in Math self-concepts for preadolescents, there was a significant effect in favor of boys for the high school years.

### Age and Sex Effects in SDQIII Responses

New analyses, similar to those conducted with the SDQI and SDQII, were performed on the 2,436 sets of responses in the SDQIII normative data base. Polynomial trend analyses were used to test if nonlinear components of age -- quadratic (a U-shaped or an inverted U-shaped curve) or cubic (a curve with two inflection points) -- added to the linear effects of age in explaining self-concept. In preliminary analyses for each self-concept score, multiple regression was used to test the effect of sex, the linear, quadratic, and cubic effects of age, and the interaction between sex and each of these polynomial components. These preliminary analyses showed, however, that the cubic effect of age and the interaction between sex and the quadratic and cubic components of age did not contribute significantly to the prediction of self-concept and were dropped from subsequent analyses. In subsequent analyses, the remaining four components (see Table 7.1) were used to predict each of the SDQIII scores.

Whereas the size of the age effects are typically small, many reach statistical significance due to the large sample size. There is, however, a reasonably consistent trend in the results. Most of the variance explicable by age is due to the linear component of age. When the effect of age is statistically significant, there is typically a weak linear increase in self-concept with age. The only major exception to this trend is for Same Sex relations which shows a weak decline with age. These results suggest that the increase in self-concept starting in mid-adolescence observed in SDQII (Marsh, Parker & Barnes, 1985) research continues into late adolescence and early adulthood.

The pattern of sex differences consistent with traditional sex stereotypes observed here (Table 7.1) is similar to that observed in SDQI and particularly SDQII research. The size of sex differences are typically small, but tend to favor males to a greater extent than was observed for younger respondents. Whereas women have significantly higher self-concepts for two facets (Religion/spiritual values and Honesty/trustworthiness), males have significantly higher self-concepts for 6 facets (Physical Appearance, Physical Ability, Problem Solving, Mathematics, Emotional Stability, and General Esteem). The largest sex difference was for Physical Appearance (favoring men) and this was also observed in SDQII studies. The significant sex x age interaction does indicate, however, that this large sex difference declines with age. Whereas self-concepts do tend to favor men to a greater extent than observed in SDQI and SDQII research, the sex difference in the total score is still very small ( $\beta = -.09$ ) and accounts for less than 1% of the variance.

### Insert Table 7.1 About Here

In the multiple regression analyses summarized above, age is considered to be a continuous variable. For purposes of the normative tables, however, age is considered as a dichotomous variable. Whereas the general lack of nonlinearity in the effects of age (Table 7.1) are supportive of this decision, the decision was tested further with additional analyses. For purposes of these supplemental analyses, a 2 (sex) by 2 (levels of age) ANOVA corresponding to the breakdown used in the norm tables was performed on each of the SDQIII scores. The general pattern of results for these ANOVAs was similar to that observed with the multiple regressions, and even the variance explained in these

ANOVAs (see second column under MR squared in Table 7.1) is similar to that explained in the multiple regressions. These supplemental analyses thus support the decision to break the total normative group into the four subgroups summarized in Appendix I.

In drawing conclusions from these analyses, two observations are relevant. First, because there is not universal schooling during the late-adolescent and early adult years, it is much more difficult to obtain representative norms for this age group than it is for younger respondents. Hence the normative data base for the SDQIII is probably not as representative as the data bases for the SDQI and SDQII (see Chapter 3). Second, the effects of both age and sex appear to be generally consistent with expectations from SDQI and SDQII research. Self-concept appears to decline with age during preadolescent and early adolescent years, level out in early to middle adolescent years, and then increase at least through early adult years. Research with the SDQ, SDQII and SDQIII has consistently shown that sex differences in self-concept vary with the particular facet of self and are consistent with stereotypic sex stereotypes.



## CHAPTER 8 -- THE RELATION OF MULTIPLE DIMENSIONS OF SELF-CONCEPT TO ACADEMIC ACHIEVEMENT INDICATORS

Wylie noted that "many persons, especially educators, have unhesitatingly assumed that achievement and/or ability measures will be strongly related to self-conceptions of achievement and ability and to over-all self-regard as well" (1979, p. 355). Not surprisingly, particularly for studies of school-aged children, some measure of academic achievement is one of the most frequently posited criteria used to validate self-concept interpretations, and has also been the focus of much SDQ research. This research, particularly for preadolescents, is reviewed in the SDQI monograph and elsewhere (e.g., Marsh, 1986c) and will be summarized here only briefly.

In the SDQ instruments, and in the Shavelson model upon which they are based, self-concept is posited to be a multifaceted, hierarchically ordered construct. Academic self-concept is one component of overall self-concept, and it is divided into self-concepts in particular content areas such as English and math. Support for the construct validity of SDQ interpretations and the Shavelson model requires academic achievement to be more positively correlated with academic self-concept than with nonacademic or General Esteem, and verbal and math achievement to be more highly correlated with self-concepts in matching content areas than with other facets of self-concept. In a meta-analysis of the achievement/self-concept relationship, Hansford & Hattie (1982) found that measures of ability/performance correlated about .2 with measures of general self-concept, but about .4 with measures of academic self-concept. This and other research reviewed in the SDQI monograph support the construct interpretation described above, and indicate the need to distinguish among academic, nonacademic and general self-concepts.

SDQ research has emphasized the distinctiveness of specific academic self-concepts and their relation to corresponding areas of academic achievement. In research based on all three SDQ instruments, math achievement is most highly correlated with math self-concept, less correlated with other academic facets, and nearly uncorrelated with nonacademic facets. Similarly, English achievement is most highly correlated with Verbal self-concept, less highly correlated with other academic facets, and nearly uncorrelated with nonacademic facets. Support for the generality of this pattern of result is summarized in the SDQI monograph and is clearly demonstrated in the SDQIII study by Marsh and O'Neill (1984) summarized in Table 8.1. Hence the correlations between the academic self-concept scales and academic achievement indicators support a dramatic distinction between academic and nonacademic facets of self-concept, and also demonstrate the clear separation of Math and Verbal self-concepts.

A considerable body of research indicates that academic self-concepts are at least moderately correlated with corresponding levels of academic achievement. However, the correlations almost never approach the reliabilities of the respective measures, suggesting that academic self-concepts reflect more than just academic achievement. Even after individuals obtain information from various sources about their levels of academic ability or achievement, these impressions must be compared to some frame of reference. To the extent that individuals have different frames-of-reference, the same objective indicators of achievement will lead to different academic self-concepts. Theoretical

models and empirical support for two different frame-of-reference effects have been emphasized in SDQ research. First, academic self-concepts are substantially influenced by the ability levels of other students in the immediate context in addition to one's own ability level. Thus average-ability students will have higher academic self-concepts in low-ability schools than in high-ability schools, and this is called the Big Fish Little Pond Effect (Marsh, 1987a; Marsh & Parker, 1984). Second, it is proposed that students compare their own ability levels in different academic subjects in addition to comparing their own ability levels to those of other students in order to formulate their own academic self-concepts. Thus a student who is poor in all academic areas but relatively better at mathematics than at other school subjects may have an average Math self-concept.

### Verbal and Math Self-Concepts: An Internal/External Frame of Reference Model

The purpose of material to be described here is to examine empirical support for the Internal/External Frame of Reference Model (the I/E model) that describes relations between Verbal and Math self-concepts, and between these academic self-concepts and verbal and math achievement. According to the I/E model, Math and Verbal self-concepts are formed in relation to both external and internal comparisons, or frames of reference. For the external process, students compare their self-perceptions of their own mathematics achievement (MACH) and verbal achievement (VACH) with the perceived abilities of other students in their frame of reference and use this external relativistic impression as one basis of their academic self-concept in each of the two areas. However, the model also posits an internal comparison process for which students compare their self-perceived MACH with their self-perceived VACH and use this internal, relativistic impression as a second basis of their academic self-concept in each of the two areas.

The external process has been well documented in self-concept research (e.g., Marsh & Parker, 1984) and more generally as a social comparison process (Suls & Miller, 1977). Since VACH and MACH are substantially correlated, this external comparison process should lead to a positive correlation between Verbal self-concept and Math self-concept as originally anticipated in the Shavelson model. The internal comparison process, though more unusual in other theoretical accounts, is like the compensatory model described by Byrne (1984) that was proposed by Winne and Marx (1981) to explain why academically less able students perceived themselves as relatively more successful on physical and social facets. Since MACH and VACH are compared with each other, and it is the difference between the two that contributes to a high self-concept in one area or the other, the internal process should lead to a negative correlation between Verbal self-concept and Math self-concept. The joint operation of both processes, depending on the relative strength of each, will lead to the near-zero correlations that have been observed in empirical research. The I/E model also predicts a negative direct effect of MACH on Verbal self-concept, and of VACH on Math self-concept. For example, a high Math self-concept will be more likely when MACH is good (the external comparison) and when MACH is better than VACH (the internal comparison). Thus, once math skills are controlled for, it is the difference between MACH and VACH that is predictive of Math self-concept, and high VACH will actually detract from a high Math self-concept. According to the I/E model having good mathematics skills detracts from verbal self-concept and having good verbal skills detracts from mathematics self-concept.

Figure 8.1 summarizes the predicted relations among VACH, MACH, Verbal self-concept, and Math self-concept. In this model, academic achievements are hypothesized to be one causal determinant of academic self-concepts, but this does not argue against a more dynamic model where subsequent levels of academic achievement and self-concept are each determined by prior levels of achievement and self-concept. According to the path model, VACH and MACH are substantially correlated with each other while Verbal and Math self-concepts are nearly uncorrelated. VACH has a strong, positive direct effect on Verbal self-concept but a small, negative direct effect on Math self-concept. Similarly, MACH has a strong positive effect on Math self-concept but a weaker, negative effect on Verbal self-concept (see Marsh, 1986c for further discussion).

Insert Figure 8.1 and Table 8.1 About Here

### Empirical Support For the I/E Model Based on SDQIII Responses

The first basis of support for the I/E model examined by Marsh (1986c) was the near-zero correlation between Math and Verbal self-concepts. He reported correlations between Math self-concept and Verbal self-concept based on responses to the SDQ, SDQII, and SDQIII from 11 different studies that spanned ages from preadolescents to young adults. Except for the youngest children, those in second and third grades, the correlations were consistently close to zero. Three of these studies were based on SDQIII responses by university students (Marsh, Barnes & Hogevar, 1985), by Year 11 high school students (Marsh & O'Neill, 1984), and by a primarily nonstudent population of young adults who were participants in an Outward Bound program (Marsh, Richards & Barnes, 1986a; 1986b). The six correlations between Math and Verbal self-concepts based on these studies were consistently close to zero (-0.03 to 0.03). These findings are also consistent with the factor analytic results based on the entire normative data base of SDQIII responses described in this monograph (Chapter 5).

Correlations between Math and Verbal self-concepts in most SDQ research are based upon responses by students in an academic setting. The importance of the internal comparison process where self-perceived skills in math and reading are compared to each other, and the distinctiveness of the two academic self-concepts, may be exaggerated in an academic setting. Hence the results based on the Outward Bound study are particularly important. This study is based on responses from young adults (ages 16 - 31, median = 21 years) who were primarily nonstudents and who were participating in a program that emphasized primarily physical outdoor activities, and, perhaps, social relationship skills



rather than academic skills. Even here, support for the relative lack of correlation between Verbal and Math self-concepts is strong.

The second basis of support for the I/E model examined by Marsh (1986c) was to test predictions from the model that are illustrated in Figure 8.1 with data from six of the studies that also had MACH and VACH scores. These results demonstrated that the direct effects of MACH on Verbal self-concept, and of VACH on Math self-concept were consistently negative. One of these studies was the Marsh and O'Neil (1984) study based on SDQIII responses that is summarized in Table 8.1. As predicted by the I/E model, the direct effect of MACH on Math self-concept is substantial and positive ( $\beta = .72$ ) whereas the direct effect of English achievement is smaller and negative ( $\beta = -.24$ ). For Verbal self-concept, the direct effect of English achievement is large and substantial ( $\beta = .55$ ) whereas the direct effect of math achievement is smaller and negative ( $\beta = -.25$ ). Though not formally included as part of the I/E model, both math and English achievement have significantly positive direct effects on Academic self-concept. It is also interesting to note that neither math nor English achievement are significantly correlated with any of the nonacademic SDQIII factors or with General Esteem.

#### The Canadian High School Test of Generality of the I/E Model

Marsh (1986c) noted that support for the I/E model was based entirely on responses by Australian students to one of the SDQ instruments. Hence, Marsh, Byrne and Shavelson (1988) tested the generalizability of the I/E model in further analyses of data from Byrne and Shavelson (1986). Nearly 1000 Canadian students, 11th and 12th graders from two coeducational high schools, responded to the Verbal, Math, Academic, and General Esteem scales from three different self-concept instruments including the SDQIII. School grades for mathematics, English, and all school subjects were used as indicators of MACH, VACH, and SACH respectively. In the initial analyses the I/E model (Figure 8.1) was tested with responses from each of the self-concept instruments separately and with combined self-concept scores derived from all the instruments. These analyses test the generalizability of support for the I/E model to non-Australian respondents and to different self-concept instruments.

Marsh, Byrne, and Shavelson (1988) also extended the original I/E model in that new variables consisting of Academic self-concept, General Esteem, overall school achievement (SACH) and gender were added. As well as having potential theoretical relevance to the I/E model, relations involving each of these additional variables are substantively important. The I/E model provides a methodological approach for examining sex differences in multiple areas of self-concept and in multiple areas of achievement, and particularly the relations between the two sets of sex differences. The inclusion of these new variables and the use of three different self-concept instruments also provides a powerful test of the construct validity of the specific facets of academic self-concept.

Verbal, Math, and Academic self-concepts were each measured by the SDQIII, the Self-concept of Ability Scale (SCA; Brookover, 1962; Shavelson & Bolus, 1982), and the Affective Perception Inventory (API; Soares & Soares, 1979). General Esteem was measured by the SDQIII, the API, and the Self-esteem Scales (SES; Rosenberg, 1965). Statistical analyses were based on correlations (Table 8.2) among the 12 self-concept scores -- VACH, MACH, SACH and GSC based on the three instruments -- and gender (1=male, 2=female). In addition, total scores for each of the four facets of self-concept were computed by summing the scores from the three different instruments. A single correlation matrix was constructed for all the variables and path coefficients used to test the I/E model were estimated with a series of multiple regressions. Four path models (Figure 8.2) derived from original I/E model (Figure 8.1) were conducted for responses from each self-concept instrument and the combined self-concept scores from all three instruments. Because the focus of the present monograph is on SDQIII, just the statistically significant path coefficients for the combined self-concept scores and for the SDQIII responses (the values in parentheses) are presented. The findings were, however, consistent for each of the different instruments (see Marsh, Byrne & Shavelson, 1988).

Insert Figure 8.2 and Table 8.2 About Here

#### Support for the I/E Model

The I/E model posits that the correlation between Verbal self-concept and Math self-concept will be small and substantially smaller than the correlation between VACH and MACH. Support for this prediction comes from both the correlations (Table 8.2) and the path analyses (Figure 8.2). The correlations between Verbal self-concept and Math self-concept varied between -.05 and .08 for the different instruments and was 0.00 for the combined scores. Despite this lack of correlation between Verbal self-concept and Math self-concept, VACH and MACH were substantially correlated (.52). Hence the replicability and generality of this first prediction is supported.

The I/E model further predicts that VACH will have a substantial positive effect on Verbal self-concept but a smaller negative effect on Math self-concept, and that MACH will have a substantial positive effect on Math self-concept but a smaller negative effect on Verbal self-concept. Support for this predicted pattern of results is demonstrated in each of the path models (Figure 8.2) for the combined scores and for each of the self-concept instruments considered separately. Hence, the replicability and generality of this second prediction is supported.

New variables were added to the original I/E model in order to see their influence on the model and its predictions. Because of the ordering of the variables the inclusion of Academic self-concept and General Esteem can influence any of the path coefficients in the original I/E model. Thus, the additional variables of interest are sex and SACH. Because sex is related to Math and Verbal self-concepts, and because SACH is related to both VACH and

MACH, support for the I/E model might be affected by their inclusion. Whereas the addition of these new variables resulted in small changes in some of the path coefficients, support for the I/E predictions was unaffected.

#### Construct Validity of Multidimensional Self-concepts

The construct validity of multidimensional self-concepts requires that academic achievement is more highly correlated with academic facets of self-concept than with General Esteem, and that academic achievement in specific content areas (e.g., MACH) is more highly correlated with matching areas of self-concept (e.g., Math self-concept) than with nonmatching areas (e.g., Verbal self-concept). The results of the present investigation provide strong support for this predicted pattern of results.

General Esteem, whether based on the SDQIII, API, Rosenberg scale or the combined scores, is not significantly correlated with VACH, MACH or SACH. Because of the consistency of this finding across the three instruments and the large sample size, this finding demonstrates dramatically that General Esteem is relatively unaffected by academic achievement and that achievement is relatively unaffected by General Esteem. From this perspective, General Esteem may not be a particularly useful construct in educational research.

Because of the substantial correlations between VACH, MACH, and SACH, the content specificity of achievement/self-concept relations is not so evident in the zero-order correlations. However, the results of Model 3 (Figure 8.2) is ideally suited for making such comparisons; each path coefficient relating any one achievement score to any one of the self-concept scores represents the effect of that achievement score after partialling out the effect of the other two achievement scores. Math self-concept is substantially and positively related with MACH, modestly and negatively related with VACH, and nearly unrelated with SACH. Verbal self-concept is substantially and positively related with VACH, modestly and negatively related with MACH, and relatively uncorrelated with SACH. Academic self-concept is substantially correlated with SACH, and nearly uncorrelated with either VACH or MACH. This pattern is consistent for self-concept scores from the SDQIII, the API, the SCA, and the combined scores, and is virtually unaffected by the inclusion of sex (Model 4). These findings are also consistent with those from the Marsh and O'Neil (1984) summarized in Table 8.1.

In summary, the findings summarized in this chapter provide remarkably strong support for the multidimensionality of self-concept and the content specificity of General Esteem, Verbal self-concept, Math self-concept, and Academic self-concept. In particular, the path analytic results suggest that General Esteem is unaffected by VACH, MACH or SACH, only VACH has a positive influence on Verbal self-concept, only MACH has a positive influence on Math self-concept, and only SACH has a positive influence on Academic self-concept. Other researchers have argued for the content specificity of different facets of academic self-concept (e.g., Marsh & Shavelson, 1985). However, no other research provides such strong support for the specificity of the different academic facets or the generality of this specificity across different self-concept instruments.

#### Sex Differences in Multidimensional Self-concepts and Academic Achievements

Based on previous research summarized in Chapter 7 (also see SDQI monograph) it was anticipated that girls would have higher VACH and Verbal self-concept scores than boys, that boys would have higher MACH and Math self-concept scores than girls, and that sex differences in SACH and Academic self-concept would fall somewhere in between those observed for English and mathematics scores. A critical question, however, is whether sex differences in Math self-concept and Verbal self-concept are larger than can be explained by corresponding differences in MACH and VACH. Such a finding would suggest that the sex stereotypes influence academic self-concepts directly in addition to any influence that may operate indirectly through academic achievement scores.

Girls, as anticipated, had higher VACH and Verbal self-concept than did boys. While much of girls' advantage in Verbal self-concept could be explained by their higher VACH, girls still had higher Verbal self-concept even after controlling for VACH (Figure 8.2). Thus, girls had even higher Verbal self-concept than was explicable in terms of their VACH and this might reflect the influence of sex stereotypes. Boys, as anticipated, had substantially higher Math self-concept than girls, but they had slightly lower MACH than did girls. Because girls had slightly higher MACH than boys, the girls' lower Math self-concept could not be explained by MACH, and many alternative explanations are not plausible. Correcting Math self-concept for MACH actually increased the sex differences in Math self-concept rather than decreasing it. Girls had modestly higher SACH and Academic self-concept than did boys. However, once the effects of SACH were partialled out, there were almost no differences between Academic self-concept scores for boys and girls. That is, girls' higher Academic self-concept scores could be explained in terms of their higher SACH.

Traditional sex stereotypes may provide an explanation for the relations between sex differences in self-concept and achievement scores. According to sex stereotypes girls are better at English than boys, and their Verbal self-concept was higher than could be explained on the basis of their VACH. According to sex stereotypes boys are better at mathematics than girls, and their Math self-concept was higher than could be explained on the basis of their MACH. Across all school subjects sex stereotypes are more balanced and sex differences in Academic self-concept were explicable in terms of SACH. It should also be noted that this explanation does not require MACH and VACH to be unaffected by sex stereotypes, but posits that sex stereotypes directly influence Math self-concept and Verbal self-concept in addition to indirect effects through the achievement scores.

#### Summary and Implications



The purposes of this Chapter were generally to examine relations between academic achievement and the different facets of self-concept measured by the SDQIII, and specifically to test the I/E frame of reference model. Evidence for the I/E model is based on support for two sets of predictions that: a) the correlation between Math self-concept and Verbal self-concept will be small and substantially smaller than the correlation between MACH and VACH; and b) the direct effect of VACH on Math self-concept, and of MACH on Verbal self-concept, will be negative. Support for both these predictions was demonstrated; the support was consistent across responses by Australians and by North Americans, was consistent across responses to different self-concept instruments, and was nearly unaffected by the inclusion of gender and Academic self-concept in the original I/E model. These findings not only demonstrate the clear separation between Math and Verbal self-concepts -- much clearer than for the corresponding areas of achievement -- but they also demonstrate that academic self-concepts are affected by different processes than are achievement measures in the academic areas which they reflect.

The present discussion has focused on the I/E model and two specific facets of academic self-concept, but the results have important implications for self-concept research in general. The findings add to the growing body of support for the multidimensionality of self-concept, for the need to separate academic self-concept from general self-concept, and for the need to separate academic self-concepts in specific areas. The remarkably consistent lack of correlation between General Esteem and achievement scores forcefully illustrates the inappropriateness of using General Esteem to evaluate an intervention that is intended to affect academic variables. However, the present results also illustrate the need to distinguish among specific facets of academic self-concept, particularly when the logical focus of a study is on a specific academic facet. Because Math self-concept and Verbal self-concept are so separate, the inclusion of both serves as a relevant placebo control for the other when the intended effect of an intervention is specific to one of these facets.

The clear distinction between academic self-concepts and academic achievements were also illustrated. The academic self-concepts are more clearly differentiated than corresponding areas of academic achievement, and are more complex than a mere subjective reflection of normatively defined academic achievement. In this respect, even though academic self-concept and achievement are positively correlated, academic achievement is a biased indicator of academic self-concept, as is academic self-concept as an indicator of academic achievement. The results also provide further support for the revision of the Shavelson hierarchical model that now posits that two higher-order academic self-concepts -- verbal/academic and math/academic -- are required to explain academic self-concepts in specific areas.

Particularly the Marsh, Byrne and Shavelson (1988) study also has important implications for understanding sex differences in academic self-concept and achievement. Whereas boys had significantly higher math self-concepts than girls, girls had higher verbal self-concepts than boys. These sex differences were still evident even after controlling for school grades in English and mathematics. As reported in other studies, being a girl contributed to a lower math self-concept than could be explained by school performance in mathematics. However, being a boy contributed to a lower Verbal self-concept than could be explained in terms of school performance. Whereas the pattern of relations between girls and mathematics has been well-publicized, fewer studies have examined what may be a mirror-image pattern of relations between boys and verbal skills. The results suggest that traditional sex stereotypes may affect Math and Verbal self-concepts beyond their influence on academic achievement, and that these sex differences in academic self-concepts may influence subsequent achievement.

The findings also have practical implications for educators at all levels. An important dilemma faced by teachers is how to give positive feedback and praise that is realistic and honest, and will be accepted by academically poor students. If teachers are able to more accurately infer the academic self-concepts of their students, and better understand how they are formed, then their ability to provide positive reinforcement to students of all ability levels will be enhanced. Even though teachers are able to infer student self-concepts in academic areas with at least modest accuracy, there appear to be several biases in their inferences. It is unjustified to assume that an academically weak student will necessarily have poor academic self-concepts in all settings and in all subject areas. First of all, students in settings where other students are also academically weak will have higher academic self-concepts than they would in settings where other students are academically average or above-average. Previous SDQ research suggests that teachers emphasize absolute measures of academic achievement in inferring the academic self-concepts of their students and largely ignore the particular setting which establishes the frame of reference for students' own development of their self-concept. Second, inferred self-concept ratings by teachers (and also by peers) overemphasize the external comparison of student skills in academic areas and underemphasize differences in skills in particular academic areas. Thus, a student who is weak in both math and verbal skills, but who is stronger in one area than the other will tend to have much larger differences in Verbal and Math self-concepts than is reflected in the self-concepts inferred by teachers. The I/E model also leads to the gratifying prediction that nearly everyone will feel at least reasonably good about themselves in at least some areas.

## CHAPTER 9 -- THE EFFECTS OF INTERVENTIONS DESIGNED TO ENHANCE SELF-CONCEPT ON SDQIII RESPONSES

The enhancement of self-concept is widely valued as a desirable goal in many areas of research, and frequently posited as an intervening process that may lead to desirable changes in other constructs (e.g., academic achievement). However, research reviewed earlier (Chapter 4) indicates that self-concept is -- and should be -- relatively stable over time, and consequently interventions typically have little effect on self-concept in well-controlled studies. The purpose of the present chapter is to describe the intervention effects produced by two Outward Bound programs as assessed by the SDQI and the SDQIII, to test the construct validity of responses to SDQ instruments in relation to these intervention effects, and to examine methodological issues in such research. One of these interventions, the Outward Bound Bridging course, was evaluated with the SDQI and is described in detail in the SDQI monograph (also see Marsh & Richards, 1988a). The other intervention, the Outward Bound Standard Course, was evaluated with the SDQIII in published studies by Marsh, Richards and Barnes (1986a; 1986b). Because the Marsh, Richards and Barnes (1986a) study is an 18-month follow-up of Marsh, Richards and Barnes (1986b) study, it will be emphasized in this Chapter.

Marsh, Richards and Barnes (1986a, 1986b) examined methodological issues in the study of intervention effects on multidimensional self-concepts. They identified what they called a post-group-euphoria effect -- the good feelings that subjects have after the completion of intensive group experiences. They did not question that such an effect existed, but were concerned that its existence affected measures designed to assess the effect of the intervention -- particularly self-concept measures. They argued that randomly assigned control groups provide little protection against such a bias, while placebo controls that are like the program yet are unrelated to the intended effects of the program are unlikely to exist or may not be feasible. Instead, they presented a construct validity approach to the study of intervention effects and of the validity of interpretations resulting from such studies. Using this approach, they argued that specific dimensions of self-concept that are most relevant to the intervention should be most affected, while less relevant dimensions should be less affected and serve as a control for response biases. They conducted a short multiple time-series design in which 26 different groups of participants in different Outward Bound standard courses completed the SDQIII one month before the start of the course, on the first day of the course, on the last day of the course, and 18 months after the completion of the course. The findings demonstrated that: (a) there was little systematic change in self-concepts during the control interval (T1/T2); (b) changes during the experimental interval (T2/T3) were large for those facets of self-concept judged a priori to be most relevant to the goals of the program; (c) changes in dimensions of self-concept less relevant to the program were significantly smaller; (d) these intervention effects were similar for 27



different groups of participants; and (e) effects were stable during the 18-month follow-up (T3/T4) period. They argued that this design, and the many tests of the validity of their interpretations, provided a stronger test of the program effects on self-concept than did most traditional experimental designs.

#### Methodological Issues in Intervention Studies.

Well-controlled interventions have typically not systematically affected self-concept, despite many possible biases that would be expected to produce changes in self-concept responses (e.g., placebo effects, acquiescence to the experimenter, post-group-euphoria, etc.) Scheirer and Kraut (1979; also see Byrne, 1984) reviewed academic intervention studies that attempted to improve self-concept as a means to improving academic achievement. They found predominantly null results in that most of the interventions failed to alter either self-concept or academic achievement. The few studies that did produce positive effects had systematic parental involvement so that parents expected and supported better academic performance by their children. Wylie (1979) reviewed studies of the effects of psychotherapy and growth-producing group experiences on self-concept, and also found predominantly null results. Marsh, Richards and Barnes (1986a, 1986b) suggest two possible reasons for this lack of success (see Scheirer & Kraut, 1979; Wylie, 1979 for other reasons). First, most research is based on ill-defined measures of self-concept rather than on multidimensional measures where some of the dimensions are specifically relevant to the aims of the intervention. Second, the size of the effect is typically small relative to probable error because the intervention is weak or because a potentially powerful intervention is administered to only a few subjects.

#### The Standard Course Study.

The Outward Bound standard course is a 26-day residential program for 17-25 year olds that comprises physically and mentally demanding outdoor activities. Richards (1977, p. 69) stated that the purpose of the course is to provide a setting for "the person to recognize and understand his own weaknesses, strengths, and resources and thus find within himself the wherewithall to master the difficult and unfamiliar" (p. 69). Reviews of Outward Bound research (Godfrey, 1974; Richards, 1977; and Shore, 1977) indicate that self-concept and locus of control are the most frequently examined outcome measures and provide a theoretical basis for why the program should impact these variables.

Emphasizing the multidimensionality of self-concept and a construct validity approach, Marsh, Richards and Barnes (1986b) argued that specific dimensions of self-concept that are most logically related to an intervention should be most affected, while less relevant dimensions should be less affected and serve as a control for potential response biases. They used a multiple-time-series design in which 27 different groups of participants completed the SDQIII one month before the start of the program (T1), the first day of the program (T2), and the last day of the program (T3). They found that: (a) there was a little change or a small drop in self-concept during the control (T1-T2) interval; (b) increases during the experimental (T2-T3) interval were significant and were significantly larger for those facets of self-concept judged a priori to be most relevant to the goals of the program; and (c) increases during the experimental interval were similar for the 27 groups that were tested. While responses to the Rotter Internal-External Locus of Control Scale (Rotter, 1966) were only collected at T2 and T3, responses to this instrument showed locus of control to be more internal after completion of the program.

Marsh, Richards and Barnes (1986b) argued that their design -- the use of a control interval and control facets of self-concept that are predicted to be less affected by the intervention -- and the many tests of the construct validity of their interpretations provided a stronger test of the program effects than do most experimental designs. In particular, they argued that a randomly assigned control group would primarily show whether or not self-concept is relatively stable over short periods of time and would provide little protection against potential biases such as placebo effects, Hawthorn effects, acquiescence to the experimenter, or post-group-euphoria effects. They further contended that placebo controls that are like the Outward Bound program but unrelated to intended effects of the program are unlikely to exist.

#### The Bridging Course Study.

The Bridging Course was developed by Outward Bound for low-achieving high school males. Richards and Richards (1981, p. 4) states "the aim of the Outward Bound Bridging Course stated in its simplest form was to attempt to produce significant gains in the cognitive domain, especially in language and mathematics, through an integrated programme of remedial teaching, normal schoolwork and experiences likely to influence personality in general and self-concept/self-esteem in particular." The design of the Bridging Course was influenced substantially by McClelland's 1965 achievement motivation theory and his practical suggestions about how achievement motivation can be changed. The selection process was designed to create parental involvement and to engender a belief in the effectiveness of the program. The Bridging Course is a 6 week residential program where a small group of 11-16 participants -- primarily ninth grade students -- is removed to an isolated environment. The learning environment emphasizes high degrees of task orientation and teacher involvement with and support of the students. Educational materials are chosen to match the achievement levels of the participants -- initially materials are below the achievement level all participants, but they become progressively more difficult until the materials challenge the most able in the group. Individual student needs are diagnosed, goals and criteria are clearly articulated, individual student progress and performance are continuously assessed, and students are actively involved in the process of setting and monitoring goal attainment so as to foster a sense of self-responsibility. Some of the outdoor physical activities from the traditional Outward Bound standard course are also included in the Bridging Course, but the primary focus is on an integrated approach to academic growth.

The Bridging course was intended to enhance reading and mathematics achievement, and to enhance the corresponding areas of academic self-concept. While its effects on nonacademic areas of self-concept are likely to be smaller and less predictable on an a priori basis, the program was intended to affect self-concepts in nonacademic areas as well. In particular, the substantial commitment made by parents suggests that effects on the Parent Relations scale might be positive. Nevertheless, it is predicted that the intervention will affect academic areas of self-concept more than nonacademic areas.

The study (see Marsh & Richards, 1988a, for further detail) used a short multiple time series: measures were administered about six weeks before the start of the course (T1), on the first day of the course (T2), and on the last day of the course (T3). Neither academic achievement nor self-concept are likely to change systematically in such a short period without any intervention. Hence, consistent with predictions, the changes in self-concept during the T2/T3 experimental interval were substantial, statistically significant, significantly more positive than corresponding changes in the control interval, and significantly larger for academic than for nonacademic facets of self-concept. Also consistent with predictions, there were corresponding changes in reading and mathematics achievement during the experimental interval. These findings provide strong support for: (a) the effectiveness of the Outward Bound Bridging course and parental support as an academic intervention for low-achieving high school males that is effective with respect to both academic achievement and academic self-concept; (b) the multidimensionality of self-concept; (c) the validity of responses to the SDQI in relation to academic achievement; and (d) the effectiveness of the SDQI as a measure that validly reflects the effect of a powerful academic intervention.

The Bridging Course study is one of the few studies to find that a systematic intervention designed to enhance both academic achievement and academic self-concept was successful (see Scheirer & Kraut, 1979). The critical features of the present study that led to its success apparently were: (a) a particularly powerful intervention which was conducted outside the school environment so that old self-concepts and behavior patterns would not be reinforced; (b) instilling expectations that changes would occur before the start of the intervention; (c) the strong parental support for the program and their expectations that the program would be successful; and (d) the use of a multidimensional self-concept scale that validly measured areas of academic self-concept that were specific to the intervention's goals and differentiated these from other areas of self-concept. The only other research known to us where an intervention had significant effects on both academic self-concept and academic achievement for adolescent students was that conducted by Brookover (see Brookover & Erikson, 1975; Scheirer & Kraut, 1979; for summaries). The design of the Brookover study is different from the present study in that it contained randomly assigned control and placebo subjects, and his intervention was also quite different. However, the four characteristics identified above were also present in the Brookover research.

The results of the Bridging Course study complement those in the Standard Course study (Marsh, Richards and Barnes, 1986b). In both studies Outward Bound courses, albeit different kinds of courses, were found to enhance those self-concepts that were most specific to the aims of the respective courses. The Bridging Course study is similar to the Standard Course study in that: (a) it looked at the effect of a course run by Outward Bound on multiple dimensions of self-concept as measured by an SDQ instrument; (b) a short multiple time series design was used; (c) the generality of effects was examined across different course offerings of the same (or a similar) program; and (d) a construct validity approach was used to assess the validity of the findings. It differs in that: (a) the primary focus of the Bridging Course was on educational objectives rather than the nonacademic goals of the Standard Course; (b) subjects were 13-16 year old low achieving males rather than self-selected 17-25 year olds; (c) subjects responded to the SDQI rather than the SDQIII; and (d) the academic nature of the intervention made it possible to assess the intervention effects with objective achievement tests as well as with multiple dimensions of self-concept.

The juxtaposition of the two studies is particularly important. The Standard Course study predicted more change in the nonacademic than academic areas of self-concept that were more relevant to its aims, and this prediction was supported. In contrast, because of the academic aims of the Bridging Course study, it predicted more change in the academic than nonacademic areas of self-concept and this prediction was also supported. In the Standard Course the aims of the intervention were specifically nonacademic, and the changes in the academic scales served as a control against which to evaluate facets that were more relevant. In the Bridging Course the aims of the intervention were primarily academic, and the changes in the nonacademic scales served as a control against which to evaluate changes in the academic facets. The Bridging Course study also differed in that changes in academic achievement provided an



objective basis for assessing intervention effects, and validating changes that took place in academic self-concepts. Taken together, the two studies provide stronger support for the specificity of the effects of each of the interventions than was possible in considering either one in isolation.

#### The Standard Course Follow-up Study

Both the Standard and Bridging Course studies were based on a multiple time-series design conducted on independent groups instead of traditional experimental designs. Counter explanations of the results, such as a post-group-euphoria effect, were tested with the construct validity approach, but neither study included a long-term follow-up. Marsh, Richards and Barnes (1986b) argued that short-term effects can be valid even if they are not maintained, but two further considerations are important; (a) short-term gains that cannot be maintained, even if they are valid, are less important than those that can; (b) if the short-term effects are maintained, then counter explanations of the short-term effects such as a post-group-euphoria bias are less viable. Hence, a long-term follow-up of Marsh, Richards and Barnes (1986b) was conducted by asking all participants in the original study to complete the self-report instruments a fourth time, 18 months after the completion of the program. The purpose of the follow-up was to test the three predictions: (a) responses to the SDQIII and their psychometric properties would be stable over time; (b) there would be no decline in the enhanced self-concepts found at the end of the Outward Bound program; and (c) the more internal locus of control found at the end of the program would not become more external.

#### Description of the Follow-up Study

Subjects are the 361 participants, aged 16 to 31 (median = 21) who completed one of 10 Outward Bound standard courses between November 1982 and May 1983 at one of two Australian sites. Enrollments for the 10 different Outward Bound courses varied from 13 to 57, and within each course participants were divided into groups of about 12. Of the 27 groups considered in the study 15 comprised all males, 3 all females, and 9 were mixed sex groups. Eighteen months after the completion of each of the different Outward Bound standard courses all 361 participants were mailed copies of the same SDQIII and the Rotter I-E instruments that they had completed previously.

Time 1 responses were completed by all participants as a required part of the course registration, while responses at times 2 and 3 were collected during the program. Thus, there were virtually no missing responses for any of these three occasions. In contrast only 229 (63%) participants completed the surveys at time 4 (i.e., the 18-month follow-up), though we estimate that about one-quarter of the nonrespondents did not receive the request because they had moved and left no forwarding address. The large number of missing responses at time 4 dictates that the results of the long-term follow-up be interpreted cautiously, but the small differences between respondents and nonrespondents on earlier responses and the similarity of the results based on responses from times 1 - 3 suggest that this potential problem would not seriously affect the conclusions (see Marsh & Richards, 1986a, for further discussion).

#### Program Impact

Responses to the 13 SDQIII factors differed substantially with the time of testing ( $F(2,696) = 136, p < 0.001$ ) and these differences due to time of testing varied significantly with the specific SDQIII factor ( $F(24,8352) = 15.2, p < 0.001$ ). In three separate analyses the effects of time were statistically significant in the comparison of responses in the control interval (T1-T2;  $F(1, 228) = 27.6, p < .01$ ) and particularly the experimental interval (T2-T3;  $F(1, 228) = 215.5, p < .0001$ ), but not in the long-term follow-up interval (T3-T4;  $F(1, 228) = 1.4, p > .20$ ). However, in each of these separate analyses, the effect of time interacted significantly with the particular scale ( $F(12,2736) = 9.4, 10.4, \text{ and } 5.9$  for the analyses of the control, experimental and follow-up intervals; all  $ps < .01$ ). Hence a series of dependent t-tests was conducted to examine shifts in each of these intervals separately for the 13 SDQIII scales.

Inspection of the SDQIII means at each time and corresponding t-tests (Table 9.1) indicates that responses for the separate scales generally show little change or a small decline in the control (T1-T2) interval, then a substantial increase in the experimental (T2-T3) interval, and finally little systematic change in the long-term follow-up (T3-T4) interval. The T1-T2 decline is statistically significant for 4 of the 13 scales, while there is a small but significant increase for one scale. The T2-T3 increase is statistically significant and positive for all 13 scales, but the size of the increase varies with the scale. T3-T4 changes are statistically significant for five scales -- three negative and two positive -- but each of these changes is smaller than the corresponding changes in the experimental interval. Inspection of the means in Table 9.1 also indicates that responses to the Rotter I-E shift substantially in the direction of a more internal locus of control during the experimental (T2-T3) interval, but do not change significantly in the long-term follow-up (T3-T4) interval. (Note that if a more conservative level of significance were used for these post-hoc t-tests to control for the number of tests that were conducted, all the shifts during the experimental interval would still be significant while some of those reported as significant in the control and long-term follow-up intervals would not, so that the approach used here is conservative in relation to predictions that are being tested.)

#### Insert Table 9.1 About Here

As discussed by Marsh, Richards and Barnes (1986a) the decrease in some of the self-concept scales from time 1 to time 2 probably reflects the proximity of a challenging or stressful experience. Consistent with this interpretation the largest T1-T2 decline was for self-concept of Physical Abilities which is probably the most stressful aspect of the program. The design of the study, the fact that T2-T3 measures were administered under similar circumstances and in the same physical setting while T1 measures were not, and the interpretation of the T1-T2 shift presented above, all

dictate that the T2-T3 interval should be used to evaluate the short-term program effects. Nevertheless, the shifts, particularly in the Physical Ability scale must be interpreted cautiously.

Shifts during the experimental interval were predicted to be significantly larger for specific facets of self-concept judged a priori to be most relevant to the Outward Bound program, and results presented by Marsh, Richards and Barnes (1986a) provided support for these predictions. In contrast, no significant shifts were predicted to occur during the long-term follow-up interval, and no significant shifts were found across the facets judged a priori to be more relevant, across the less relevant facets, or across the entire set of 13 SDQIII scales even though there were small but significant shifts in some facets. These findings support the predictions for this long-term follow-up interval.

An important feature of this study is that the Outward Bound program was actually experienced by 27 reasonably distinct groups of participants in different locations and at different times during the year. This multiple replication of the time-series design provides a test for idiosyncratic, time-related occurrences that are a threat to the validity of conclusions based on a single time-series (see Cook & Campbell, 1979). Marsh, Richards and Barnes (1986b) compared experimental (T2-T3) shifts in the 27 groups for each of the 13 SDQIII scores and found significant differences for only two of the scales. One of these was for the Opposite Sex Relationships and subsequent analyses showed that coeducational groups experienced significantly more positive shifts for this facet than did single-sex groups. In the follow-up study, group differences were compared for long-term follow-up (T3-T4) shifts in each of the 13 SDQIII scales and the Rotter I-E scale, but group differences did not reach statistical significance for any of the scales (all 14  $ps > .1$ ). These findings, as did the earlier ones, indicate that effects of the Outward Bound Program were consistent across the groups and supports the generality of the findings.

#### Summary and Implications

The follow-up study, particularly in combination with the Standard and Bridging Course studies, support the Outward Bound Program as an effective intervention for enhancing multiple dimensions of self-concept. The findings also support the validity of interpretations based upon responses to the SDQIII, and its usefulness as a criterion measure for intervention studies. Psychometric properties of the SDQIII -- reliability, factor structure, and correlations among different dimensions -- were consistent at times 1, 2, 3, and 4, stability coefficients were high for even the long-term intervals, and the MTMM analysis provided support for both the convergent and divergent validity of the responses (see earlier descriptions in Chapters 5 and 6). Finally, a powerful intervention specifically designed to affect self-concept was shown to significantly influence responses to the SDQIII, the largest effects were observed with the dimensions chosen a priori to be more relevant to the goals of the program, and these changes were maintained 18 months after the completion of the program. Other important issues are the long-term stability of multidimensional self-concepts and methodological considerations in the study of self-concept interventions.

Since this is one of the few self-concept studies to examine the long-term stability of clearly distinguished facets, it is important to examine the stability of specific facets. Across all the long-term stability coefficients (i.e., T1/T4, T2/T4 & T3/T4 coefficients), the lowest values occur for the Honesty and the General-self scales. The Honesty scale has a lower internal consistency than the other scales and this probably explains its lower stability. In contrast, the internal consistency of the General-self scale is among the highest at each of the four testing occasions, and so the surprisingly low stability coefficients suggest that this self facet is much less stable than the other components. Similarly, the general Academic facet of self-concept is less stable than more specific facets of academic self-concept, even though its internal consistency is high. These findings are in direct opposition to Shavelson's model (Shavelson, et al., 1976) and other theoretical accounts that posit more general components of self to be more stable. The findings suggest that the more general facets are more affected by short-term response biases, short-term mood changes, or some other short-term time-specific influences. Whatever the eventual explanation for the surprisingly poor stability of the general facets, the findings offer further support for the use of multidimensional measures of self-concept instead of general measures of the construct.

The post-group-euphoria (PGE) that participants typically feel at the end of an intensive group experience might bias other measures so that they would not validly reflect the short-term impact of the intervention. PGE-like biases are a particularly viable threat to the validity of conclusions based on self-report data, and neither a time-series design nor randomly assigned no treatment control groups provide much protection against such a threat. In order to test for PGE-like biases Marsh, Richards and Barnes (1986b) proposed a construct validity approach, and the results demonstrated that a PGE bias in their study was unlikely. They also recognized that short-term gains that were attributable to PGE-like biases would probably not be maintained over longer time intervals, but since their study had no long-term follow-up, this approach was not pursued. However, the long-term results provide particularly compelling evidence against a PGE-like bias as a counter-explanation for the short-term gains and further support for the construct validity approach used by Marsh, Richards and Barnes (1986b).

The longitudinal study of successful interventions designed to enhance self-concept are rare, and so the findings of this study are important in that they demonstrate that self-concept can be changed through effective intervention, and that these effects can be maintained. In this regard the critical features of the present investigation seemed to be: a) the application of particularly powerful intervention; b) the large sample size and the use of a within-subject design; and c) the ability of the SDQIII to clearly differentiate among multiple dimensions of self-concept, some of which were particularly relevant to the goals of the program. Hence we recommend that these features be considered in other research that examines short- and long-term intervention effects on self-concept.



## CHAPTER 10 -- INFERRED SELF-CONCEPTS: SELF-OTHER AGREEMENT ON SDQIII RESPONSES

In a series of SDQ studies significant others have been asked to infer the self-concepts of students who have completed the SDQ. The initial emphasis of this research was on theoretical issues related to the symbolic interactionist perspective and multitrait-multimethod (MTMM) analyses used to test the construct validity of SDQ responses. More recently, however, self-other discrepancies have been used to test for self-favorability biases that are sometimes posited in self-report responses. The purpose of this chapter is to present an overview of the theoretical basis for this research, to briefly review SDQ research summarized in the SDQI monograph and to describe the results of three SDQIII studies.

### Theoretical and Empirical Background

#### Theoretical Basis

The study of self-other agreement in self-concept research has a long and controversial history (e.g., Marsh, Barnes & Hocevar, 1985; Shrauger & Schoeneman, 1979; Wells & Marwell, 1976; Wylie, 1974; 1979). Symbolic

interactionists argue that: (a) self-concept emerges from social interaction with others, (b) self-concept is based on the ways others respond to the person, and (c) perceptions of how one is perceived by others reflect, in part, actual perceptions by others (Kinch, 1963; Marsh, Barnes & Hocevar, 1985; Shrauger & Schoeneman, 1979). In a behaviorist perspective, Coombs, Soper, and Courson (1963) argued that ratings by external observers provide a better indicator of self-concept than self-report measures. In contrast, most researchers (e.g., Crandall, 1973; Marsh, Barnes & Hocevar, 1985; Marsh, Smith, Barnes & Butler, 1983; Shavelson, et al., 1976) argue for the theoretical separation of self-concept that is based on self-report from inferred self-concept that is based on the report of others. Shavelson specifically postulated that self-concept is influenced by the evaluations of significant others, but he also emphasized that self-concept measured by self-report is a separate construct from self-concept inferred by external observers. Crandall suggests that ratings by others are useful in validating self-report measures, though Marsh argued that self-other agreement will be substantial only if the external observer knows the subject well, observes a wide range of behavior, and makes judgments of the same specific characteristics as the subject.

Research about ratings by others is plagued by methodological problems such as the variety of different ways that the rating task can be formulated. For example, external observers can be asked what they "objectively" think or feel about a person, or to use their observations to infer what that person thinks about him/herself (i.e., inferred self-concept). The first approach might be appropriate to determine how accurately a person views him/herself compared to the perceptions of others. However, self-concept is based upon self-perceptions, whether accurate or not, and so the second approach is used in most self-concept research (see Wells & Marwell, 1976, p. 136-142, for further discussion).

Shrauger and Schoeneman (1979) reviewed studies that correlated self-reports with judgments by others, and concluded that "there is no consistent agreement between people's self-perceptions and how they are actually viewed by others" (p. 549). However, in their review the content of the self-reports was quite varied, no attempt was made to determine if some external observers (e.g., teachers, parents, peers) provided more accurate assessments than others, and they did not consider the distinctiveness of different components when multiple characteristics were judged. Furthermore, they did not distinguish between studies that asked external observers to record their own perceptions and those where observers made inferred self-concept ratings.

Self-other discrepancies are sometimes used to test a frequently hypothesized bias in self-concept responses -- that self-ratings are systematically higher than they "should" be (self-favorability bias). In such studies the focus is on mean differences between self-responses and responses by others rather than correlations between responses that are emphasized in most research. Such a self-favorability effect on self-concept may represent the influence of selective perception, memory, and interpretations, the perhaps unrealistic feedback often given particularly to young children, and frame of reference effects (i.e., different standards of comparison), or, alternatively, intentional distortions in self-reports that do not accurately reflect true self-perceptions. In a review of this research, Wylie (1979, p. 681) concluded that: "there appears to be a considerable consistency among the methodologically more adequate studies in showing trends toward self-favorability biases regarding evaluative characteristics."

Wylie (1979), however, specifically excluded studies based on "private-self-concept responses" (i.e., the subject is instructed to report how he or she privately sees him or herself, whether or not this agrees with external criteria) and only considered studies in which subjects made "social-self-concept responses" (i.e., regardless of his or her own private view of him or herself, the subject is to tell how he or she thinks generalized or particular others would characterize him or her) or made self-ratings relative to some objective standard such as school grades. Wylie's review does suggest systematic errors in the accuracy of self-perceptions, but provides no evidence for biases in the reports of what Wylie calls private-self-concept reports. The social-self-concept that she used to evaluate self-favorability biases is not the self-concept considered here, is not the self-concept typically considered in other self-concept research, and is not the self-concept considered by Wylie in other sections of her 1974 and 1979 books (e.g., she only used the terms social- and private-self-concepts in relation to self-other research).

#### MTMM Studies Relating Self-concept and Inferred Self-concept Responses.

When multiple dimensions of self-concept are represented by both self-ratings and inferred-ratings, MTMM analyses provides an important analytical tool for testing the construct validity of the self-concept facets (see Marsh, 1989b; Marsh & Hocevar, 1983; Marsh, Barnes & Hocevar, 1985; Shavelson, et al., 1976 for more general discussions of MTMM analyses). Convergent validity is inferred from substantial correlations between self-ratings and inferred-ratings on matching self-concept traits. Discriminant validity provides a test of the distinctiveness of self-other agreement and of the multidimensionality of the self-concept facets; it is inferred from the lack of correlation between nonmatching traits.

A series of eight MTMM studies based on responses to the SDQI is summarized in the SDQI monograph in which inferred self-concepts were teacher responses for 7 studies and responses by other students for one study. Across all studies there was statistically significant but modest (mean  $r = .53$ ) self-other agreement. Student-teacher agreement tended to be highest in academic areas where the teachers could most easily make relevant observations, and tended to be lowest for Parent Relations where teachers typically had no basis for making inferences. Support for the discriminant validity of the SDQI scales in these studies was also demonstrated in that student-teacher agreement on each facet was specific to the facet and could not be explained in terms of a generalized agreement that incorporated different areas. Marsh, Smith & Barnes (1984) collected inferred self-concepts from peers, and here also MTMM analyses demonstrated moderate support for convergent and discriminant validity of the SDQI scales.

These studies are important in that they demonstrate that classroom teachers can infer self-concepts with at least a reasonable degree of accuracy, thus countering Shrauger and Schoeneman's 1979 claim, and also because of the support they provide for the construct validity of SDQI responses. Whereas support for convergent and discriminant validity is typically good when evaluated by the Campbell-Fiske criteria, the level of self-other agreement (mean  $r = .3$ ) is only modest -- particularly for nonacademic facets. There are several likely explanations for this modest self-other agreement: (a) preadolescents may be more likely than older subjects to base their self-concepts on idiosyncratic criteria that are unobservable or not considered by their teachers; (b) teachers may not have an appropriate basis for inferring



self-concepts on some SDQI factors; (c) because teachers made ratings of all students in their class, they were only asked to respond to psychometrically weaker single-item scales instead of the SDQI multi-item scales completed by students; and (d) external observer responses were based on responses by a single observer and the reliability of teacher responses was not estimated. These and other issues are addressed in two SDQIII studies summarized below.

#### Self-Other Agreement on SDQIII Responses By Australian University Students

##### Description and Rationale

Marsh, Barnes, and Hocevar (1985) conducted an SDQIII study in which university students completed the SDQIII. The students were also asked to choose the person in the world who knew them best to complete the SDQIII as if they were the person who had given them the survey; over half chose one of their parents. It is important to note that: (a) ratings by significant others were based on responses by a person specifically selected by the subject as knowing them the best rather than responses by a convenient external observer (e.g., teachers or supervisors) used in most research; and (b) significant others responded to the same SDQIII items as completed by the subjects. One focus of the study was the MTMM matrix used to assess self-other agreement on the SDQIII responses, but a number of other features of the study were also important: (a) psychometric properties of both self-responses and responses by others were examined; (b) in addition to the SDQIII multi-item scales, self-other agreement was also examined for single-item responses designed to reflect each SDQIII scale that are like those typically used in many studies; (c) in addition to self-other correlations, mean differences between self-responses and responses by others were examined for both multi-item and single-item scales.

##### Results

Psychometric analyses. For both self-ratings and responses by significant others exploratory factor analysis (see Table 5.2) and confirmatory factor analysis (see Table 5.5) identified the 13 dimensions of self-concept which the SDQIII is designed to measure. For each set of responses, internal consistencies of all scales were high while the average correlations among the factors was low. Thus, the psychometric properties of both self-responses and responses by others to the SDQIII were good and similar to each other. Self-other agreement was quite high (mean  $r = 0.57$ ), demonstrating that significant others were able to accurately infer the multidimensional self-concepts of someone whom they know well, and supporting the validity of interpretations based on responses to the SDQIII.

MTMM analyses. The MTMM matrix of correlations between self responses and responses by others (Table 10.1) indicates that:

- 1) all 13 convergent validities are statistically significant (mean  $r = 0.57$ ) and substantial;
- 2) for each of the 312 possible comparisons between a convergent validity and another correlation in the same row or column of the square (heterotrait-heteromethod) block of coefficients, the validity coefficient is higher;
- 3) for 310 of the 312 possible comparisons between a convergent validity coefficient and other correlations in the same row or column of the two triangular (heterotrait-monomethod) blocks, the validity coefficient is higher.

These findings provide strikingly strong support for both the convergent and divergent validity of responses by older subjects to the SDQIII. More sophisticated forms of MTMM analysis, using confirmatory factor analysis, are described by Marsh, Barnes and Hocevar (1985) and the results provide further support for these conclusions.

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Insert Table 10.1 About Here  
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Single-item response scales. Though not formally part of the SDQIII, most studies have also included the set of 12 single-item scales that are designed to reflect all but the General-esteem scale. Whereas the mean convergent validity was .58 (excluding the General scale since there was no corresponding single-item rating) when both subjects and significant others completed the entire SDQIII, the convergent validity was poorer when subjects completed single item ratings (.48), when significant others completed single item ratings (.44) and when both subjects and significant other completed single item ratings (.40). This illustrates that the use of single-item scales may not be an acceptable substitute for multi-item scales that are psychometrically sound. The demonstration is important in that most self-other studies -- indeed many self-concept studies that consider multiple dimensions of self-concept -- rely on such single-item scales.

Mean differences between self-responses and responses by others. Self-other agreement in most research emphasizes relative agreement based on correlations such as those in Table 10.1. It is important to note that correlational agreement is independent of mean differences. It would be possible for ratings-by-others to be systematically higher, systematically lower, or not to differ from self-responses, and still to result in the same pattern of correlations in the MTMM matrix. Such mean differences are particularly important for testing the hypothesized self-favorability bias in self-concept ratings in which self-responses are posited to be systematically more favorable than responses by others.

Separate analyses were performed on responses to the 13 SDQIII factors and responses to the 12 summary descriptions. First a two-factor within-subjects ANOVA was conducted in which traits (different self-concept facets) and rater (self vs. other) were the independent variables. The main effect of rater, representing the average self-concept response across all self-facets, was not statistically significant for either the SDQIII or single-item scales. The trait-by-rater interaction, however, was statistically significant for both. In other words, averaged across all traits, self-ratings and

ratings by others did not differ for either response mode, but that there were differences in some specific traits that canceled each other out when summed across all traits. Hence paired t-tests were used to make comparisons for specific traits. Only two of the 25 t-tests were statistically significant (self-ratings are higher for Relations With Parents and lower for Appearance) while 6 other tests were significant at  $p < .05$  (self-ratings are lower for 5). For the total across the 13 SDQIII factors and for the total across the 12 single-item scales, self-ratings did not differ significantly from the ratings-by-others. These analyses illustrate that there is reasonably good absolute agreement between self-ratings and ratings-by-others with both response modes. Because the small differences that did exist tended to be in the direction of higher responses by significant others, the results offer no support for the frequently hypothesized self-favorability bias in self-concept responses.

#### Self-Other Agreement on SDQIII Responses By Canadian University Students

##### Description and Rationale

Marsh and Byrne (1989) replicated the Marsh, Barnes, and Hocevar (1985) study with responses by Canadian university students. In the Canadian university study a large sample of 1000 introductory psychology students participated as part of a course requirement. As in the Australian study, students completed the SDQIII and then were asked to choose the person in the world who knew them best. Although the nature of the relation between subjects and significant others (e.g., parent, sibling, spouse, etc.) was not examined, the nature of the study suggested that significant others in the Canadian study were less likely to be parents and were more likely to be other university students. These significant others were asked to complete the SDQIII as if they were the person who had given them the survey.

For both self-ratings and responses by significant others exploratory factor analyses (see Table 5.2) identified the 13 dimensions of self-concept which the SDQIII is designed to measure. For each set of responses, internal consistencies of all scales were high (see Table 10.2) whereas the average correlation among the factors was low. Thus, the psychometric properties of both self-responses and responses by others to the SDQIII were good, similar to each other, and similar to those reported in the Australian study. Self-other agreement was quite high (mean  $r = 0.56$ ), thus replicating this central finding from the Australian study. Furthermore, even the pattern of self-other correlations for specific SDQIII scales was similar for the two studies (see Table 10.2).

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Applying the Campbell and Fiske guidelines to the MTMM matrix of correlations between self responses and responses by others for the Canadian study indicated that:

- 1) all 13 convergent validities were statistically significant (mean  $r = 0.56$ ) and substantial;
- 2) for each of the 312 possible comparisons between a convergent validity and another correlation in the same row or column of the square (heterotrait-heteromethod) block of coefficients, the validity coefficient was higher;
- 3) for 311 of the 312 possible comparisons between a convergent validity coefficient and other correlations in the same row or column of the two triangular (heterotrait-monomethod) blocks, the validity coefficient was higher.

These MTMM findings provide strikingly strong support for both the convergent and divergent validity of responses by the Canadian students to the SDQIII, and replicate results based on the Australian study.

Mean differences in responses by students and by the significant others were also tested in the Canadian study. Here, there were significant differences between the mean self-response and the mean response by significant others. Across all 13 SDQIII scales, self-responses were about part to the large sample size, the differences were also significant for 11 of the 13 scales; self-responses were lower for 10 and higher for 1 (Relations With Parents). Although differences between self-responses and responses by significant others tended in the direction of higher responses by significant others in both the Australian and Canadian studies, the differences were larger in the Canadian study. Self responses were slightly lower (about .05 standard deviations) in the Canadian study than the Australian study, whereas responses by significant others were slightly higher (about .04 standard deviations) in the Canadian study than the Australian study.

Results of neither the Australian study nor the Canadian study provide any support for a self-favorability bias in the self-ratings. It should be noted, however, that significant others were specifically instructed to respond as subjects "would" respond. Hence, it is possible that if they had been instructed to respond as subjects "should" respond then support for the hypothesized bias would have been found. Marsh, Barnes and Hocevar (1985) noted, however, that: "We suspect that similar results would have been obtained if significant others had been asked to respond according to how they felt the subject should have responded, but this question requires additional research" (p. 1375). Whereas Marsh, Barnes and Hocevar implicitly suggest that observers may be unable to meaningfully distinguish between "should" and "would" responses, they did not test this proposal nor are we aware of previous research directed at this central issue.

#### The SDQIII Self-Other Agreement By Outward Bound Participants

##### Rationale and Description of the Study



The present investigation examines issues in the study of self-other agreement raised by Marsh, Barnes and Hocevar (1985) in the context of a new study of the Outward Bound program previously shown by Marsh, Richards and Barnes (1986a, 1986b) to enhance self-concept. Subjects, 280 participants in one of 7 Outward Bound courses offered in 1985 or 1986, completed the SDQIII at the beginning (T1) and end of the program (T2). Because participants worked in small groups, they had observed the other members of their group in many different situations during the 26-day intervention. Each subject chose two group members who knew him or her the best at T2, and these external observers were asked to complete single-item summary ratings as the subject "would" complete them and as the subject "should" complete them. As in previous studies, MTMM analyses tested the convergent and discriminant validity of self-responses and responses by others. In addition, the study tests the ability of observers to meaningfully differentiate between "would" and "should" responses and for self-other discrepancies used to infer self-favorability biases. Because multiple observers rated each participant, psychometric tests of the observer ratings could also be examined. Finally, the study also provides a further test of the effectiveness of the Outward Bound Standard Course in enhancing self-concept.

#### Convergent and Divergent Validity of Responses

Two MTMM matrices were used to test the convergent and discriminant validity of responses. In the first (Table 10.3), responses by the first external observer are related to those by the second observer. Here, convergent validities (the traditional term is retained even though these correlations might be interpreted as support for reliability rather than validity) represent agreement between two different external observers. These correlations (the values with asterisks,  $Mn r = .323$ ) are all statistically significant and sufficiently large to support their convergent validity. When the convergent validities were compared to other correlations in the heterotrait-heteromethod (square) submatrix as proposed by Campbell and Fiske (1959; Marsh, 1989b), convergent validities are larger for 254 of 264 comparisons. This provides support for the discriminant validity of the external observer responses. Because correlations in the heterotrait-monomethod (triangular) submatrices are larger than those in the heterotrait-heteromethod matrix, there apparently is a substantial halo/method effect associated with the external observer responses.

#### Insert Tables 10.3 & 10.4 About Here

In the second MTMM matrix (Table 10.4), responses by the subject (averaged across T1 and T2) are correlated with responses to the multi-item response scales by the external observers (averaged across the two observers). Here the convergent validities ( $Mn r = .5374$ ) represent agreement between self-responses and responses by external observers. When the convergent validities are compared to other correlations in the heterotrait-heteromethod (square) submatrix, convergent validities are larger for 256 of 264 comparisons and this supports the discriminant validity of the responses.

The reliability of self-responses and of external observer responses sets an upper limit for self-other agreement -- the convergent validities in Table 10.3. Whereas self-responses to the multi-item SDQIII scales are quite reliable (Table 10.4), the mean reliability for observer responses to the single-item summary scales -- the correlation between responses by two independent observers (i.e., the convergent validities in Table 10.3) corrected by the Spearman-Brown equation -- is only .49. When the convergent validities in Table 10.4 are corrected for unreliability (Table 10.4), self-other agreement is substantially higher ( $Mn r = .56$  vs. .37).

Correlations among self-responses to the SDQIII multi-item scales and the observer responses to the single-item summary scales are not directly comparable because of the reliability differences. Despite the substantially greater reliability of the self-ratings, correlations among self-rating scales ( $Mn r = .26$ ) are smaller than among the observer rating scales ( $Mn r = .33$ ). This suggests a substantial halo/method effect associated with external observer ratings and is consistent with the interpretation of the MTMM analysis of agreement between the two external observers in Table 10.3.

In summary the two MTMM matrices provide support for the convergent and discriminant validity of responses by external observers and by the subjects. Whereas all self-other convergent validities, ranging from .23 to .60, are statistically significant and typically larger than those cited by Shrauger & Schoeneman (1979), their size should be evaluated in relation to three restrictions: (a) external observer ratings were responses to single-item summary scales instead of multi-item scales; (b) external observers had contact, albeit intensive contact, with subjects for only 26 days; (c) due in part, perhaps, to (a) and (b), agreement between two different observers was only modestly higher than agreement between each observer and the subject. Particularly in relation to these limitations, support for the convergent and discriminant validity of the responses in the present investigation is surprisingly good. Nevertheless, the focus of the present investigation is on more specific questions about responses by external observers and their relation to self-responses.

#### Do "Would" and "Should" Responses By Observers Measure Distinguishable Constructs

In one set of analyses, correlations were determined between all possible combinations of "would" and "should" ratings by the two external observers ( $W1/S1$ ,  $W2/S2$ ,  $W1/W2$ ,  $S1/S2$ ,  $W1/S2$ ,  $W2/S1$ ). To the extent that the "would" and "should" ratings are meaningfully differentiated, matching ratings by different observers ( $W1/W2$ ,  $S1/S2$ ) should be substantially higher than nonmatching ratings by different observers ( $W1/S2$ ,  $W2/S1$ ). Correlations between matching ratings by different external observers ( $Mn r$ s of .285 for  $W1/W2$  and .274 for  $S1/S2$ ) differ little from correlations between nonmatching ratings ( $Mn r$ s of .268 for  $W1/S2$  and .277 for  $W2/S1$ ). Furthermore, agreement between the two external observers based on the mean of "would" and "should" responses ( $Mn r = .323$ ) is higher than for either "would" or "should" responses considered separately. These results provide no support for the ability of external observers to meaningfully differentiate between "should" and "would" responses.

In an alternative analytic approach, residual variables were formed by partialling variance attributable to "would" responses from "should" responses and by partialling variance attributable to "should" responses from "would" responses. Correlations between the residual "should" ratings ( $Mn r = .5082$ ) and residual "would" rating ( $Mn r = .092$ ) were small though some were statistically significant. These results demonstrate that there is little reliable variance in "should" ratings that cannot be explained by "would" ratings and little reliable variance in "would" ratings that cannot be explained by "should" ratings.

Observer "would" responses ought to be more highly correlated with self-responses than the "should" responses. Results provide weak support for this prediction and were reasonably consistent across T1 and T2, across multi-item and single-item self-responses, and across the 12 different rating scales. Whereas residual "would" variables ("would" ratings after partialling "should" ratings) were significantly correlated with self-responses, residual "should" variables were not. These results indicate that self-concept responses were somewhat more highly correlated with "would" ratings than with "should" ratings, but still provide no support for the validity of "should" ratings. That is, there is still no evidence that variance in "should" ratings that cannot be explained by "would" ratings is systematically related to any criteria specific to the "should" ratings.

In summary, these results support the prediction that external observers are unable to meaningfully distinguish between "should" and "would" ratings, but do suggest that self-concept ratings may be somewhat better predicted by "would" ratings than "should" ratings.

#### Self-other Discrepancies: Program Effects and Self-favorability biases

Program effects. Self-concept responses, both multi-item and single-item scales, are more positive at T2 than T1 (Table 10.5). SDQIII scales selected a priori by Marsh, Richards and Barnes (1986a; 1985a; see Chapter 10) as being less relevant to Outward Bound goals served as a control against which to evaluate changes in the remaining scales in that research. As in the earlier studies, intervention effects for these control scales are significantly less positive than for the remaining scales. The present focus is not to evaluate the effectiveness of the Outward Bound intervention per se, but these changes are consistent with previous research specifically designed for this purpose (see Chapter 10).

#### Insert Table 10.5 About Here

External observer responses, unlike self-responses, were collected only at the end of the program because participants did not know each other at the start of the program. For this reason, it was not possible to evaluate the intervention in relation to changes in observer ratings. It was hypothesized, however, that T2 self-ratings would be more similar to T2 external observer ratings than would T1 self-ratings. This hypothesis is tested by comparing the means of responses by subjects and by external observers to the same single-item summary scales (see Table 10.5). Whereas not all mean differences are statistically significant for all the scales, there is a consistent pattern for those that are. "Should" responses by external observers ( $Mn = 6.60$ ) are higher than "would" responses by external observers ( $Mn = 6.51$ ), and both "should" and "would" responses by external observers are higher than self-responses at T1 ( $Mn = 6.13$ ) and T2 ( $Mn = 6.40$ ). External observer responses -- both "would" and "should" ratings -- are substantially higher than self-responses at T1 but only marginally higher than self-responses at T2. These results provide further support for interpretations of the intervention effect offered by Marsh, Richards and Barnes (1986a, 1986b).

Self-favorability biases. Self-concept responses are consistently lower than those of external observers -- even after completion of the intervention. Hence, there is no support for a positive self-favorability bias, but support for a negative self-favorability bias (i.e., a modesty effect). This modesty effect is also consistent with the finding that observer "would" ratings are marginally lower than observer "should" ratings. That is, observers say that subjects "would" give themselves lower self-ratings than they "should". In evaluating this modesty effect it is important to note that self-responses and observer responses were actually made by the same individuals. That is, each participant judged him or herself (self-responses) and also made judgments of two other participants (observer responses). On average then, participants indicated that other participants "would" and "should" give themselves higher ratings than participants gave themselves -- again suggesting a modesty effect in the self-responses. Because the stimulus materials and individuals making the judgments were the same for the self-rating and observer tasks, many influences that might differentially affect self and other ratings (e.g., differences in response biases, the constructs being evaluated, frame of reference effects) are less plausible.

#### Summary and Implications of the Outward Bound Study

The focus of the present investigation was on specific issues in the study of self-other agreement in ratings of self-concept. Support for the convergent and discriminant validity of responses by subjects and external observers was found. This support -- particularly for discriminant validity -- was stronger than typically found, but weaker than that reported by Marsh, Barnes and Hocevar (1985) and by Marsh and Byrne (1989). The present research differed in two ways that Marsh, Barnes and Hocevar postulated would lead to weaker results: (a) observer responses here were to single-item summary scales that are less reliable and valid than the multi-item scales used earlier, and (b) observers here did not know the subjects as well as observers in the earlier studies. Because these differences resulted in a priori predictable differences in self-other agreement, the results provide support for the Marsh, Barnes and Hocevar postulates and provide a better basis for evaluating self-other research.

In empirical studies of self-other agreement, the important distinction between observer ratings of what subjects "would" say and what subjects "should" say is typically neglected. The present investigation provides little support for



the ability of observers to meaningfully distinguish between these two rating tasks, though "would" ratings were somewhat more highly correlated with self-responses than "should" ratings. Whereas it is possible that observers who know the subjects better or who have special training may be better able to meaningfully distinguish between "would" and "should" rating tasks than were our subjects, the onus of proof lies with researchers who seek to support this claim. The demonstration of agreement between two observers on "should" ratings that is independent of "would" ratings, and vice versa, appears to be the minimally appropriate methodology for testing such claims.

The results of the present investigation support conclusions by Marsh, Richards and Barnes (1986a, 1986b) that the Outward Bound program has a significant effect on multiple dimensions of self-concept and that the SDQIII is a useful instrument for measuring change in self-concept. The design of the present investigation, a pre-test/post-test design, is not as strong as the short multiple interrupted time-series design -- including an 18 month follow-up -- used in the earlier research. The addition of external observer ratings, however, provides further support for the construct validity approach described in the earlier research, but even this additional support is weaker than if external observer responses had been available for T1 as well as T2 (T1 observer ratings were not collected because participants did not know each other at T1). In other studies, however, it may be possible to collect observer ratings before and after the intervention that will provide a stronger test of changes in self-concept responses. Whereas the present study was not intended as a rigorous test of the Outward Bound intervention effect, it does replicate results from earlier research that was designed for that purpose.

The results of the present investigation suggest a negative self-favorability bias -- modesty effect -- in self-concept ratings, and this requires further consideration. The results are surprising because of the preponderance of results (e.g., Wylie, 1974, 1979) supporting positive self-favorability biases. As noted earlier, however, most such research focuses on the accuracy of self-ratings in relation to objective criteria and not self-favorability biases in self-concept reports. The self-concept construct is defined in relation to self-perceptions, so that self-reports are not biased as long as they accurately reflect true self-perceptions, whether or not the self-perceptions are accurate in relation to external criteria. Whereas self-concept reports may be biased as predictors of some variables to which they have been related, these variables are biased as predictors of self-concept. The modesty effect reported here, however, is consistent with the results of the Marsh and Byrne (1989) study.

The observation that much previous research is not appropriate for testing self-favorability biases in self-concept reports, of course, does not necessarily mean that the present research is. Because self-concept, as opposed to self-report self-reports, are not observable, hypotheses about differences between the two are difficult to test. The approach used here was to compare self-concept responses with external criteria of the self-concept as inferred by external observers. Because all participants served as both subjects and external observers in making ratings to the same items, the approach seems reasonable for inferences based on group-average responses. There are, of course, many possible explanations of this modesty effect. Observer ratings may be affected by a self-favorability bias in that observers base their ratings in part on what subjects say about themselves. These results could be interpreted to mean that self-concept responses have a positive favorability bias but that observer ratings have an even larger favorability bias. One possible effect of participation in the Outward Bound program might be to make more salient the positive characteristics of others. Also, the present investigation is based on Australian subjects (and Canadian subjects in the Marsh and Byrne, 1989, study) who may naturally be more modest than American subjects who are the basis of most previous research. Hence, it is important to test the generality of these findings for what Wylie calls private self-concepts in other settings.

#### Summary and Implications of Self-other Agreement Studies

The results summarized in this chapter have important implications for further theoretical work in self-concept. The most obvious implication is for the study of ratings-by-others. However, interpreting the self-other agreement found here in terms of theory and previous research is difficult because of the ambiguous use of ratings-by-others by different researchers (see Wells and Marwell, 1976). The present findings apparently are consistent with the Shavelson model, particularly his counter-intuitive prediction that self-other agreement would be weaker for self-concepts close to the apex of his hierarchical model. However, Shavelson intentionally de-emphasized the use of ratings-by-others in his presentation, and argued that they should not necessarily have any close correspondence with the preferred self-report measures of self-concept. Crandall (1973), and also Marsh, suggested the pragmatic use of ratings-by-others as a means of validating self-concept measures, though the suggestions were apparently not based upon any specific theoretical position. The present findings do offer support for this application of inferred self-concepts.

Ratings-by-others are most relevant to theory and research based upon the symbolic interactionist perspective. Shrauger and Schoeneman (1979), on the basis of an extensive review designed to test implications of the theory, concluded that there is little consistent relationship between self-ratings and ratings by others. The results of the present investigation contradict their generalization and seem to provide support for the symbolic interactionists, but several qualifications are necessary. First, the prediction of self-other agreement in the symbolic interactionist theory is not clear-cut (see Kinch, 1963; Marsh, Barnes & Hocevar, 1985; Shibutani, 1961; Wells & Marwell, 1976). In particular, major importance is given to the subject's perceptions of how he or she is viewed by others, and how these are related to self-perceptions. Hence, a more complete examination of the issue would require the determination of: a) the subject's self-perceptions; b) the subject's perceptions of how the significant other perceives the subject; c) the significant other's actual perceptions of the subject; and d) the significant other's inferred perceptions of the subject's self-perceptions. Second, the symbolic interactionist perspective posits that perceptions of others "cause" self-concept, though a causal ordering in the opposite direction may also be consistent with the theory (Kinch, 1963). However, such causal orderings are problematic to test, any defensible test requires longitudinal data, and the "true" relationship is probably reciprocal.

Consequently, the interpretation of the self-other agreement observed here in terms of theory and previous research is ambiguous, primarily due to the ambiguity in previous applications. Nevertheless, the results of this study do unambiguously demonstrate that significant others are able to accurately infer multiple self-concepts of a person who they know well, and this empirical relationship has practical and theoretical implications.

MTMM studies based on the SDQI have found significant self-other agreement between self-concept ratings by school children and self-concepts inferred by their teachers. These findings contradict the implications of the Shrauger-Schoeneman review which suggests that self-ratings and ratings by others are nearly uncorrelated. As expected, student-teacher agreement generally tends to be stronger in academic areas of self-concept and weaker in nonacademic areas, but the lack of student-teacher agreement is limited primarily to Parent Relations and Physical Appearance. The relative lack of agreement on the Parent Relations scale is expected, since this is the area where teachers and peers are least likely to have an adequate basis for accurately inferring self-concepts. In the Marsh, Barnes and Hocevar (1985) study in which most of the significant observers were parents, self-other agreement on this scale (.76) was particularly high. The lack of agreement on Physical Appearance is somewhat more surprising. It is reasonable, perhaps, that standards used by teachers as the basis for inferring Physical Appearance are different from those used by students. However, even student-peer agreement on this factor was among the lowest of any of the scales (Marsh, Smith & Barnes, 1985). This suggests that students may be using idiosyncratic standards in forming their own self-concepts of Physical Appearance and that these standards may not even generalize to those that they employ in making ratings about one of their classmates. In the SDQIII studies reviewed here, self-other agreement on Physical appearance was better, but still below the average observed with other scales. Perhaps, by this age, respondents are using internal standards that are more similar to those used by significant others, but there are many possible explanations for this finding. Clearly there is need for further research on the basis of the formation of Physical Appearance self-concepts and its reporting.

The results of the Marsh, Barnes and Hocevar (1985) and the Marsh and Byrne (1989) studies provide the strongest contradiction to implications of the Shrauger-Schoeneman review. They also provide better support for both the convergent and discriminant validity of multiple facets of self-concept than do the SDQI studies described earlier, the other SDQIII study described here, or any other research known to the author. Particularly because the original Australian study provided provided results so much stronger than previous research on self-other agreement, the Canadian study provided an important replication.

The self-other agreement found in both the Australian and Canadian studies was apparently stronger than found elsewhere because: a) subjects were older (e.g., subjects knew themselves better or based their self-responses on more objective, observable criteria); b) both subjects and significant others made their responses on the same well developed instrument consisting of multi-item scales; c) self-other agreement was for specific characteristics rather than for broad, ambiguous characteristics or an overall self-concept; d) the significant others knew the subjects better and in a wider range of contexts than the observers in most research. The results of the Marsh and Richards study also seems consistent with these suggestions in that the poorer self-other agreement was apparently because the observers did not know subjects as well in the other two SDQIII studies and made responses on single-item scales.

For SDQI studies (see SDQI monograph) self-other agreement on the General Esteem scale was among the lowest of the SDQI scales. The SDQIII studies described here provide further support for these observations. Similarly, results summarized in Chapter 9 suggested that the SDQIII General Esteem is less stable over time than most of the more specific SDQIII scales. In relation to that finding it was suggested that short-term idiosyncratic characteristics such as mood may have more influence on the General Esteem scale than other scales. These findings have important implications for further self-concept research in which a measure of general or overall self-concept is typically the only measure of self-concept that is considered. Results such as these further demonstrate that self-concept cannot be adequately understood if its multidimensionality is ignored and researchers continue to rely upon single-scale indicators of self-concept.



## CHAPTER 11 -- THE RELATION BETWEEN RESPONSES TO THE SDQIII AND RESPONSES TO OTHER SELF-CONCEPT INSTRUMENTS

Most research on the construct validity of responses to the SDQ instruments has emphasized their factor structure (a within construct concern -- see Chapter 4) or their relation to external criteria such as academic achievement (Chapter 8), responses by significant others (Chapter 10), or the effects of interventions specifically designed to enhance self-concept (Chapter 9). The focus of this chapter is on relations between responses to the SDQIII and other self-concept instruments.

Historically, researchers have typically been unable to clearly identify the factors measured by most self-concept instruments, and so little effort was made to cross-validate responses from different instruments. In one of the early attempts to do so, Marx and Winne (1978) used multitrait-multimethod (MTMM) analyses to compare responses from three self-concept instruments (the Piers-Harris Children's Self-Concept Scale, the Sears Self-Concept Inventory, and the Gordon's How I See Myself Scale). They began by subjectively classifying scales from each instrument into one of three facets (physical, social and academic) identified in the Shavelson model and formed scores by taking the average subscale scores from each facet. They then constructed a MTMM matrix in which the different facets of self were the multiple traits and the different instruments were the multiple methods. Marx and Winne found little basis of support for the divergent validity of responses to any of the instruments and suggested that the study provided support for the unidimensionality of self-concept. In a reanalysis of the same data, Shavelson and Bolus (1982) selected a single scale from each self-concept instrument that best represented each of the three facets. In contrast to Marx and Winne, Shavelson and Bolus reported better support for discriminant validity though they still found substantial method effects.

Marsh and Smith (1982) examined relations between responses to two self-concept instruments (the Sears Self-Concept Inventory and the Coopersmith Self-Esteem Inventory). MTMM analyses of responses to the two instruments provided modest support for convergent validity but not for divergent validity. Factor analyses of responses to the Sears instrument provided support for many of its intended scales, but factor analyses of responses to the Coopersmith did not support its scales. Longitudinal data suggested moderate stability of the Sears scales, but not the Coopersmith. Marsh and Smith also conducted separate MTMM analyses for each instrument in which multiple occasions were used the multiple methods. These separate MTMM analyses provided better support for the divergent validity of the Sears scales but not the Coopersmith scales. The authors argued that if an instrument is unable to demonstrate support for divergent validity across two administrations of the same instrument, then it is unlikely to do so when related to responses to another instrument.

Marsh and Richards (1988a; also see SDQI manual) collected responses to the SDQI and Coopersmith instruments on two occasions. Whereas the two instruments were not designed to measure the same facets of self, several of the scales were selected a priori as measuring matching constructs. Applying the logic of MTMM analysis, correlations between these matching scales from the two instruments were interpreted as convergent validities. This MTMM analysis provided support for the convergent and discriminant validity for Parents (SDQ) and Home (Coopersmith) scales and for the Peer (SDQ) and Social (Coopersmith) scales, but not for the academic scales. Surprisingly, matching SDQI and Coopersmith scales were sometimes more highly correlated than the stability of the Coopersmith scales over time. Whereas academic achievement scores were significantly correlated with SDQI academic self-concept scales, the achievement scores were often not significantly correlated with the Coopersmith academic scale. Whereas the results provided modest support for the construct validity of some of the Coopersmith scales, they provided much stronger support for the SDQI scales.

Marsh and Gouvenet (1989) collected responses by 7th, 8th, and 9th grade students to both the SDQI and the Perceived Competence Scale (PCS; Harter, 1982). Factor analyses of responses to both instruments identified the 8 SDQI scales and the 4 PCS scales (Physical, Social, Cognitive and General). An MTMM analysis of the matching scales from the two instruments provided clear support for both convergent and divergent validity. Reading and mathematics achievement were significantly correlated with the academic scales from both instruments and substantially less correlated with the nonacademic scales from both instruments. Math achievement was more highly correlated with SDQI math scale than the SDQI reading scale, whereas reading achievement was more highly correlated with the SDQI reading scale than the SDQI math scale (the PCS had only one general academic scale).

Marsh and McDonald-Holmes (in press) collected responses by 5th grade students to the SDQI, the PCS, and the Piers-Harris Children's Self-concept scales (PH; Piers, 1984). Factor analyses again provided good support for the 8 SDQI scales and the 4 PCS scales. Factor analyses of PH responses, however, provided only weak support for some the scales that it is claimed to measure. MTMM analyses of correlations between matching scales from the three instruments provided good support for convergent validity. Support for divergent validity was good for the SDQI and, to a lesser extent, the PCS, but was poorer for the PH. Responses to the academic scales of the three instruments were significantly correlated with academic achievement in mathematics and English. The self-concept/achievement relations were, however, more specific to academic self-concept for the SDQI and PCS than the PH. PH responses, half of which are based on negatively worded items, were shown to be affected by a negative item effect like that which led to the exclusion of SDQI responses to negatively worded items. Students apparently had little difficulty in responding to the

traditional response formats on the SDQI and PH. On the PCS, however, 90 of 290 children responded incorrectly to its idiosyncratic response format and this occurrence was significantly correlated to mathematics and particularly English achievement. These results provided good support for the construct validity of the SDQI responses.

In two studies to be examined here in greater detail, SDQIII responses were related to those from other self-concept instruments. In the first, Marsh and Richards (1988b) examined responses to the Tennessee Self Concept Scales (TSCS) and related them to SDQIII responses and to ratings by external observers. Because the TSCS does not contain any academic scales, this first study primarily provides a test of the nonacademic scales from the SDQIII. In the second study -- the Canadian high school study -- Marsh, Byrne, and Shavelson (1988) related Verbal, Math, General Academic, and General Esteem scales from three different self-concept instruments. Because Esteem was the only nonacademic scale considered, this second study primarily provides a test of the academic scales from the SDQIII.

### Agreement Between SDQIII and the TSCS Responses

Marsh and Richards (1988b) conducted a study of reliability, internal structure and construct validity of interpretations of responses to the TSCS. As part of that study, responses to the TSCS were related to responses to the SDQIII and responses by external observers (using the data summarized in Chapter 10).

### Description of the TSCS

The TSCS (Fitts, 1965), unlike most early instruments, emphasized the multidimensionality of self and was specifically designed to measure a priori factors. Fitts noted the need for a scale that was "multidimensional in its description of self-concept" (1965, p. 1) and developed the TSCS to meet this need. In this respect, the TSCS was a forerunner of more recently developed instruments such as the SDQIII.

Fitts used a 5 (external frame of reference; EXT) x 3 (internal frame of reference; INT) x 2 (positively vs. negatively worded items; PN) facet design in the development of the TSCS. The 5 EXT scales -- Physical self, Moral self, Personal self, Family self, and Social self -- are like traits on the SDQIII. In Fitts's schema each of these self-concept traits could be manifested in relation to three internal frames of reference -- Identity (what I am), Self-Satisfaction (how I feel about myself), and Behavior (what I do or how I act). Identity is the private, internal self-concept, whereas Behavior is the manifestation of self that is observable to others. Self-Satisfaction reflects an actual-ideal discrepancy. Thus Fitts notes that a person can have high scores on the Identity and Behavior scales but still have a low Satisfaction score "because of very high standards and expectations of himself" (1965, p. 2). The third facet in the design of the TSCS, PN, provided a control for various response biases although Fitts also suggested that differences in responses to positively and negatively worded items may represent psychological conflict (1965, p. 4). Each of the 90 TSCS items can be classified into one of 3x5=15 cells representing all combinations of the EXT and INT facets, or one of 30 cells if positively and negatively worded items are considered separately. Whereas a wide variety of scores have been proposed, Fitts' discussion and most subsequent research has emphasized the 5 EXT scales, the 3 INT scales, and a total score. The construct validity of responses to the TSCS in relation to the 3x5 design and the 3x5x2 design was the focus of the Marsh and Richards (1988b) study.

The TSCS continues to be one of the most popular personality instruments and, perhaps, the most widely used multidimensional self-concept instrument. In most recent Mental Measurements Yearbook (Mitchell, 1985, p. xviii), the TSCS ranked 18th in total number of references compared to all tests, 12th among personality tests, and 1st among self-concept instruments (followed by the Piers-Harris Children's Self Concept Scale and the Coopersmith Self Esteem Inventories). Despite this popularity, reviews of the TSCS differ dramatically. In his extensive review of self-concept instruments, Crandall (1973) ranked the TSCS first among existing instruments in terms of "perceived overall quality." Bentler's 1972 review of the TSCS indicated that "the various content areas are well conceived" (p. 366) but also noted "the virtually complete absence of information regarding the internal structure of the scale" (p. 367) that is surprising for a multidimensional self-concept instrument. In a particularly negative review, Wylie (1974) concluded that "no justification can be offered, either a priori analysis in terms of acceptable methodological criteria or from a survey of empirical results to justify using the scale" (p. 236). Wylie, like Bentler, was critical of the lack of evidence about the TSCS factor structure and the discriminant validity of its many scores. In a recent update of the TSCS Manual (Roid & Fitts, 1988) -- but not the actual instrument -- numerous exploratory but few confirmatory studies were noted. The exploratory studies provided widely disparate results, ranging from support for a single factor to multifactor structures that differed from Fitts' original conception. The few isolated confirmatory studies (Marsh & Richards, 1988b; Roid & Fitts, 1988) tended to support 4 of the 5 external scales.

### Factor Analyses of TSCS Responses

Exploratory factor analysis (EFAs) studies of TSCS responses were reviewed by Marsh and Richards (1988b), but the results are not easily summarized. The findings vary substantially depending on the number of factors retained and whether item or scale scores were analyzed. In general there was better support for the EXT scales -- particularly the Social, Family, and perhaps the Physical scales -- than the INT scales. Nevertheless, if enough factors were retained in analyses of item responses (e.g., Vacchiano & Strauss, 1968; Gable, La Salle & Cook, 1973), or items within a single EXT scale were analyzed (e.g., Tzeng, Maxey, Fotier, and Landis, 1985), then differentiable subcomponents were found for each EXT scale. For example, the Physical scale has components reflecting physical health, physical attractiveness, and neatness of appearance, whereas the Moral scale has components reflecting religion, honesty, and morality. In analyses of item responses, factors reflecting a majority of the items from any one internal scale were unusual, but in analyses of scale scores there was some support for INT scales -- particularly the Satisfaction scale. In some studies



there were negative-item factors that may represent a method effect or response bias (see Chapter 6). In one of the earliest studies, Vacchiano and Strauss concluded that "the TSCS is a complex measure of self" (p. 326) but found that most of their empirically derived factors reflected subcomponents of specific EXT scales. Subsequent research seemed to support these conclusions.

#### The Present Investigation

The original purpose of the Marsh and Richards (1988b) study was to further examine the construct validity of responses to the TSCS. This was accomplished by examining the internal structure of responses to the TSCS and by examining relations between TSCS responses and external constructs including responses to the SDQIII. Subjects were 343 participants in one of 9 Outward Bound courses offered in 1985 or 1986 and comprise most of the subjects in earlier analyses summarized in Tables 10.3-10.5. The internal structure of TSCS responses was examined with different analytic strategies including exploratory factor analyses of item and scale responses and confirmatory factor analyses (CFA) in which a priori factors corresponding to the design of the TSCS were postulated. The external validity of the TSCS responses was tested with MTMM analyses relating TSCS responses to responses to SDQIII and to ratings by external observers.

#### The Internal Structure of TSCS Responses

**Exploratory Factor Analyses.** Marsh and Richards conducted many factor analyses on responses to the 90 TSCS items, the 3x5=15 scales representing all combinations of the INT and EXT facets, and the 3x5x2=30 scales that also separated responses to positively and negatively worded items. Additional EFAs were performed on each of the 5 sets of 18 items representing each of the EXT scales.

For EFAs of responses to the 90 TSCS items, Marsh and Richards chose a 9-factor oblique solution as most interpretable. It provided clear support for three EXT scales -- Family, Social, and Physical. For each of these scales a majority of items (at least 13 of 18 items) designed to define it load positively on the same factor. Items from the TSCS Moral scale contributed substantially to three different factors. Eight of the 18 Moral items, primarily from the Identity scale, loaded substantially on one factor. Because of the strong evaluative component of these items the factor was interpreted as a "good (moral) person" factor. Four of the moral items defined a bipolar religion factor; 3 Moral (religion) Satisfaction items (e.g., I ought to go to church more) loaded positively but the Identity item "I am a religious person" had a substantial negative loading. That is, it is respondents who think of themselves as religious persons who feel more dissatisfied with themselves in relation to religion. Whereas this pattern may be consistent with Fitts' original conceptualization of the Satisfaction scale, it may be inconsistent with summing across all Moral items to form a moral scale score. One other factor was also a religious or ethical factor, but it was unidimensional in that all substantial loadings are in the same direction. (The bipolar religion factor and a separate unidimensional religion/ethical factor were also reported by Gable, et al., 1973). One additional factor seemed to be a negative item factor. Other factors did not appear to represent a single INT or EXT scale.

Thirty scales, each the sum of responses to three items, were formed to represent all possible combinations of the 5 EXT scales, the 3 INT scales, and the positively and negatively worded items. Factor analyses of these 30 scales resulted in factors similar to those based on item responses; the Physical, Social and Family factors representing 3 EXT scales, a bipolar Moral factor, and a negative item factor.

Fifteen scales, each the sum of responses to six items, were formed to present all possible combinations of the 5 EXT and 3 INT scales. Three of the 5 factors identified by Marsh and Richards again corresponded to the Physical, Social and Family scales identified in the other factor analyses. One additional factor was like the Satisfaction factor identified in the analysis of individual item responses. Because each measured variable was the sum of responses to 3 positively and 3 negatively worded items, it was, of course, impossible to obtain a negative-item factor.

**Confirmatory Factor Analysis.** In CFA the researcher posits an a priori model and tests its ability to fit the data. The general approach is to: (a) examine parameter estimates in relation to the substantive, a priori model (and also for improper solutions); (b) evaluate the model in terms of indices of fit; (c) compare the fit of alternative, a priori models; and, perhaps, (d) test new, a posteriori models if the a priori models do not perform adequately or if further clarification of a priori structures is needed. In CFA studies, measured variables are typically posited to be influenced by just one factor in what may be referred to as a single facet test design. For TSCS responses, each measured variable is posited to be influenced by an external frame of reference, an internal frame of reference, and, perhaps, the positive or negative wording of items. In this respect the TSCS represents a two- or three-facet test design. Hence, the present application of CFA is more complicated than typical.

Marsh and Richards (1988b) fit various models to a 30x30 correlation matrix representing the 30=5 (EXT facet) x 3 (INT facet) x 2 (positive and negative items) combinations of test facets. A detailed progression of alternative models was posited to test the ability of each facet (e.g., a five-factor model representing the 5 EXT scales), each pair of facets, and all three facets to fit the data. In the first, most parsimonious model (Model 1) a single factor that might correspond to total self-concept was posited. One-factor models positing only 2 PN factors (Model 2), only 3 INT factors (Model 3), or only 5 EXT factors (Model 4) each did substantially better than Model 1, indicating that Model 1 is inadequate. Model 4 fit the data better than Models 2 or 3, suggesting that the EXT facet has the greatest influence. Two-factor models (Models 5, 6 and 7), however, performed better than any of the one-factor models, indicating that the one-factor models were inadequate. Finally, the three-factor model (Model 8) that posits 5 EXT factors, 3 INT factors, and 2

PN factors provides a substantially better fit than did any of the two-facet models. The chi-square/df ratio of 1.53 for Model 8 -- particularly given the moderately large sample size -- and a TLI of .93, suggest an adequate fit. These results, along with the comparisons with alternative models, indicate that the fit of Model 8 is adequate.

The inspection of the parameter estimates is important for evaluating Model 8. Factor loadings for 4 of the 5 EXT factors, all but the Moral factor, were well defined in that all factor loadings were positive and statistically significant. The factor loadings for the Personal factor, however, were smaller than those for Physical, Social and Family factors. For the Moral factor, 3 of 6 factor loadings were nonsignificant. Whereas the factor loading for the Moral/Identity/positive scale was substantial and positive, the factor loadings for the two Satisfaction scales were negative. It should be noted that a similar pattern of factor loadings was observed for each of the EFAs (the bipolar religion factor). In summary, interpretations of the 5 EXT factors are reasonable and generally consistent with results based on the EFAs, though the Moral factor is different from the one proposed by Fitts.

Each of the 3 INT factors was well defined in that all 10 factor loadings defining each factor were statistically significant and positive. Consistent with the Fitts' interpretation of the Satisfaction scale, the Identity and Behavior factors were more highly correlated with each other (.83) than with the Satisfaction factor (.61 & .75). The very high correlations among all three INT factors suggested either a general self-concept that influences responses to all 3 INT scales or a halo effect. Whatever the explanation, the INT factors -- particularly the Identity and Behavior factors, are not well differentiated.

The negative item factor was well defined in that all factor loadings are positive and 14 of 15 are statistically significant. In contrast, only 5 of 15 factor loadings on the positive item factor are significant, and two of these are negative. This suggests that the positive item factor is weak and that its interpretation may be ambiguous. One additional model in which the positive item factor was eliminated was tested in order to further examine this influence. Whereas the elimination of the positive item factor led to a modestly (statistically significant) poorer fit, its elimination had little effect on other parameter estimates.

Tests of the internal structure of the TSCS responses provide important evidence about its construct validity. Different analytic procedures, for example, provide clear support for differentiation among the Physical, Social, and Family scales of the TSCS. An implicit assumption, of course, is that the basis of this differentiation is consistent with interpretations of the scales. Support for this assumption requires that the TSCS responses be related to external constructs.

#### Relations Between TSCS and SDQIII Responses

One approach to validating responses to one self-concept instrument is to relate them to responses to another self-concept instrument. Because few self-concept instruments have a well-defined structure, this approach is usually applied to correlations between total scores (see Wylie, 1974). To the extent that responses to each instrument are correlated, then responses are not idiosyncratic to either instrument. A much stronger application of this approach is possible, however, when two or more multidimensional self-concept instruments are designed to measure similar components. Using the logic of MTMM analysis, scores for matching scales from different instruments should be substantially correlated, whereas scores between nonmatching scales should be substantially less correlated. When the intended scales from each instrument are strictly parallel, or when only matching scales are selected from different instruments, the data can be analyzed with the traditional approaches to MTMM data. Even when the scales from the different instruments are not strictly parallel, the logic of MTMM analyses can be adopted (Marsh & Smith, 1982).

There seems to be a reasonably clear correspondence between the TSCS EXT scales and the SDQIII scales: (a) the TSCS Family scale corresponds to the SDQIII Parents scale; (b) the TSCS Social scale corresponds to the Same Sex and Opposite Sex scales on the SDQIII; (c) the TSCS Physical scale corresponds to the Physical Ability and Physical Appearance scales on the SDQIII; (d) the TSCS Moral scale corresponds to the Honesty/Trustworthiness and the Religion/Spiritual Values scales on the SDQIII; (e) the TSCS Personal scale is not so obviously related to SDQIII scales, but appears most like General Esteem and, perhaps, Emotional Stability; (f) the TSCS has no specifically academic self-concept scales corresponding to the Academic, Math, Verbal, and Problem Solving scales of the SDQIII. Whereas several EXT TSCS scales appear to correspond to more than one SDQIII scale, EFAs of the EXT items suggest that these TSCS scales contain differentiable subcomponents that may correspond more directly to specific SDQIII scales. Also, Marsh (1987d; see Chapter 5) posited higher-order SDQIII factors in which two or more scales are combined that may correspond more directly to the TSCS scales.

Correlations between the 5 TSCS EXT scales and the 13 SDQIII scales are presented in Table 11.1. Correlations between scales posited to be matching (indicated with asterisks) are like convergent validities in MTMM analyses. Applying the logic of MTMM analyses these 9 convergent validities should be substantial and substantially higher than correlations between non-matching TSCS and SDQIII scales. The median of these 9 correlations, .560, provides support for convergent validity. Eight of the 9 convergent validities vary between .53 to .71, the one exception being the near-zero correlation between the TSCS Moral and the SDQIII Religion/Spiritual Values scales. In contrast to these substantial convergent validities, the median of the remaining 56 correlations is only .30 and just two of these correlations are greater than .5 (both these involve the SDQIII General Esteem scale which should be substantially correlated with other areas of self-concept). In general, these results provide support for both the convergent and discriminant validity of responses to the TSCS and the SDQIII.



Insert Table 11.1 About Here

The three smallest convergent validities involve the the TSCS Physical and Moral scales -- particularly the near-zero correlation between TSCS Moral and SDQIII Religion/Spiritual Values scales. A more detailed analysis of the Identity, Satisfaction, and Behavior components of these TSCS scales, however, reveals some interesting anomalies. The SDQIII Religion/Spiritual Values scale is substantially correlated (.51) with the Moral/Identity scale, not significantly correlated (.08) with the Moral/Behavior scale, and significantly *negatively* correlated (-.38) with the Moral/Satisfaction scale. This apparently represents the influence of the bipolar religion component identified in the TSCS Moral responses in earlier factor analyses. In contrast, the SDQIII Honesty/Trustworthiness scale is most highly correlated with the Behavior component of the TSCS Moral scale. The SDQIII Physical ability scale correlates only .53 with the TSCS Physical scale. It, however, correlates .60 with the Physical/Behavior scale and only .39 and .34 with the Physical/Identity and Physical/Satisfaction scales. In contrast, the SDQIII Physical Appearance scale correlates .51, .69, and .53 with the Identity, Satisfaction and Behavior components of the TSCS Physical scale.

In separate EFAs of just the TSCS Physical items Marsh and Richards suggested that these scales could be differentiated into distinguishable components which they called: (a) Fit/healthy body, (b) Neat appearance, (c) Attractiveness, and (d) Sickness. Factor analyses of just the Moral items resulted in factors they called: (a) Honest, reliable, trustworthy, (b) Bipolar religion, and (c) Religion/ethics. The contents of several of these TSCS factors seem to correspond more closely to SDQIII scales than do the TSCS Physical and Moral scales. In order to test this observation, Marsh and Richards derived factor scores from their factor analyses of the TSCS Physical items and of the TSCS Moral items, and related these to the SDQIII scales (Table 11.1). The SDQIII Physical Ability scale was substantially correlated with the Fit/healthy body factor score (.66). The SDQIII Physical Appearance scale was substantially correlated with the Attractiveness factor score (.76). The SDQIII Religion/Spiritual Values and the TSCS Bipolar religion factor score were also correlated (.76). Finally, the SDQIII Honesty/trustworthiness scale was also substantially correlated with the corresponding TSCS factor score (.54).

In summary, these analyses provide strong support for both the convergent and discriminant validity of responses to the TSCS and SDQIII. Further analyses, however, revealed important anomalies in some of the TSCS scales. For the TSCS Physical and particularly the Moral items, well defined subcomponents were substantially more highly correlated with corresponding SDQIII scales than were the total scale scores. These additional analyses, then, provided stronger support for the construct validity of the SDQIII scales -- particularly the Religion/Spiritual Values scale -- and also provided convincing evidence of the multidimensionality of some of the TSCS EXT scales. These further analyses also suggested, however, that distinctions between the Identity, Satisfaction, and Behavior subcomponents of some EXT scales may reflect systematic content differences in the items used to define the subcomponents instead of, or in addition to, the influence of the INT frames of reference. For example, the TSCS Physical/Behavior scale was most highly correlated with the SDQIII Physical Ability scale whereas the TSCS Physical/Satisfaction scale was most highly correlated with the SDQIII Physical Appearance scale. As noted earlier, even when the existence of a priori factors are supported, the interpretation of these factors should be tested with external constructs.

#### Ratings By External Observers.

Multidimensional self-concept ratings were inferred by each of two external observers for 12 single-item rating scales designed to parallel 12 of the 13 SDQIII scales (all but General Esteem). Thus, the hypothesized relations between the external observer ratings and the TSCS responses was the same as posited for the TSCS and SDQIII scales except for General Esteem. Correlations between the 12 observer rating scales and the 5 TSCS EXT scales (Table 11.2) provide only modest support for convergent validity. The 8 convergent validities range from .05 to .31 (median = .23) and 7 are statistically significant. The one nonsignificant convergent validity is the correlation between the Religion/spiritual scale and the TSCS Moral scale. Despite these modest convergent validities, there is reasonable support for the discriminant validity of responses to the TSCS Family, Social, and Physical scales. Whereas the magnitude of correlations between observer ratings and TSCS EXT scales is much lower than observed between SDQIII and TSCS scales, the pattern of results is similar.

Insert Table 11.2 About Here

The only nonsignificant convergent validity was between Religion/spiritual value observer scale and the TSCS Moral scale. The Identity component of the TSCS Moral scale, however, is substantially correlated with this external observer rating (.29) whereas the TSCS Moral/Satisfaction scale is negatively correlated with it. Furthermore, the TSCS factor labeled Bipolar Religion correlates .40 with the Religion/spiritual value scale, and represents the highest correlation between any TSCS scale and observer ratings. This anomalous pattern is like that observed for the TSCS Moral and the SDQIII Religion/spiritual value scales. The factor scores derived from the TSCS Physical items also provide modest support for the separation of different physical factors.

The external observer ratings may, perhaps, also provide a basis for testing the validity of the INT scales. Results from Table 11.1 suggest that the SDQIII scales are more consistently correlated with Identity and, to a lesser extent, Behavior scales than to Satisfaction scales. Behavior is, however, the most obvious basis for external observers to form inferred self-concept ratings. Intuitively it would seem that external observer ratings should be most highly correlated with Behavior ratings and least correlated with Satisfaction ratings. Results in Table 11.2, however, provide no support for these expectations. The Behavior scale tends to be less correlated with observer ratings than the Identity

scale and even the Satisfaction scale (except for the Moral responses that were already discussed). Whereas there may be plausible counter-explanations of these findings, they provide no support for the construct validity of the TSCS INT scales.

The observer rating scales were specifically designed to parallel 12 of the SDQIII scales, and so observer ratings should be more highly correlated with SDQIII responses than TSCS responses (see Chapter 10 for further discussion). Correlations among the 12 observer rating and corresponding SDQIII scales indicate that the 12 convergent validities vary from .17 to .57 (median  $r = .35$ ), all are statistically significant, and only one (Emotional Stability) is less than .25. With the exception of the Emotional Stability scale, there is also clear support for discriminant validity. These results provide much stronger support for the validity of the external observer ratings than did the TSCS responses.

#### Summary and Discussion of the TSCS Study

The TSCS is one of the few self-concept instruments developed prior to the 1970s that was specifically designed to measure a priori dimensions of self-concept. Nevertheless, reviewers have been critical of the lack of empirical information about the TSCS structure and support for the discriminant validity of its scales. Subsequent research, primarily EFAs of item or scale responses, has not resolved this problem. A variety of factor analyses described here indicated the multidimensional nature of the TSCS responses, but empirically derived factors were sometimes not clearly related to the scales which the TSCS was intended to measure. There was clear and consistent support for three of the EXT scales -- Physical, Social and Family, but not for the remaining scales. The Moral scale was complicated by the existence of a bipolar religion component that has been reported in previous research. Personal self appears to be the least specific of the EXT scales and was not consistently identified as a differentiable factor.

Interpretations of correlations between TSCS responses, SDQIII responses, and the external observer ratings provided support for interpretations of TSCS's internal structure. Support for convergent and discriminant validity was strongest for the TSCS Physical, Social and Family scales. Only when the TSCS Moral scale was separated into subcomponents was its relation to SDQIII and observer responses clarified. The TSCS Personal factor was most strongly related to the SDQIII General Esteem scale, though it is not clear that it was intended to be such a scale. There was little support for the TSCS INT scales in the present investigation. These scales were not clearly identified in the EFAs, and were so highly correlated in the CFAs as to be difficult to distinguish. Whereas this facet does influence TSCS responses, this influence may reflect the idiosyncratic wording of items used to define these scales instead of, or in addition to, the internal frames of reference that they were intended to measure. To the extent that these internal frames of reference have an effect, it seems that this effect is specific to particular EXT scales so that it may be unjustified to interpret INT scales averaged across the five EXT scales.

One of the most interesting aspects of the TSCS design, in addition to its clearly articulated emphasis on a multidimensional self-concept, is the theoretical role of satisfaction. According to Fitts' conceptualization, Satisfaction is like the self-ideal discrepancies posited by other researchers. That is, satisfaction is the juxtaposition between accomplishments and the standards that one sets for oneself. Empirical support for discrepancy models of self-concept is generally weak (e.g., Wylie, 1974; 1979), due in part to methodological problems in the analysis of discrepancy scores, though interest in this approach continues to be strong (e.g., Higgins, Klein & Strauman, 1985). Most researchers, however, measure actual-self and ideal-self independently, and infer self-satisfaction or esteem from the discrepancies between the two. Measuring satisfaction directly, as in the TSCS, may avoid methodological problems in the use of difference scores, but it introduces new problems as demonstrated with the bipolar religious factor. Individuals who had religious identities (e.g., responded more positively to the item "I am a religious person") had lower self-satisfaction in relation to religion (e.g., responded negatively to the item "I am as religious as I want to be"). This distinction is lost, however, when responses are summed across Identity, Satisfaction and Behavior responses as in the TSCS EXT scales and the total score. That is, quite different levels of accomplishments and internal standards can lead to the same level of satisfaction. Whereas it may be more justifiable to sum responses across the Satisfaction items, the definition of satisfaction in relation to accomplishments and internal standards probably varies for different areas of self-concept. Furthermore, TSCS Satisfaction scale was no more highly correlated with the SDQIII Esteem scale than were the TSCS Behavior and Identity scales. In summary there appear to be problems with the operationalization of self-satisfaction in the TSCS that render its interpretation as dubious.

Fitts (1965) proposed a 3x5 schema for the design of the TSCS, and recommended the use of the 8 marginal scores in interpreting responses to the TSCS. Implicit in this recommendation is the assumption that there is no interaction between the EXT and INT facets. The identification of EFA factors that represent a particular combination of EXT and INT items, the results of an analysis of variance of responses described by Marsh and Richards (1988b), the interpretation of the bipolar religion factor, and, perhaps, even Fitts' own interpretation of the Satisfaction scale suggest that this assumption is unwarranted. However, the interpretation of the 15 scales that represent the cells in this 3x5 schema may also be unwarranted. Individually, the reliability of these 15 scales is not sufficient to justify their practical application. Furthermore, the substantial correlations among many of the scales would further complicate interpretations of TSCS responses based on them.

The emphasis of the present investigation has been on the examination of TSCS responses in relation to the subscales that it was designed to measure. It is also important, however, to evaluate the TSCS scale in relation to what it does not measure. Most empirical and theoretical research identifies academic self-concept as an important self-concept dimension, particularly for school-aged individuals in Western society. Because Math and Verbal self-concepts are nearly uncorrelated, at least two dimensions of academic self-concept should be included in multi-dimensional



instruments. The exclusion of any academic self-concept scale on the TSCS seems unjustified for an instrument that is to be used by school-aged subjects.

Historically, the TSCS is important because of its popularity, because of its emphasis on multiple dimensions of self-concept and, perhaps, because of its theoretically provocative design. In the 1960s it may have represented the best of existing self-concept instruments as suggested in Crandall's 1973 review, particularly if a multidimensional measure was sought, though other reviewers were less favorable. Its continuing popularity demonstrates its heuristic value. Despite its historical importance and heuristic value, however, the TSCS is not a strong instrument when judged by current test standards. The TSCS was designed to be multidimensional, but multidimensional statistical procedures were apparently not used in the original construction/selection of items and the items have not been refined during the ensuing 30 years. From this perspective it is hardly surprising that there is weak support for many of the scales that the TSCS is designed to measure. Whereas responses to the TSCS are multidimensional, clear empirical support was found for only 3 of 5 EXT scales and for none of the 3 INT scales in the present investigation, and these findings seem to be consistent with previous research. The three-facet design of the TSCS was theoretically important, and all three facets may influence responses to the TSCS. Neither the nature nor the theoretical significance of the INT and PN facets are well understood, however, and the INT facets seems to introduce unjustified complications into the interpretation of TSCS responses. Finally, the lack of an academic self seems unjustified for an instrument to be used with school-aged respondents.

#### The Canadian High School Study

Byrne and Shavelson (1986) collected responses from nearly 1000 Canadian students, 11th and 12th graders from two coeducational high schools, to the Verbal, Math, Academic, and General Esteem scales from three different self-concept instruments. Verbal, Math, and Academic self-concepts were each measured by the SDQIII, the Self-concept of Ability Scale (SCA; Brookover, 1962; Shavelson & Bolus, 1982), and the Affective Perception Inventory (API; Soares & Soares, 1979). General Esteem was measured by the SDQIII, the API, and the Self-esteem Scales (SES; Rosenberg, 1965). Because the SCA does not include a General Esteem scale and because of similarities in the construction of the scales (Byrne & Shavelson, 1986) the SES items were used in conjunction with the SCA for purposes of the MTMM analyses described here. As described earlier (Chapter 8), Marsh, Byrne and Shavelson (1988) reanalyzed this data to test the I/E frame of reference model. Whereas discussion in Chapter 8 focused on the relations between self-concept responses and academic achievement, the emphasis here is on relations between responses to the different instruments.

In preliminary analyses, exploratory factor analyses using a principal factors extraction of four factors followed by an oblique rotation (SPSS, 1986) were conducted on responses to the SDQIII, to the API, and to the SCA (and SES). The factor analysis of SDQIII responses resulted in four clearly defined factors corresponding to the intended scales, but the intended scales were not so clearly identified with responses to the SCA and the API. In the factor analysis of the SCA (and SES) items, General Esteem (based on SES responses) was clearly identified. However, items from the Verbal self-concept, Math self-concept, and Academic self-concept scales sometimes loaded with other items representing the same content area as predicted, but sometimes with items having the same wording except for the academic area referred to (on the SCA the Academic self-concept, Verbal self-concept, and Math self-concept scales are worded the same except for the words school, English and mathematics). Hence the SCA factor structure was complicated by method effects produced by the idiosyncratic wording of specific items (see Carmines & Zeller, 1979, for further discussion of this type of idiosyncratic method effect). In the factor analysis of the API items, three of the four factors -- all but the Academic self-concept -- were clearly defined; many of the Academic self-concept items had larger loadings on at least one of the other factors than on the Academic self-concept factor (also see Byrne & Shavelson, 1986, for details). However, problems with the factor analysis of the API may have been related to the wording of individual items as with the SCA.

For factor analyses of self-concept responses, Marsh (1987d; Marsh & O'Neill, 1984; Marsh, Smith & Barnes, 1985) argued for the use of subscale scores -- each subscale based on responses to two or more items designed to reflect the same scale -- as is typical in achievement research where factor analyses are rarely conducted at the item level. In addition to pragmatic advantages such as reducing costs associated with the factor analysis and increasing the ratio of subjects to variables, the use of such subscales instead of individual items produces measured variables that are likely to be more reliable; be more generalizable; contain less unique variance due to the idiosyncratic characteristics of individual items; and more closely approximate a normal distribution. These advantages may be relevant to suggested weaknesses of the factor analyses of SCA and API responses described above. For this reason, three subscales were used to represent each of the 12 self-concept scales by computing the average response to randomly selected thirds of the items from each scale, and the factor analyses like those described above were conducted with these subscale scores instead of item responses. These subsequent factor analyses of SDQIII responses, API responses, and the combination of SCA and SES responses each clearly identified the Math self-concept, Verbal self-concept, Academic self-concept, and General Esteem factors. In all three factor analyses subscale scores loaded substantially higher on the factor each was designed to measure (target loadings varied from .67 to .89, .58 to .91, and .64 to .92 respectively for the SDQ, the API, and the SCA/SES items) than on other factors (nontarget loadings varied from -.13 to .18, -.07 to .21, and -.04 to .29 respectively).

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Insert Table 11.3 About Here  
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Correlations among the 12 factor scores derived from these three factor analyses are presented in the form of a MTMM matrix (see Byrne & Shavelson, 1986, Table 11.3 for a similar MTMM based on scale scores instead of factor scores). In an application of the Campbell-Fiske criteria:

- 1) All 12 convergent validities ( $M r = .68$ ) are statistically significant and substantial. Convergent validities involving SDQIII responses ( $M r = .70$ ) are slightly higher than those involving the API (.67) or SCA/SES (.68), but the differences are small.
- 2) Convergent validities ( $M r = .68$ ) are higher than correlations between nonmatching traits in the same row or column of the heterotrait-heteromethod square submatrices ( $M r = .22$ ) for 71 of 72 comparisons. The one rejection involved the SSC scale from the API.
- 3) Convergent validities ( $M r = .68$ ) are higher than correlations between nonmatching traits in the same row or column of the heterotrait-homomethod triangular submatrices ( $M r = .25$ ) for 70 of 72 comparisons. Both rejections involved the SSC scale from the API. Correlations among the SDQIII scales ( $M r = .20$ ) are somewhat smaller than those among the API (.29) or among the SCA/SES (.25) scales.
- 4) The pattern of correlations among the scales is consistent in that MSC and VSC are nearly uncorrelated, SSC is moderately correlated to both MSC and VSC, and GSC tends to be more highly correlated with SSC than with MSC or VSC (also see discussion of hierarchical factor structure in Chapter 4).

In summary, the MTMM analyses provides remarkably strong support for both the convergent and divergent validity for each of the scales from all three instruments. The only minor exception, perhaps, to this generalization is the SSC from the API scale which tends to be as highly correlated with the various GSC scales as with the other SSC scales. This observation is also consistent with the initial factor analyses in which the SSC scale from the API could not be identified. As noted in Chapter 8, the consistently near-zero correlation between MSC and VSC also provides strong support for the revision of the Shavelson model proposed by Marsh and Shavelson (1985).

#### Summary of Relations Between Responses to the SDQIII and Other Instruments.

One widely accepted approach to establishing construct validity is to correlate scores from different instruments designed to measure the same construct. Particularly for multidimensional constructs this approach is facilitated by the application of MTMM analyses. Despite the popularity of this approach, it has not been employed frequently and the few applications have generally not been supportive (e.g., Marx & Winne, 1978). The reason, apparently, is that prior to the 1970s or even 1980s self-concept instruments have generally not been specifically designed to measure a priori components of self-concept and do not have well-defined factor structures. If there is ambiguity in the factors measured by individual instruments, then it is not surprising that there is ambiguity in relations between factors from different instruments.

In contrast to most self-concept instruments, the SDQIII and other SDQ instruments were specifically designed to measure a priori factors which have been clearly defined in numerous factor analytic studies. For this reason a logical pattern of relations between SDQIII factors and those of other multidimensional self-concept instruments is more likely than in previous studies such as that by Marx and Winne (1978). Results summarized in this chapter provide support for this expectation. The Marsh and Richards (1988b) study provided support for the construct validity of many of the nonacademic scales from the SDQIII whereas the Marsh, Byrne and Shavelson (1988) study provided strong support for the construct validity of the academic and General Esteem scales from the SDQIII.

#### CHAPTER 12 -- SUMMARY AND OVERVIEW

Interest in self-concept stems from its recognition as a valued outcome in a wide spectrum of disciplines, from the assumption that the improvement of self-concept may facilitate improvements in other outcomes such as academic achievement, from interest in how self-concept is related to other variables, and from interest in particular measurement and methodological problems inherent in this area of research. The study of self-concept represents one of the oldest areas of research in the social sciences. (The longest chapter in William James' textbook, the first introductory textbook in psychology, was on self-concept.) There are also interesting peculiarities about research in this area. Unlike other areas of research, the study of self-concept is not aligned with any particular discipline. Also, although many thousands of self-concept studies have been conducted, only a few researchers have published a substantial number of studies or have continued their research over an extended period of time. In fact, most self-concept studies emphasize other theoretical constructs, and the interest in self-concept comes from its assumed relevance to these other constructs. Reviews of self-concept research (e.g., Burns, 1979; Shavelson, Hubner & Stanton, 1976; Wells & Marwell, 1976; Wylie, 1974; 1979) typically emphasize the lack of a theoretical basis in most studies, the poor quality of measurement instruments used to assess self-concept, methodological shortcomings, and a general lack of consistent findings. The disappointing lack of rigor can perhaps be explained by the lack of identification of self-concept research with any particular discipline.

In an attempt to clarify the status of the self-concept construct, Shavelson, et al. (1976) reviewed existing theoretical and empirical research, and developed their multifaceted, hierarchical model of self-concept. While the



facets proposed in the Shavelson model, as well as their structure, were heuristic and plausible, they were not supported by empirical research. In particular, Shavelson et al. were unable to identify any existing instruments which measured the facets posited in their model, and not even the multidimensionality of self-concept was widely accepted by other researchers. While Shavelson et al. speculated that the lack of empirical support for their model was due to the poor quality of measurement instruments employed in self-concept research, it was clear that development of a suitable measurement instrument was necessary for empirically testing the model and for examining further theoretical issues. This need provided the initial impetus for the development and refinement of the set of SDQ instruments. In adopting such an approach, atheoretical or purely empirical approaches to developing and refining the self-concept instrument were clearly rejected. Instead, an explicit theoretical model was taken to be the starting point for instrument construction, and empirical results were used to support, refute or revise the instrument and the theory upon which it was based. Implicit in this approach is the assumption that theory building and instrument construction are inexorably intertwined, and that each will suffer if the two are separated. In this sense the set of SDQ instruments is based upon strong empirical and theoretical bases.

Since self-concept is a hypothetical construct, its usefulness must be demonstrated by investigations of its construct validity. These investigations can be classified as within-network or between-network studies. Within-network studies examine the dimensionality of self-concept; whether self-concept is a unidimensional or multidimensional construct, and if multidimensional then what dimensions characterize self-concept. These studies typically employ factor analysis and multitrait-multimethod analysis. Between-network studies attempt to demonstrate a theoretically consistent, or at least logical, pattern of relationships between measures of self-concept and other constructs. SDQ research includes both within-network and between network studies. Early SDQ research, primarily within-network studies, focused on internal characteristics of self-concept, particularly its facets and their organization. More recent SDQ research, between-network studies, examined the relationship between self-concept facets and a wide variety of other constructs including sex, age, academic performance, self-concepts inferred by significant others, family background characteristics, attributions for success and failure, and experimental interventions designed to enhance self-concept. Research described in this monograph has provided strong support for the validity of interpretations based upon responses to the set of SDQ instruments and the Shavelson model upon which it is based. The research has also clarified many theoretical issues in self-concept research. In this sense SDQ research represents an interplay between theory and empirical research, and supports the construct validity approach which has guided SDQ research.

Perhaps the strongest contribution of the SDQ research is the description of a well-developed set of instruments, based on a strong empirical foundation and a good theoretical model, for the measurement of self-concept. Reviewers in this field typically argue that the most important weakness in self-concept research is the poor quality of measurement instruments, and it is hoped that the set of SDQ instruments will help to remedy this situation.

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Table 1.1

## A Brief Characterization of The SDQIII Scales and the Number of Items (in parentheses).

## ACADEMIC

1. Math (10) -- I have good mathematical skills/reasoning ability.
2. Verbal (10). I have good verbal skills/reasoning ability.
3. General Academic (10). I am a good student in most school subjects.
4. Problem Solving (10). I am good at problem solving/creative thinking.

## NONACADEMIC

5. Physical Ability (10). I am good at sports and physical activities.
6. Physical Appearance (10). I am physically attractive/good looking.
7. Relations With Same Sex (10). I have good interactions/relationships with members of the same sex.
8. Relations With the Opposite Sex (10). I have good interactions/relationships with members of the opposite sex.
9. Relations With Parents (10). I have good interactions/relationships with my parents.
10. Spiritual Values/Religion/ (12). I am a religious/spiritual person.
11. Honesty/Trustworthiness (12). I am an honest, reliable, trustworthy person.
12. Emotional Stability (12). I am an emotionally stable person.

## GENERAL

13. General-Self (12). I have self-respect, self-confidence, self-acceptance, positive self-feelings and a good self-concept.
14. Total Score 136). (The sum of responses to all 136 items)



Table 4.1

Internal Consistency Estimates of Reliability and Standard Errors of Measurement for SDQ III Scales.

|            |                    | Coefficient Alpha Estimates |              | Standard Error<br>of Measurement |           |         |
|------------|--------------------|-----------------------------|--------------|----------------------------------|-----------|---------|
|            |                    | Number<br>of Items          | Standardized | Unstandardized                   | Raw Score | T-score |
| SDQ Scales |                    |                             |              |                                  |           |         |
| 1)         | Mathematics        | 10                          | .94          | .94                              | 3.80      | 2.45    |
| 2)         | Verbal             | 10                          | .86          | .87                              | 3.82      | 3.61    |
| 3)         | Academic           | 10                          | .92          | .93                              | 3.10      | 2.65    |
| 4)         | Problem Solving    | 10                          | .84          | .85                              | 3.76      | 3.87    |
| 5)         | Physical Ability   | 10                          | .94          | .94                              | 2.99      | 2.45    |
| 6)         | Appearance         | 10                          | .90          | .91                              | 3.36      | 3.00    |
| 7)         | Same Sex Peers     | 10                          | .87          | .88                              | 3.43      | 3.46    |
| 8)         | Opp Sex Peers      | 10                          | .92          | .92                              | 3.62      | 2.83    |
| 9)         | Parents            | 10                          | .89          | .89                              | 3.75      | 3.32    |
| 10)        | Spiritual/Religion | 12                          | .95          | .95                              | 4.75      | 2.24    |
| 11)        | Honesty            | 12                          | .74          | .76                              | 4.35      | 4.89    |
| 12)        | Emotional          | 10                          | .89          | .89                              | 3.85      | 3.32    |
| 13)        | General Esteem     | 12                          | .93          | .93                              | 3.52      | 2.65    |
| 14)        | Total Score        | 136                         | .95          | .96                              | 17.14     | 2.00    |

NOTE: Standard errors of the mean were computed for the raw score totals and the standardized T-scores (see Appendix I).

TABLE 4.2

Coefficient Alphas and Items Statistics for the SDQIII Scales: Item Means SDs, Item Correlations, and Corrected Item-Total Scale Correlations

SCALE: Math; Coefficient Alpha = .94 (.94)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |             |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-------------|
|      |      |      |                        | 1                     | 14  | 27  | 40  | 53  | 66  | 79  | 92 105 118  |
| 1    | 5.13 | 1.83 | .76                    | ---                   |     |     |     |     |     |     |             |
| 14*  | 5.45 | 2.13 | .74                    | .60                   | --- |     |     |     |     |     |             |
| 27   | 4.46 | 2.14 | .76                    | .62                   | .62 | --- |     |     |     |     |             |
| 40*  | 5.80 | 1.79 | .71                    | .58                   | .59 | .54 | --- |     |     |     |             |
| 53   | 5.12 | 1.96 | .87                    | .71                   | .66 | .72 | .65 | --- |     |     |             |
| 66*  | 5.85 | 1.61 | .78                    | .62                   | .65 | .57 | .68 | .72 | --- |     |             |
| 79   | 5.13 | 1.91 | .83                    | .64                   | .62 | .70 | .60 | .81 | .67 | --- |             |
| 92*  | 5.65 | 1.69 | .79                    | .62                   | .62 | .59 | .64 | .74 | .73 | .71 | ---         |
| 105  | 3.90 | 1.93 | .70                    | .54                   | .51 | .61 | .48 | .65 | .52 | .69 | .55 ---     |
| 118* | 4.71 | 1.98 | .75                    | .68                   | .59 | .61 | .53 | .68 | .59 | .63 | .62 .59 --- |

SCALE: Verbal; Coefficient Alpha = .86 (.87)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |             |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-------------|
|      |      |      |                        | 6                     | 19  | 32  | 45  | 58  | 71  | 84  | 97 110 123  |
| 6*   | 5.21 | 1.81 | .61                    | ---                   |     |     |     |     |     |     |             |
| 19   | 5.57 | 1.56 | .64                    | .70                   | --- |     |     |     |     |     |             |
| 32*  | 6.04 | 1.49 | .67                    | .48                   | .51 | --- |     |     |     |     |             |
| 45   | 4.94 | 2.01 | .37                    | .20                   | .19 | .29 | --- |     |     |     |             |
| 58*  | 5.51 | 1.65 | .60                    | .44                   | .44 | .50 | .22 | --- |     |     |             |
| 71   | 5.64 | 1.30 | .63                    | .41                   | .46 | .51 | .26 | .50 | --- |     |             |
| 84*  | 4.85 | 1.68 | .50                    | .33                   | .29 | .38 | .31 | .35 | .32 | --- |             |
| 97   | 5.47 | 1.40 | .63                    | .50                   | .54 | .50 | .20 | .51 | .61 | .31 | ---         |
| 110* | 6.39 | 1.66 | .44                    | .29                   | .29 | .36 | .24 | .29 | .28 | .30 | .24 ---     |
| 123  | 5.89 | 1.34 | .72                    | .44                   | .47 | .55 | .41 | .45 | .52 | .48 | .47 .49 --- |

SCALE: Academic; Coefficient Alpha = .92 (.93)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |             |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-------------|
|      |      |      |                        | 9                     | 22  | 35  | 48  | 61  | 74  | 87  | 100 113 126 |
| 9    | 5.23 | 1.57 | .72                    | ---                   |     |     |     |     |     |     |             |
| 22*  | 5.17 | 1.82 | .68                    | .66                   | --- |     |     |     |     |     |             |
| 35   | 5.41 | 1.58 | .78                    | .74                   | .66 | --- |     |     |     |     |             |
| 48*  | 6.16 | 1.42 | .73                    | .47                   | .48 | .54 | --- |     |     |     |             |
| 61   | 5.58 | 1.38 | .79                    | .58                   | .51 | .64 | .70 | --- |     |     |             |
| 74*  | 5.91 | 1.56 | .74                    | .64                   | .58 | .68 | .55 | .58 | --- |     |             |
| 87   | 5.63 | 1.32 | .72                    | .49                   | .44 | .55 | .65 | .73 | .52 | --- |             |
| 100* | 6.06 | 1.47 | .77                    | .61                   | .60 | .69 | .60 | .62 | .70 | .55 | ---         |
| 113  | 5.59 | 1.34 | .73                    | .54                   | .49 | .57 | .65 | .73 | .53 | .69 | .56 ---     |
| 126* | 6.03 | 1.76 | .46                    | .25                   | .32 | .30 | .46 | .45 | .33 | .43 | .41 .40 --- |



SCALE: Problem Solving; Coefficient Alpha = .84 (.85)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 10                    | 23  | 36  | 49  | 62  | 75  | 88  | 101 | 114 | 127 |
| 10*  | 5.63 | 1.45 | .54                    | ---                   |     |     |     |     |     |     |     |     |     |
| 23   | 4.96 | 1.36 | .70                    | .45                   | --- |     |     |     |     |     |     |     |     |
| 36*  | 4.04 | 1.83 | .35                    | .24                   | .30 | --- |     |     |     |     |     |     |     |
| 49   | 5.48 | 1.55 | .59                    | .42                   | .55 | .14 | --- |     |     |     |     |     |     |
| 62*  | 5.62 | 1.37 | .60                    | .49                   | .49 | .23 | .53 | --- |     |     |     |     |     |
| 75   | 5.74 | 1.42 | .50                    | .34                   | .40 | .14 | .42 | .39 | --- |     |     |     |     |
| 88*  | 5.34 | 1.45 | .62                    | .40                   | .51 | .43 | .34 | .41 | .31 | --- |     |     |     |
| 101  | 5.47 | 1.43 | .60                    | .33                   | .50 | .41 | .31 | .33 | .34 | .59 | --- |     |     |
| 114* | 4.91 | 1.95 | .46                    | .28                   | .40 | .14 | .42 | .33 | .36 | .29 | .32 | --- |     |
| 127  | 5.61 | 1.32 | .44                    | .25                   | .43 | .15 | .35 | .32 | .25 | .34 | .32 | .25 | --- |

SCALE: Physical Ability; Coefficient Alpha = .94 (.94)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 13                    | 26  | 39  | 52  | 65  | 78  | 91  | 104 | 117 | 130 |
| 13   | 4.97 | 1.69 | .78                    | ---                   |     |     |     |     |     |     |     |     |     |
| 26*  | 6.34 | 1.39 | .72                    | .63                   | --- |     |     |     |     |     |     |     |     |
| 39   | 5.39 | 1.60 | .74                    | .69                   | .54 | --- |     |     |     |     |     |     |     |
| 52*  | 6.86 | 1.29 | .73                    | .55                   | .57 | .54 | --- |     |     |     |     |     |     |
| 65   | 5.39 | 1.63 | .81                    | .72                   | .57 | .73 | .60 | --- |     |     |     |     |     |
| 78*  | 6.15 | 1.45 | .75                    | .62                   | .72 | .56 | .55 | .61 | --- |     |     |     |     |
| 91   | 5.58 | 1.72 | .72                    | .58                   | .47 | .58 | .58 | .65 | .53 | --- |     |     |     |
| 104* | 6.00 | 1.50 | .80                    | .69                   | .69 | .61 | .61 | .65 | .72 | .58 | --- |     |     |
| 117  | 6.34 | 1.41 | .78                    | .60                   | .57 | .58 | .71 | .65 | .59 | .67 | .66 | --- |     |
| 130* | 6.05 | 1.54 | .68                    | .51                   | .47 | .52 | .57 | .59 | .53 | .61 | .57 | .61 | --- |

SCALE: Physical Appearance; Coefficient Alpha = .90 (.91)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 11                    | 24  | 37  | 50  | 63  | 76  | 89  | 102 | 115 | 128 |
| 11   | 4.96 | 1.44 | .75                    | ---                   |     |     |     |     |     |     |     |     |     |
| 24*  | 6.24 | 1.42 | .67                    | .66                   | --- |     |     |     |     |     |     |     |     |
| 37   | 5.19 | 1.45 | .68                    | .74                   | .66 | --- |     |     |     |     |     |     |     |
| 50*  | 4.99 | 1.80 | .68                    | .47                   | .48 | .54 | --- |     |     |     |     |     |     |
| 63   | 5.46 | 1.83 | .50                    | .58                   | .51 | .64 | .70 | --- |     |     |     |     |     |
| 76*  | 5.79 | 1.54 | .78                    | .64                   | .58 | .68 | .55 | .58 | --- |     |     |     |     |
| 89   | 5.22 | 1.31 | .65                    | .49                   | .44 | .55 | .65 | .73 | .52 | --- |     |     |     |
| 102* | 4.20 | 1.79 | .54                    | .61                   | .60 | .69 | .60 | .62 | .70 | .55 | --- |     |     |
| 115* | 4.81 | 1.39 | .61                    | .54                   | .49 | .57 | .65 | .73 | .53 | .69 | .56 | --- |     |
| 128  | 5.21 | 1.34 | .77                    | .25                   | .32 | .30 | .46 | .45 | .33 | .43 | .41 | .40 | --- |

SCALE: Same Sex Peer Relations; Coefficient Alpha = .87 (.88)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 12                    | 25  | 38  | 51  | 64  | 77  | 90  | 103 | 116 | 129 |
| 12*  | 4.88 | 2.17 | .37                    | ---                   |     |     |     |     |     |     |     |     |     |
| 25   | 6.42 | 1.22 | .55                    | .19                   | --- |     |     |     |     |     |     |     |     |
| 38*  | 6.30 | 1.24 | .60                    | .25                   | .50 | --- |     |     |     |     |     |     |     |
| 51   | 5.79 | 1.34 | .68                    | .23                   | .54 | .53 | --- |     |     |     |     |     |     |
| 64*  | 5.97 | 1.27 | .60                    | .22                   | .42 | .47 | .47 | --- |     |     |     |     |     |
| 77   | 5.67 | 1.56 | .56                    | .28                   | .32 | .35 | .44 | .34 | --- |     |     |     |     |
| 90*  | 6.21 | 1.22 | .66                    | .24                   | .41 | .49 | .49 | .58 | .40 | --- |     |     |     |
| 103  | 5.57 | 1.24 | .65                    | .23                   | .43 | .44 | .56 | .50 | .43 | .55 | --- |     |     |
| 116* | 5.04 | 1.60 | .64                    | .32                   | .36 | .40 | .46 | .45 | .44 | .49 | .45 | --- |     |
| 129  | 5.70 | 1.46 | .74                    | .36                   | .44 | .44 | .61 | .45 | .57 | .51 | .57 | .64 | --- |

SCALE: Opposite Sex Peer Relations; Coefficient Alpha = .92 (.92)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 5                     | 18  | 31  | 44  | 57  | 70  | 83  | 96  | 109 | 122 |
| 5    | 4.57 | 1.42 | .62                    | ---                   |     |     |     |     |     |     |     |     |     |
| 18*  | 5.09 | 1.83 | .69                    | .45                   | --- |     |     |     |     |     |     |     |     |
| 31   | 5.20 | 1.83 | .72                    | .57                   | .52 | --- |     |     |     |     |     |     |     |
| 44*  | 5.16 | 1.72 | .67                    | .42                   | .52 | .51 | --- |     |     |     |     |     |     |
| 57   | 5.88 | 1.47 | .75                    | .47                   | .53 | .61 | .57 | --- |     |     |     |     |     |
| 70*  | 5.26 | 1.76 | .79                    | .50                   | .61 | .60 | .61 | .66 | --- |     |     |     |     |
| 83   | 5.34 | 1.57 | .80                    | .58                   | .57 | .69 | .56 | .68 | .69 | --- |     |     |     |
| 96*  | 5.13 | 1.81 | .69                    | .40                   | .57 | .49 | .54 | .55 | .64 | .58 | --- |     |     |
| 109  | 5.67 | 1.78 | .62                    | .44                   | .47 | .47 | .44 | .53 | .51 | .53 | .49 | --- |     |
| 122  | 5.59 | 1.49 | .70                    | .49                   | .53 | .57 | .55 | .55 | .57 | .60 | .52 | .48 | --- |

SCALE: Parent Relations; Coefficient Alpha = .89 (.89)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 8                     | 21  | 34  | 47  | 60  | 73  | 86  | 99  | 112 | 125 |
| 8*   | 4.96 | 1.72 | .55                    | ---                   |     |     |     |     |     |     |     |     |     |
| 21   | 5.39 | 1.87 | .65                    | .41                   | --- |     |     |     |     |     |     |     |     |
| 34*  | 5.83 | 1.89 | .65                    | .44                   | .43 | --- |     |     |     |     |     |     |     |
| 47*  | 6.55 | 1.45 | .60                    | .39                   | .38 | .47 | --- |     |     |     |     |     |     |
| 60   | 5.33 | 1.66 | .62                    | .46                   | .56 | .44 | .37 | --- |     |     |     |     |     |
| 73*  | 6.89 | 1.26 | .62                    | .35                   | .42 | .40 | .57 | .38 | --- |     |     |     |     |
| 86   | 6.50 | 1.32 | .61                    | .38                   | .48 | .41 | .44 | .40 | .53 | --- |     |     |     |
| 99*  | 5.30 | 1.95 | .63                    | .40                   | .45 | .53 | .42 | .40 | .41 | .40 | --- |     |     |
| 112  | 5.63 | 1.59 | .75                    | .40                   | .55 | .57 | .47 | .55 | .50 | .47 | .61 | --- |     |
| 125  | 6.91 | 1.24 | .60                    | .28                   | .47 | .43 | .38 | .38 | .50 | .47 | .43 | .54 | --- |



SCALE: Spiritual Values/Religion; Coefficient Alpha = .95 (.95)

| Item | Mean | SD   | Item-<br>total<br>Corr | Correlation With Item |     |     |     |     |     |     |     |     |     |     |     |
|------|------|------|------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |                        | 2                     | 15  | 28  | 41  | 54  | 67  | 80  | 93  | 106 | 119 | 133 | 136 |
| 2*   | 4.92 | 2.18 | .44                    | ---                   |     |     |     |     |     |     |     |     |     |     |     |
| 15   | 4.29 | 2.21 | .88                    | .43                   | --- |     |     |     |     |     |     |     |     |     |     |
| 28*  | 4.69 | 2.28 | .84                    | .38                   | .78 | --- |     |     |     |     |     |     |     |     |     |
| 41   | 4.25 | 2.18 | .89                    | .39                   | .83 | .79 | --- |     |     |     |     |     |     |     |     |
| 54   | 3.89 | 2.20 | .87                    | .38                   | .80 | .77 | .86 | --- |     |     |     |     |     |     |     |
| 67   | 4.23 | 2.28 | .89                    | .37                   | .83 | .78 | .86 | .84 | --- |     |     |     |     |     |     |
| 80*  | 3.94 | 2.30 | .78                    | .35                   | .72 | .69 | .71 | .72 | .74 | --- |     |     |     |     |     |
| 93   | 4.31 | 2.23 | .85                    | .37                   | .78 | .74 | .83 | .81 | .83 | .70 | --- |     |     |     |     |
| 106* | 6.02 | 2.17 | .65                    | .37                   | .60 | .57 | .58 | .55 | .56 | .49 | .55 | --- |     |     |     |
| 119  | 5.46 | 2.22 | .69                    | .32                   | .63 | .60 | .64 | .61 | .62 | .53 | .60 | .66 | --- |     |     |
| 133* | 4.64 | 2.29 | .84                    | .39                   | .77 | .76 | .79 | .76 | .80 | .70 | .77 | .56 | .62 | --- |     |
| 136* | 4.17 | 2.01 | .49                    | .26                   | .44 | .43 | .45 | .46 | .45 | .46 | .43 | .30 | .31 | .45 | --- |

SCALE: Honesty/Trustworthiness; Coefficient Alpha = .74 (.76)

| Item | Mean | SD   | Item-         | Correlation With Item |     |     |     |     |     |     |     |     |     |     |     |     |
|------|------|------|---------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      | total<br>Corr | 4                     | 17  | 30  | 43  | 56  | 69  | 82  | 95  | 108 | 121 | 132 | 134 |     |
| 4*   | 4.85 | 1.73 | .36           |                       | --- |     |     |     |     |     |     |     |     |     |     |     |
| 17   | 6.28 | 1.12 | .38           |                       | .12 | --- |     |     |     |     |     |     |     |     |     |     |
| 30*  | 7.01 | 1.16 | .43           |                       | .22 | .26 | --- |     |     |     |     |     |     |     |     |     |
| 43   | 6.56 | 1.16 | .42           |                       | .23 | .25 | .30 | --- |     |     |     |     |     |     |     |     |
| 56*  | 6.74 | 1.36 | .46           |                       | .24 | .21 | .24 | .23 | --- |     |     |     |     |     |     |     |
| 69   | 5.58 | 1.85 | .39           |                       | .21 | .16 | .15 | .18 | .29 | --- |     |     |     |     |     |     |
| 82*  | 5.88 | 1.73 | .33           |                       | .28 | .14 | .26 | .21 | .17 | .13 | --- |     |     |     |     |     |
| 95   | 6.38 | 1.02 | .59           |                       | .29 | .35 | .36 | .41 | .37 | .31 | .25 | --- |     |     |     |     |
| 108* | 6.54 | 1.43 | .44           |                       | .24 | .16 | .31 | .20 | .26 | .31 | .23 | .30 | --- |     |     |     |
| 121  | 5.63 | 1.36 | .24           |                       | .07 | .16 | .18 | .12 | .12 | .11 | .15 | .22 | .14 | --- |     |     |
| 132* | 6.48 | 1.27 | .37           |                       | .13 | .46 | .23 | .23 | .22 | .17 | .13 | .31 | .17 | .13 | --- |     |
| 134  | 6.33 | 1.92 | .29           |                       | .09 | .08 | .10 | .17 | .28 | .25 | .06 | .23 | .20 | .11 | .13 | --- |

SCALE: Emotional Stability; Coefficient Alpha = .89 (.89)

|       |      |      | Item- |                       |     |     |     |     |     |     |     |     |     |
|-------|------|------|-------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Item  | Mean | SD   | total | Correlation With Item |     |     |     |     |     |     |     |     |     |
|       |      |      | Corr  | 7                     | 20  | 33  | 46  | 59  | 72  | 85  | 98  | 111 | 124 |
| ----- |      |      |       |                       |     |     |     |     |     |     |     |     |     |
| 7     | 5.76 | 1.40 | .62   | ---                   |     |     |     |     |     |     |     |     |     |
| 20*   | 4.95 | 1.91 | .74   | .53                   | --- |     |     |     |     |     |     |     |     |
| 33    | 6.18 | 1.25 | .54   | .42                   | .35 | --- |     |     |     |     |     |     |     |
| 46*   | 5.40 | 1.73 | .65   | .47                   | .59 | .30 | --- |     |     |     |     |     |     |
| 59    | 4.83 | 1.78 | .60   | .38                   | .47 | .47 | .37 | --- |     |     |     |     |     |
| 72*   | 5.77 | 1.63 | .74   | .58                   | .60 | .43 | .59 | .46 | --- |     |     |     |     |
| 85    | 4.93 | 1.71 | .65   | .42                   | .66 | .33 | .48 | .46 | .53 | --- |     |     |     |
| 98*   | 5.81 | 1.53 | .73   | .43                   | .57 | .52 | .49 | .64 | .60 | .52 | --- |     |     |
| 111   | 5.57 | 1.53 | .39   | .28                   | .27 | .36 | .27 | .28 | .30 | .24 | .34 | --- |     |
| 124*  | 5.57 | 1.65 | .72   | .52                   | .64 | .36 | .58 | .42 | .65 | .53 | .55 | .32 | --- |

SCALE: General Esteem; Coefficient Alpha = .93 (.93)

| Item | Mean | SD   | Item-         | Correlation With Item |     |     |     |     |     |     |     |     |     |     |     |     |
|------|------|------|---------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      | total<br>Corr | 3                     | 16  | 29  | 42  | 55  | 68  | 81  | 94  | 107 | 120 | 131 | 135 |     |
| 3    | 6.11 | 1.21 | .69           |                       | --- |     |     |     |     |     |     |     |     |     |     |     |
| 16*  | 5.37 | 1.85 | .73           |                       | .51 | --- |     |     |     |     |     |     |     |     |     |     |
| 29   | 5.88 | 1.34 | .68           |                       | .54 | .52 | --- |     |     |     |     |     |     |     |     |     |
| 42*  | 6.45 | 1.38 | .75           |                       | .68 | .57 | .56 | --- |     |     |     |     |     |     |     |     |
| 55   | 5.34 | 1.62 | .75           |                       | .54 | .74 | .54 | .57 | --- |     |     |     |     |     |     |     |
| 68   | 5.74 | 1.31 | .76           |                       | .61 | .59 | .60 | .60 | .64 | --- |     |     |     |     |     |     |
| 81*  | 6.55 | 1.42 | .51           |                       | .37 | .36 | .32 | .40 | .34 | .38 | --- |     |     |     |     |     |
| 94   | 5.91 | 1.37 | .81           |                       | .61 | .61 | .62 | .66 | .67 | .69 | .41 | --- |     |     |     |     |
| 107* | 6.23 | 1.46 | .78           |                       | .55 | .60 | .55 | .65 | .61 | .65 | .43 | .69 | --- |     |     |     |
| 120* | 6.15 | 1.52 | .81           |                       | .57 | .63 | .58 | .66 | .63 | .63 | .43 | .73 | .73 | --- |     |     |
| 131  | 5.76 | 1.36 | .51           |                       | .38 | .36 | .34 | .36 | .39 | .41 | .57 | .42 | .38 | .40 | --- |     |
| 135* | 5.82 | 1.63 | .71           |                       | .48 | .54 | .58 | .58 | .54 | .55 | .35 | .60 | .64 | .68 | .37 | --- |

Note: Numbers identifying each item refer to the item numbers on the SDQI instrument. Coefficient alphas not in parentheses refer to scales based standardized scores for each item whereas those in parentheses refer to scales based on unstandardized scores.



Table 4.3

Internal Consistency and Stability of SDQ III Responses Over Four Occasions Spanning a Total of 20 Months (N=229) [Adapted from Marsh, Richards & Barnes, 1986a]

| SDQ Scales            | Internal Consistency |     |     |     | Stability Coefficients |           |           |           |           |           |
|-----------------------|----------------------|-----|-----|-----|------------------------|-----------|-----------|-----------|-----------|-----------|
|                       | T1                   | T2  | T3  | T4  | T1/<br>T2              | T1/<br>T3 | T1/<br>T4 | T2/<br>T3 | T2/<br>T4 | T3/<br>T4 |
| 1) Mathematics        | .94                  | .95 | .95 | .95 | .94                    | .92       | .87       | .95       | .87       | .89       |
| 2) Verbal             | .85                  | .86 | .88 | .87 | .90                    | .86       | .73       | .89       | .75       | .75       |
| 3) Academic           | .92                  | .93 | .94 | .92 | .87                    | .85       | .69       | .88       | .72       | .71       |
| 4) Problem Solving    | .84                  | .83 | .86 | .86 | .86                    | .79       | .75       | .84       | .78       | .81       |
| 5) Physical Ability   | .92                  | .93 | .92 | .93 | .89                    | .85       | .77       | .85       | .75       | .74       |
| 6) Appearance         | .88                  | .89 | .88 | .86 | .87                    | .79       | .63       | .84       | .66       | .65       |
| 7) Same Sex Peers     | .88                  | .90 | .88 | .91 | .85                    | .74       | .61       | .80       | .66       | .67       |
| 8) Opposite Sex Peers | .91                  | .92 | .92 | .91 | .90                    | .83       | .73       | .88       | .88       | .80       |
| 9) Parents            | .89                  | .89 | .90 | .91 | .88                    | .87       | .74       | .92       | .78       | .79       |
| 10) Religion          | .94                  | .95 | .95 | .95 | .94                    | .93       | .84       | .95       | .81       | .84       |
| 11) Honesty           | .72                  | .77 | .77 | .79 | .76                    | .63       | .49       | .74       | .60       | .61       |
| 12) Emotional         | .90                  | .90 | .89 | .91 | .84                    | .76       | .69       | .81       | .65       | .68       |
| 13) General           | .94                  | .94 | .93 | .93 | .87                    | .68       | .50       | .75       | .51       | .54       |
| Median                | .90                  | .90 | .90 | .91 | .87                    | .83       | .73       | .85       | .75       | .74       |

NOTE: Participants completed the SDQIII one month before (T1), the first day of (T2), the last day of (T3), and 18 months after (T4) the completion of the Outward Bound Program. Results presented here are based on the 229 participants who completed the SDQIII at T4 as well as T1-T3, but results for the 361 participants who completed responses for only T1-T3 (see Marsh, Richards & Barnes, 1986a; 1986b) are nearly identical. Internal consistency coefficients are coefficient alpha estimates of reliability. Stability coefficients are the correlations between responses by the same individual at two points in time. (See Chapter 8 for more detail about the study.)

Table 4.4

NTMM Matrix Relating the 13 Self-concept Factors For Times 3 and 4 [Adapted from Marsh, Richards & Barnes, 1986a]

| Time 3 Self-concept Factors |      |        |      |      |      |      |      |      |      |      |    |      | Time 4 Self-concept Factors |     |     |     |     |    |    |    |    |     |     |    |    |  |
|-----------------------------|------|--------|------|------|------|------|------|------|------|------|----|------|-----------------------------|-----|-----|-----|-----|----|----|----|----|-----|-----|----|----|--|
| 1                           | 2    | 3      | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12 | 13   | 1                           | 2   | 3   | 4   | 5   | 6  | 7  | 8  | 9  | 10  | 11  | 12 | 13 |  |
| Time 3                      |      |        |      |      |      |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 1)                          | --   |        |      |      |      |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 2)                          | 02   | --     |      |      |      |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 3)                          | 45   | 39     | --   |      |      |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 4)                          | 32   | 30     | 23   | --   |      |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 5)                          | 17   | 13     | 09   | 15   | --   |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 6)                          | 04   | 24     | 11   | 24   | 28   | --   |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 7)                          | 02   | 18     | 14   | 26   | 17   | 27   | --   |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 8)                          | 13   | 09     | 05   | 19   | 37   | 20   | 42   | --   |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 9)                          | 08   | 07     | 06   | 11   | 13   | 16   | 18   | --   |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 10)                         | -05  | -04    | 06   | -05  | 04   | 08   | -03  | 06   | 01   | --   |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 11)                         | 03   | 09     | 14   | 08   | 23   | 17   | 11   | 22   | 17   | 02   | -- |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 12)                         | 15   | 12     | -01  | 15   | 08   | 20   | 07   | 16   | 17   | -08  | 15 | --   |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 13)                         | 03   | 23     | 14   | 19   | 19   | 43   | 17   | 28   | 23   | 03   | 32 | 37   | --                          |     |     |     |     |    |    |    |    |     |     |    |    |  |
| Time 4                      |      |        |      |      |      |      |      |      |      |      |    |      |                             |     |     |     |     |    |    |    |    |     |     |    |    |  |
| 1)                          | (89) | 00     | 37   | 32   | 18   | 03   | 01   | 11   | 02   | -06  | 02 | 13   | 01                          | --  |     |     |     |    |    |    |    |     |     |    |    |  |
| 2)                          | 07   | (75)   | 36   | 27   | 06   | 16   | 19   | 15   | 05   | -06  | 08 | 13   | 16                          | 09  | --  |     |     |    |    |    |    |     |     |    |    |  |
| 3)                          | 36   | 45     | (71) | 25   | 08   | 00   | 15   | -01  | 07   | -06  | 07 | 05   | 10                          | 33  | 50  | --  |     |    |    |    |    |     |     |    |    |  |
| 4)                          | 37   | 29     | 29   | (81) | 10   | 16   | 26   | 19   | 02   | -07  | 02 | 15   | 13                          | 39  | 38  | 35  | --  |    |    |    |    |     |     |    |    |  |
| 5)                          | 14   | 06     | 08   | 15   | (74) | 21   | 20   | 34   | 02   | 03   | 13 | 07   | 12                          | 18  | 13  | 16  | 18  | -- |    |    |    |     |     |    |    |  |
| 6)                          | 13   | 15     | 07   | 18   | 19   | (65) | 12   | 16   | 07   | 00   | 07 | 18   | 20                          | 16  | 18  | 02  | 22  | 18 | -- |    |    |     |     |    |    |  |
| 7)                          | -02  | 16     | 08   | 26   | 16   | 18   | (80) | 39   | 12   | -02  | 09 | 12   | 07                          | -01 | 15  | 08  | 28  | 20 | 14 | -- |    |     |     |    |    |  |
| 8)                          | -02  | 11     | 04   | 09   | 20   | 02   | 31   | (67) | 14   | 03   | 07 | 07   | 11                          | 01  | 31  | 13  | 20  | 36 | 02 | 39 | -- |     |     |    |    |  |
| 9)                          | -01  | 03     | 05   | 02   | 09   | 09   | 12   | 15   | (79) | -05  | 08 | 18   | 17                          | 02  | 04  | 09  | -03 | 06 | 09 | 12 | 16 | --  |     |    |    |  |
| 10)                         | -08  | -07    | 08   | -05  | 05   | 05   | 00   | 07   | 00   | (84) | 00 | -02  | 03                          | -04 | -09 | -05 | -06 | 02 | 03 | 01 | 04 | -02 | --  |    |    |  |
| 11)                         | 11   | 010714 | 09   | 10   | 04   | 18   | 19   | 13   | -03  | (61) | 14 | 11   |                             | 17  | 17  | 14  | 14  | 18 | 18 | 18 | 19 | 15  | 00  | -- |    |  |
| 12)                         | 13   | 02     | 02   | 13   | 03   | 16   | 08   | 14   | 13   | -08  | 00 | (68) | 23                          | 16  | 18  | 10  | 20  | 18 | 19 | 16 | 24 | 20  | -04 | 16 | -- |  |
| 13)                         | 08   | 07     | 14   | 18   | 10   | 20   | 21   | 32   | 12   | -05  | 18 | 36   | (54)                        | 05  | 18  | 17  | 22  | 20 | 21 | 25 | 34 | 21  | 01  | 28 | 46 |  |

Note: The names corresponding to self-concept factors 1 to 13 are presented in Table 4.3. The correlations are presented without decimal points, and those in parentheses are the convergent validity (stability) coefficient



TABLE 5.1

Factor Analysis Estimates For Parameters for the SDQ III (N = 2436)

| Oblique Factor Pattern Matrix After Rotation Variables |      |      |      |      |      |      |      |      |      |      |     |      |      |     |
|--------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|-----|------|------|-----|
|                                                        | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HON | EMOT | GENR |     |
| Math1                                                  | 75   | -07  | 15   | 16   | 05   | -01  | -02  | -03  | 04   | 00   | 01  | 03   | -01  | 751 |
| Math2                                                  | 84   | -06  | 04   | 00   | 05   | 02   | -01  | -03  | 03   | -03  | 02  | 06   | 02   | 779 |
| Math3                                                  | 86   | 07   | 10   | 04   | 03   | 03   | 03   | -01  | 01   | -01  | 00  | 02   | 02   | 870 |
| Math4                                                  | 83   | 04   | 12   | 04   | 03   | 03   | 05   | 01   | 01   | -02  | 02  | 01   | 00   | 833 |
| Math5                                                  | 74   | -10  | 17   | 11   | -03  | 02   | 01   | 02   | -03  | 04   | 02  | 00   | 00   | 695 |
| Verb1                                                  | -13  | 55   | 09   | 10   | 02   | 09   | 04   | 04   | -02  | 00   | 03  | 03   | 00   | 476 |
| Verb2                                                  | -05  | 62   | 10   | 06   | -03  | 02   | -01  | -02  | -02  | 03   | 05  | 01   | 01   | 478 |
| Verb3                                                  | -01  | 60   | 09   | 11   | -01  | 06   | 07   | 08   | 01   | 00   | -03 | -01  | 12   | 595 |
| Verb4                                                  | 04   | 63   | 01   | 13   | -04  | 06   | 07   | 09   | 01   | -03  | 03  | 11   | 04   | 633 |
| Verb5                                                  | 02   | 71   | 10   | -07  | 04   | -03  | 03   | 01   | 06   | -03  | 02  | 01   | -01  | 556 |
| Acad1                                                  | 02   | -01  | 76   | 08   | 01   | 03   | -01  | 02   | 02   | 04   | 04  | 01   | 00   | 636 |
| Acad2                                                  | 09   | 11   | 81   | 01   | 02   | 01   | 02   | 01   | 02   | 00   | 04  | 03   | 02   | 835 |
| Acad3                                                  | 12   | 12   | 78   | 03   | 01   | 01   | 04   | 00   | 03   | 03   | 02  | -01  | 06   | 831 |
| Acad4                                                  | 15   | 18   | 71   | 06   | 03   | 00   | 04   | 01   | 05   | 01   | 00  | 03   | 04   | 798 |
| Acad5                                                  | 20   | 25   | 47   | 09   | 01   | 09   | 01   | 03   | 03   | 00   | -04 | 01   | 04   | 568 |
| Prob1                                                  | 09   | 08   | 06   | 76   | 04   | -01  | -02  | 04   | 02   | -02  | -01 | 04   | 02   | 634 |
| Prob2                                                  | 05   | 04   | 02   | 66   | -01  | 09   | 01   | 03   | 02   | -02  | 03  | 07   | 01   | 519 |
| Prob3                                                  | 19   | 17   | 25   | 50   | 05   | 01   | -03  | -03  | -02  | 00   | 02  | 00   | 09   | 632 |
| Prob4                                                  | -07  | 17   | -07  | 68   | 01   | 02   | 12   | 08   | -02  | 04   | 02  | -01  | 10   | 612 |
| Prob5                                                  | 05   | -06  | 10   | 59   | 05   | 05   | 06   | 02   | -01  | 00   | -01 | -02  | 03   | 404 |
| Phys1                                                  | 04   | 01   | -05  | 02   | 72   | 20   | 08   | 01   | 03   | -05  | -03 | 08   | 05   | 750 |
| Phys2                                                  | 00   | -02  | 03   | -12  | 81   | 04   | 08   | -01  | 04   | 04   | 01  | 06   | 02   | 765 |
| Phys3                                                  | 05   | 02   | -04  | 07   | 81   | 09   | 08   | 03   | 01   | 00   | 01  | 04   | 07   | 819 |
| Phys4                                                  | 02   | 00   | 03   | 02   | 84   | 05   | 05   | 05   | 02   | 02   | 01  | 03   | 02   | 801 |
| Phys5                                                  | 00   | 01   | 06   | 00   | 80   | -03  | 07   | 07   | 01   | 01   | 06  | 02   | 00   | 719 |
| Appr1                                                  | 01   | 07   | 02   | 01   | 05   | 72   | 01   | 08   | 01   | 00   | -02 | 03   | 15   | 725 |
| Appr2                                                  | 03   | 04   | 03   | -02  | 12   | 77   | -02  | 00   | 02   | 01   | 03  | 10   | 03   | 751 |
| Appr3                                                  | 06   | 03   | -01  | 04   | 11   | 67   | 00   | 01   | 02   | 01   | 00  | 04   | 16   | 631 |
| Appr4                                                  | -03  | -02  | 07   | 03   | 01   | 71   | 04   | 04   | 02   | 04   | 07  | 02   | 06   | 614 |
| Appr5                                                  | 01   | 04   | 01   | 10   | 01   | 69   | 04   | 12   | 03   | -01  | -01 | 00   | 09   | 674 |
| Ssex1                                                  | 01   | 04   | 05   | 00   | -01  | -02  | 54   | 05   | 03   | 01   | 00  | 09   | 03   | 365 |
| Ssex2                                                  | 03   | 03   | 04   | 00   | 04   | -03  | 66   | 11   | 05   | 01   | 07  | 03   | 09   | 617 |
| Ssex3                                                  | 01   | 03   | -06  | 00   | 16   | 04   | 68   | 01   | 02   | 00   | -02 | 05   | 09   | 641 |
| Ssex4                                                  | 02   | 06   | 01   | 03   | 09   | 09   | 67   | 12   | 05   | 00   | 05  | 04   | 05   | 666 |
| Ssex5                                                  | 00   | -02  | 01   | 04   | 05   | -01  | 76   | 07   | 05   | -01  | -05 | 00   | 04   | 660 |
| Osex1                                                  | 00   | 01   | 03   | 09   | 00   | 18   | 07   | 69   | 02   | 01   | -04 | 05   | 05   | 670 |
| Osex2                                                  | -02  | 02   | -01  | 03   | 02   | 01   | 15   | 78   | -01  | 00   | 00  | -01  | 01   | 731 |
| Osex3                                                  | 01   | 05   | 02   | 00   | 01   | 00   | 05   | 81   | -02  | -01  | 01  | 06   | 09   | 777 |
| Osex4                                                  | -02  | 04   | 02   | 01   | 03   | 02   | 10   | 77   | 03   | -03  | 02  | 08   | 07   | 772 |
| Osex5                                                  | 01   | 03   | 00   | 05   | 09   | 06   | 05   | 71   | 03   | 01   | 01  | 02   | 05   | 640 |
| Prnt1                                                  | 01   | -03  | 03   | -01  | -00  | 05   | 02   | -04  | 74   | 05   | -02 | 05   | 01   | 589 |
| Prnt2                                                  | 00   | 06   | 09   | 00   | 05   | 08   | 01   | 02   | 69   | -05  | 06  | 08   | 04   | 619 |
| Prnt3                                                  | 04   | 02   | 01   | -04  | 03   | 00   | 05   | 00   | 75   | 04   | 05  | 02   | 06   | 648 |
| Prnt4                                                  | 00   | 04   | 01   | 06   | 01   | -03  | 04   | 07   | 75   | -05  | 01  | 07   | 05   | 647 |
| Prnt5                                                  | -01  | -02  | -01  | 05   | 03   | -01  | 10   | 03   | 77   | 00   | 04  | 00   | 09   | 688 |
| Relg1                                                  | 00   | -02  | 00   | 02   | -01  | -03  | 03   | -02  | 07   | 80   | 00  | -06  | 03   | 642 |
| Relg2                                                  | -02  | 02   | 03   | 00   | 00   | -02  | 00   | -01  | 00   | 93   | 05  | -03  | 02   | 882 |
| Relg3                                                  | 00   | 01   | 03   | -01  | -01  | 00   | -01  | -01  | 01   | 95   | 03  | -02  | 01   | 889 |
| Relg4                                                  | 00   | 02   | 01   | 01   | 01   | 03   | 01   | -01  | -01  | 91   | 01  | -01  | 03   | 831 |
| Relg5                                                  | -04  | -01  | 03   | -04  | 03   | -02  | 07   | 02   | 01   | 70   | 05  | -04  | 01   | 542 |
| Relg6                                                  | -01  | -01  | 08   | -01  | -05  | 02   | -01  | 02   | -02  | 82   | 05  | 00   | 02   | 682 |
| Hons1                                                  | 03   | 03   | -03  | 05   | 01   | 08   | 02   | 00   | 02   | 05   | 54  | 15   | -05  | 385 |
| Hons2                                                  | 05   | 04   | 00   | -01  | 10   | 00   | 04   | -01  | 06   | 08   | 57  | -01  | 07   | 400 |
| Hons3                                                  | 01   | 02   | 02   | 03   | -03  | -01  | 03   | -01  | 02   | -02  | 57  | 02   | 00   | 340 |
| Hons4                                                  | 01   | 02   | 02   | -02  | 03   | 09   | -01  | 02   | 00   | 04   | 59  | 04   | 06   | 419 |
| Hons5                                                  | -05  | -01  | 16   | 04   | -01  | 00   | -06  | 02   | 04   | 07   | 50  | -04  | 08   | 332 |

|       |     |     |     |     |    |     |    |     |     |     |     |    |    |     |
|-------|-----|-----|-----|-----|----|-----|----|-----|-----|-----|-----|----|----|-----|
| Hons6 | 03  | 10  | 06  | 03  | 02 | -01 | 07 | 01  | 09  | -15 | 44  | 00 | 06 | 296 |
| Emot1 | 03  | -03 | -01 | 09  | 06 | 06  | 02 | 00  | -01 | -02 | -04 | 76 | 11 | 714 |
| Emot2 | 01  | 06  | 02  | -03 | 02 | 03  | 07 | 05  | 07  | 03  | 06  | 68 | 10 | 651 |
| Emot3 | 04  | 01  | -01 | -04 | 02 | 01  | 08 | 02  | 08  | -04 | 04  | 76 | 06 | 717 |
| Emot4 | 02  | 00  | 03  | 03  | 02 | 07  | 05 | 02  | 05  | -01 | -01 | 75 | 08 | 706 |
| Emot5 | -02 | 11  | 06  | 08  | 08 | -02 | 03 | 11  | 01  | 02  | 01  | 57 | 16 | 568 |
| Genr1 | 03  | 03  | 03  | 09  | 02 | 10  | 05 | 12  | 03  | -03 | -01 | 14 | 63 | 738 |
| Genr2 | 02  | 00  | 01  | 02  | 02 | 11  | 08 | -03 | 05  | -04 | 04  | 11 | 71 | 733 |
| Genr3 | 02  | 04  | 02  | 10  | 00 | 07  | 07 | 10  | 04  | 00  | 00  | 13 | 66 | 748 |
| Genr4 | 03  | 04  | 04  | 05  | 06 | 07  | 08 | 08  | 08  | 09  | 06  | 07 | 62 | 679 |
| Genr5 | 01  | 05  | 04  | 01  | 01 | 16  | 05 | 04  | 06  | 02  | -01 | 16 | 68 | 784 |
| Genr6 | -01 | -01 | 03  | 07  | 06 | 06  | 10 | 12  | 06  | 02  | 07  | 08 | 57 | 614 |

Correlations Among Factors

|      | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HON | EMOT | GENR |
|------|------|------|------|------|------|------|------|------|------|------|-----|------|------|
| MATH | 1    |      |      |      |      |      |      |      |      |      |     |      |      |
| VERB | -01  | 1    |      |      |      |      |      |      |      |      |     |      |      |
| ACAD | 33   | 31   | 1    |      |      |      |      |      |      |      |     |      |      |
| PROB | 21   | 26   | 24   | 1    |      |      |      |      |      |      |     |      |      |
| PHYS | 09   | 04   | 06   | 11   | 1    |      |      |      |      |      |     |      |      |
| APPR | 07   | 13   | 10   | 20   | 21   | 1    |      |      |      |      |     |      |      |
| SSEX | -01  | 15   | 07   | 16   | 12   | 19   | 1    |      |      |      |     |      |      |
| OSEX | 04   | 15   | 06   | 10   | 23   | 09   | 29   | 1    |      |      |     |      |      |
| PRNT | 05   | 07   | 11   | 03   | 10   | 09   | 07   | 17   | 1    |      |     |      |      |
| RELG | -04  | 00   | 07   | -01  | -01  | -01  | 00   | 03   | 02   | 1    |     |      |      |
| HONS | 04   | 12   | 14   | 06   | 08   | 08   | 03   | 07   | 15   | 08   | 1   |      |      |
| EMOT | 09   | 12   | 07   | 12   | 15   | 18   | 16   | 20   | 17   | -06  | 09  | 1    |      |
| GENR | 05   | 15   | 14   | 23   | 15   | 33   | 25   | 27   | 20   | 05   | 14  | 36   | 1    |

Note: Coefficients are presented without decimal points. Coefficients which appear in the boxes in the factor pattern matrix are the factor loadings of each variable on the factor it was designed to measure (target loadings). The measured variables are the sum of responses to pairs of items designed to measure the same factor. A total of 13 eigenvalues were greater than 1.0 and a scree test also indicated that 13 factors should be retained.

a Math=Math; Verb=Verbal; Acad = Academic; Prob=Problem Solving; Pabl= Physical Ability; Appr=Physical Appearance; Ssex=Same Sex Relationships; Osex=Opposite Sex Relationships; Prnt=Parent Relationships; Relg=Religion/Spiritual Values; Hnst=Honesty; Emot=Emotional Stability; Estm=General Self Esteem.



Table 5.2

Summary Statistics For Target Loadings, Nontarget Loadings, and Factor Correlations in Ten Factor Analyses of SDQIII Responses

|                        | Study |      |      |      |      |      |      |      |      |      |
|------------------------|-------|------|------|------|------|------|------|------|------|------|
|                        | 1     | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
| 68 Target Loadings     |       |      |      |      |      |      |      |      |      |      |
| Highest                | .94   | .95  | .95  | .96  | .91  | .92  | .91  | .93  | .94  | .93  |
| Lowest                 | .40   | .44  | .36  | .29  | .35  | .23  | .37  | .36  | .44  | .40  |
| Median                 | .72   | .74  | .72  | .70  | .68  | .67  | .68  | .70  | .71  | .69  |
| % > 0.30               | 100%  | 100% | 100% | 99%  | 100% | 96%  | 100% | 100% | 100% | 100% |
| 716 Nontarget Loadings |       |      |      |      |      |      |      |      |      |      |
| Highest                | .21   | .26  | .21  | .28  | .33  | .43  | .34  | .37  | .25  | .33  |
| Lowest                 | -.14  | -.14 | -.14 | -.21 | -.27 | -.28 | -.21 | -.17 | -.17 | -.11 |
| Median                 | .02   | .02  | .02  | .02  | .01  | .02  | .02  | .02  | .02  | .02  |
| % > 0.30               | 0%    | 0%   | 0%   | 0%   | 0%   | 3%   | .1%  | 0%   | 0%   | .1%  |
| 78 Factor Correlations |       |      |      |      |      |      |      |      |      |      |
| Highest                | .36   | .38  | .38  | .40  | .25  | .32  | .34  | .41  | .36  | .35  |
| Lowest                 | -.07  | -.04 | -.05 | -.08 | -.09 | -.19 | -.08 | -.10 | -.06 | -.11 |
| Median                 | .10   | .11  | .11  | .11  | .08  | .07  | .11  | .11  | .10  | .09  |
| % > 0.30               | 4%    | 5%   | 4%   | 4%   | 0%   | 1%   | 6%   | 6%   | 5%   | 3%   |

Note: Target loadings are the factor loadings of the 68 item-pairs on the factor each is designed to measure, while all other factor loadings are Nontarget loadings (see Table 5.1). Factor Correlations are the factor pattern correlations among the 13 oblique correlations identified in each analysis. The "% > 0.30" refers to the percentage of coefficients which are greater than 0.30. Studies 1-4 are data from four occasions described by Marsh, Richards and Barnes (1986a; Table 1), study 5 is Marsh and O'Niell (1984; Table 1), study 6 is Marsh, Barnes and Hocevar (1985; Table 1), studies 7 and 8 are data from two occasions described by Marsh and Richards (1987), study 9 is a summary of the analysis in Table 5.1, and 10 is from an unpublished study of introductory psychology students from a large Canadian university (data from Study 10 are not included in the norms or other analyses described in this Manual unless specifically noted).

Table 5.3

Summary of Factor Analyses of SDQIII Responses For the Total Group and By 4 Subgroups: Younger Boys (less than 20 years old); Older Boys (20+ years old); Younger Girls (less than 20 years old); and Older Girls (20+ years old)

|                                                                                                               | Total Group | Younger Boys | Older Boys | Younger Girls | Older Girls |
|---------------------------------------------------------------------------------------------------------------|-------------|--------------|------------|---------------|-------------|
| Target Loadings                                                                                               |             |              |            |               |             |
| No. of Coefficients                                                                                           | 68          | 68           | 68         | 68            | 68          |
| Highest                                                                                                       | .94         | .90          | .94        | .92           | .93         |
| Lowest                                                                                                        | .44         | .43          | .46        | .38           | .39         |
| Median                                                                                                        | .71         | .69          | .69        | .71           | .72         |
| Non-Target Loadings                                                                                           |             |              |            |               |             |
| No. of Coefficients                                                                                           | 716         | 716          | 716        | 716           | 716         |
| Highest                                                                                                       | .25         | .25          | .26        | .32           | .31         |
| Lowest                                                                                                        | -.17        | -.18         | -.14       | -.14          | -.25        |
| Median                                                                                                        | .02         | .02          | .02        | .02           | .02         |
| Factor Correlations                                                                                           |             |              |            |               |             |
| No. of Coefficients                                                                                           | 78          | 78           | 78         | 78            | 78          |
| Highest                                                                                                       | .36         | .36          | .37        | .32           | .42         |
| Lowest                                                                                                        | -.06        | -.07         | -.05       | -.07          | -.07        |
| Median                                                                                                        | .10         | .12          | .11        | .09           | .10         |
| Correlations between factor scores derived from the Total Sample and those derived from each of the subgroups |             |              |            |               |             |
| SDQIII Factor                                                                                                 |             |              |            |               |             |
| Physical                                                                                                      | ---         | .98          | .99        | .99           | .99         |
| Appearance                                                                                                    | ---         | .99          | .99        | .99           | .99         |
| Opposite Sex                                                                                                  | ---         | .99          | .99        | .99           | .99         |
| Same Sex                                                                                                      | ---         | .94          | .99        | .99           | .99         |
| Parents                                                                                                       | ---         | .99          | .99        | .99           | .99         |
| Religion                                                                                                      | ---         | .99          | .99        | .99           | .99         |
| Honesty                                                                                                       | ---         | .98          | .99        | .99           | .98         |
| Emotional                                                                                                     | ---         | .98          | .99        | .99           | .99         |
| General                                                                                                       | ---         | .99          | .99        | .99           | .99         |
| Math                                                                                                          | ---         | .99          | .99        | .99           | .99         |
| Verbal                                                                                                        | ---         | .97          | .99        | .99           | .98         |
| School                                                                                                        | ---         | .99          | .99        | .99           | .99         |
| Problem Solving                                                                                               | ---         | .98          | .99        | .99           | .98         |
| Median                                                                                                        | ---         | .99          | .99        | .99           | .99         |

Note: Five separate factor analyses were performed for the total group and for 4 subgroups; younger boys, older boys, younger girls, older girls. Target loadings are factor loadings for the variables designed to measure each factor whereas all other factor loadings are nontarget loadings. For each variable there is one and only one target loading (i.e., each variable is designed to measure only one factor). In all five factor analyses the factor structures are very well defined in that target loadings are consistently high, nontarget loadings are consistently low, and factor correlations are modest. For each of the four subgroups, factor scores were derived from the total group factor analysis and from the factor analysis of just that subgroup. Within each of the subgroups, these two sets of factor scores were correlated. Results summarized here indicate that these two sets of factor scores were very highly correlated for all SDQIII factors in each of the subgroups. This further demonstrates that the total group and subgroup factor structures were very similar. Taken together, these findings demonstrate that the SDQIII factor structures are very similar across age and across sex.



Table 5.4  
Parameter Estimates for the First-order Simple Structure Model (reprinted from Marsh, 1987d).

| Sub-<br>scale | Factor Loadings For: |      |      |      |      |      |      |      |      |      |      |      |      | Error/<br>Unique-<br>ness |
|---------------|----------------------|------|------|------|------|------|------|------|------|------|------|------|------|---------------------------|
|               | Math                 | Verb | Acad | Prob | Pabl | Appr | Ssex | Osex | Prnt | Relg | Hnst | Emot | Estm |                           |
| 1             | .96                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .21                       |
| 2             | .98                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .18                       |
| 3             | 1                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .15                       |
| 4             | 0                    | .85  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .47                       |
| 5             | 0                    | .86  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .46                       |
| 6             | 0                    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .27                       |
| 7             | 0                    | 0    | .86  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .40                       |
| 8             | 0                    | 0    | 1.04 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .12                       |
| 9             | 0                    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .19                       |
| 10            | 0                    | 0    | 0    | 1.08 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .40                       |
| 11            | 0                    | 0    | 0    | 1.11 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .36                       |
| 12            | 0                    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .48                       |
| 13            | 0                    | 0    | 0    | 0    | 1.07 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .22                       |
| 14            | 0                    | 0    | 0    | 0    | 1.14 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .12                       |
| 15            | 0                    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .32                       |
| 16            | 0                    | 0    | 0    | 0    | 0    | .98  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .32                       |
| 17            | 0                    | 0    | 0    | 0    | 0    | .96  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .35                       |
| 18            | 0                    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .29                       |
| 19            | 0                    | 0    | 0    | 0    | 0    | 0    | .80  | 0    | 0    | 0    | 0    | 0    | 0    | .50                       |
| 20            | 0                    | 0    | 0    | 0    | 0    | 0    | 1.02 | 0    | 0    | 0    | 0    | 0    | 0    | .19                       |
| 21            | 0                    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | .23                       |
| 22            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | .89  | 0    | 0    | 0    | 0    | 0    | .34                       |
| 23            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | .95  | 0    | 0    | 0    | 0    | 0    | .24                       |
| 24            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | .16                       |
| 25            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .95  | 0    | 0    | 0    | 0    | .29                       |
| 26            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .93  | 0    | 0    | 0    | 0    | .32                       |
| 27            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | .20                       |
| 28            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1.09 | 0    | 0    | 0    | .11                       |
| 29            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1.05 | 0    | 0    | 0    | .18                       |
| 30            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | .25                       |
| 31            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1.49 | 0    | 0    | .40                       |
| 32            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1.16 | 0    | 0    | .64                       |
| 33            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | .73                       |
| 34            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .97  | 0    | .24                       |
| 35            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .93  | 0    | .31                       |
| 36            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | .19                       |
| 37            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | .99  | .18                       |
| 38            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1.05 | .08                       |
| 39            | 0                    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | .17                       |

## Factor Correlations

|      |                                                      |
|------|------------------------------------------------------|
| Math | 1.00                                                 |
| Verb | .12 1.00                                             |
| Acad | .62 .53 1.00                                         |
| Prob | .48 .54 .55 1.00                                     |
| Pabl | .26 .21 .26 .28 1.00                                 |
| Appr | .19 .32 .19 .32 .43 1.00                             |
| Ssex | .15 .26 .17 .27 .62 .36 1.00                         |
| Osex | .14 .37 .23 .32 .35 .42 .52 1.00                     |
| Prnt | .15 .18 .23 .25 .38 .32 .48 .32 1.00                 |
| Relg | -.01 -.02 .07 .03 .08 .08 .07 -.02 .01 1.00          |
| Hnst | .22 .18 .22 .24 .18 .19 .08 .11 .20 .27 1.00         |
| Emot | .24 .27 .25 .34 .42 .42 .52 .39 .47 -.04 .24 1.00    |
| Estm | .25 .35 .30 .54 .47 .55 .56 .56 .47 .11 .29 .72 1.00 |

Note. Parameters with the values of 0 and 1 were fixed in order to define the model. Standard errors for all estimated parameters vary from .02 to .08 and all parameters differ substantially from zero. In order to facilitate interpretations, just the factor covariances are presented in standardized form so that they represent factor correlations. (see Table 5.1 for scale names)

Table 5.5

## Goodness of Fit Tests For Five Confirmatory Factor Analyses of the SDQIII Responses

|                                                                        | 2              |               |           |
|------------------------------------------------------------------------|----------------|---------------|-----------|
|                                                                        | Chi-<br>Square | X /df<br>(df) | ratio TLI |
| <u>Marsh and O'Neil (1984): Study I</u>                                |                |               |           |
| Null Model                                                             | 15,332         | (2278)        | 6.73      |
| Simple Structure Model <sup>a</sup>                                    | 3,572          | (2132)        | 1.68 .88  |
| <u>Marsh and O'Neil (1984): Study II Self-ratings</u>                  |                |               |           |
| Null Model                                                             | 10,613         | (2278)        | 4.66      |
| Simple Structure Model                                                 | 3,787          | (2132)        | 1.78 .79  |
| <u>Marsh and O'Neil (1984): Study II Ratings By Others<sup>b</sup></u> |                |               |           |
| Null Model                                                             | 11,195         | (2132)        | 5.25      |
| Simple Structure Model                                                 | 3,399          | (2132)        | 1.59 .85  |
| <u>Marsh (1987e): Time 1 Ratings (also see Table 5.4)</u>              |                |               |           |
| Null Model                                                             | 11,183         | (741)         | 15.09     |
| Simple Structure Model                                                 | 1,333          | (624)         | 2.14 .92  |
| <u>Marsh (1987e): Time 2 Ratings</u>                                   |                |               |           |
| Null Model                                                             | 11,620         | (741)         | 15.68     |
| Simple Structure Model                                                 | 1,251          | (624)         | 2.00 .95  |

Note. All five studies tested the ability of a first-order simple structure model to fit SDQIII responses. In the first three studies the 10 or 12 items from each SDQIII scale were divided into 5 or 6 subscales each consisting of a pair of items and analyses were conducted on these 68 subscale scores. In the last two studies, each SDQIII was represented by three subscales consisting of 3 or 4 items and analyses were conducted on these 39 subscale scores. The analyses are described in more detail in the source publications.

a -- The "simple structure" solution in each study contained 13 factors with each measured variable allowed to load only on the factor it was designed to measure (see Table 5.4). Correlations among the factors were estimated, but the error/uniqueness terms were uncorrelated.

b -- For just this study, significant others were asked to complete the SDQIII as would the participant who had chosen them as a significant other. That is, significant others were asked to predict how subjects would respond. The majority of significant others were parents, siblings, or spouses.



Table 5.6

Goodness of Fit For CFA and HCFA Models of the SDQIII Structure (also see Figure 5.1; adapted from Marsh, 1987e)

| Model | Description                                                                                                                                                                                                    | X (df)    | X /df | RMS  | TLI  | RFI  |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|------|------|------|
| 1A.   | 13 correlated first-order factors and no higher-order factors                                                                                                                                                  | 1333(624) | 2.14  | .042 | .919 | .881 |
| 1B.   | same as 1A except that all factors are uncorrelated                                                                                                                                                            | 2811(702) | 4.00  | .235 | .787 | .749 |
| 2A.   | 1 higher-order factor defined by all 13 first-order factors                                                                                                                                                    | 1786(689) | 2.59  | .083 | .887 | .840 |
| 3A.   | 2 higher-order (academic and nonacademic) correlated factors                                                                                                                                                   | 1613(687) | 2.35  | .065 | .904 | .862 |
| 4A.   | 3 second-order factors (math/academic, verbal/academic, and nonacademic) and 1 third-order (general) factor                                                                                                    | 1539(686) | 2.24  | .061 | .912 | .862 |
| 5A.   | 4 second-order factors (math/academic, verbal/academic, physical, social) and 1 third-order (general) factor                                                                                                   | 1527(686) | 2.23  | .061 | .913 | .863 |
| 6A.   | 5 second-order factors (math/academic, verbal/academic, physical, social, moral) and 1 third-order (general) factor                                                                                            | 1515(686) | 2.21  | .061 | .914 | .865 |
| 7A.   | same as 6A except that the physical and social second-order factors are combined to form a single second-order factor, and the Problem Solving factor contributes directly to the third-order (general) factor | 1476(685) | 2.15  | .057 | .903 | .868 |

**Note.** Six of the hierarchical models (2A, 3A, 4A, 5A, 6A, and 7A) and their parameter estimates are also illustrated in Figure 5.1. First-order factors were defined as in Table 5.4 for all models. RMS=residual mean squares; TLI=Tucker-Lewis Index; RFI=Bentler-Bonett Index (see Marsh, Balla & McDonald, 1988, for further descriptions).

Table 5.7

Parameter Estimates for the First-order Factor Structure (Model 1A) [Adapted from Marsh, Byrne & Shavelson, 1988; also see Table 5.8]

| First-order Factor Loadings For: |          |          |          |          |          |          |          |          |          |
|----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Measured Variables               | SDQ Verb | SDQ Math | SDQ Schl | API Verb | API Math | API Schl | SCA Verb | SCA Math | SCA Schl |
| SDQ Verb 1                       | .77      | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Verb 2                       | .76      | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Verb 3                       | .67      | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Math 1                       | 0        | .93      | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Math 2                       | 0        | .92      | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Math 3                       | 0        | .87      | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Schl 1                       | 0        | 0        | .82      | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Schl 2                       | 0        | 0        | .88      | 0        | 0        | 0        | 0        | 0        | 0        |
| SDQ Schl 3                       | 0        | 0        | .88      | 0        | 0        | 0        | 0        | 0        | 0        |
| API Verb 1                       | 0        | 0        | 0        | .82      | 0        | 0        | 0        | 0        | 0        |
| API Verb 2                       | 0        | 0        | 0        | .78      | 0        | 0        | 0        | 0        | 0        |
| API Verb 3                       | 0        | 0        | 0        | .79      | 0        | 0        | 0        | 0        | 0        |
| API Math 1                       | 0        | 0        | 0        | 0        | .95      | 0        | 0        | 0        | 0        |
| API Math 2                       | 0        | 0        | 0        | 0        | .87      | 0        | 0        | 0        | 0        |
| API Math 3                       | 0        | 0        | 0        | 0        | .89      | 0        | 0        | 0        | 0        |
| API Schl 1                       | 0        | 0        | 0        | 0        | 0        | .86      | 0        | 0        | 0        |
| API Schl 2                       | 0        | 0        | 0        | 0        | 0        | .69      | 0        | 0        | 0        |
| API Schl 3                       | 0        | 0        | 0        | 0        | 0        | .65      | 0        | 0        | 0        |
| SCA Verb 1                       | 0        | 0        | 0        | 0        | 0        | 0        | .80      | 0        | 0        |
| SCA Verb 2                       | 0        | 0        | 0        | 0        | 0        | 0        | .93      | 0        | 0        |
| SCA Verb 3                       | 0        | 0        | 0        | 0        | 0        | 0        | .83      | 0        | 0        |
| SCA Math 1                       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | .95      | 0        |
| SCA Math 2                       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | .96      | 0        |
| SCA Math 3                       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | .87      | 0        |
| SCA Schl 1                       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | .81      |
| SCA Schl 2                       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | .89      |
| SCA Schl 3                       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | .78      |

## Factor Correlations

|          |      |
|----------|------|
| SDQ Verb | ---  |
| SDQ Math | -.01 |
| SDQ Schl | .47  |
| API Verb | .87  |
| API Math | .06  |
| API Schl | .45  |
| SCA Verb | .65  |
| SCA Math | .02  |
| SCA Schl | .39  |

**Note.** Factor loadings and factor correlations are presented in standardized form to facilitate interpretation. Each of the nine sets of subscales represents the sum of responses to a third of the items in the corresponding self-concept scale. Verb=Verbal; Math=Math; Schl=School; SDQ=Self Description Questionnaire; API=Affective Perceptions Inventory; SCA=Self Concept of Ability.



Table 5.8

Goodness of Fit Indicators for All CFA Models Relating Responses To Three Self-concept Instruments.  
[Adapted from Marsh, Byrne & Shavelson, in press]

| Model | X     | df  | BBI | TLI | Model Description                                                      |
|-------|-------|-----|-----|-----|------------------------------------------------------------------------|
| 0     | 19784 | 351 | 0   | 0   | Null model                                                             |
| 1     | 1390  | 288 | .93 | .93 | 9 correlated 1st order factors                                         |
| 1A    | 6714  | 324 | .66 | .64 | 9 uncorrelated 1st order factors                                       |
| 2     | 3792  | 315 | .81 | .80 | 9 1st order and 1 2nd order factors                                    |
| 3     | 1972  | 311 | .90 | .90 | 9 1st order and 2 2nd order factors                                    |
| 4     | 1841  | 312 | .91 | .91 | 9 1st order and 3 2nd order factors                                    |
| 3A    | 1975  | 312 | .90 | .90 | same as model 3 with zero correlation between the 2 2nd order factors  |
| 3B    | 1991  | 320 | .90 | .91 | same as model 3A with invariance of factor loadings across instruments |

Note. The null model (Model 0) is of no substantive interest, but is used in the definition of the Bentler Bonett Index (BBI) and the Tucker Lewis Index (TLI). Models 1 and 1A each posited 9 first-order factors and no higher-order factors, but differed in that correlations among the nine factors were freely estimated in Model 1 but fixed to be zero in Model 1A. One, two and three higher-order factors were posited to explain correlations among first-order factors in Models 2, 3 and 4 respectively (see Table 5.7). In Model 3A the correlation between the two higher-order factors was fixed to be zero, and in Model 3B the same content factors from the different instruments were required to have the same factor loading on each of the higher-order factors.

Table 6.1

Correlations Between Various Combinations of Indicators of Each of the 13 Self Concept Facets Based on Positively-Worded Items (P1 & P2), Negatively-Worded Items (N1 & N2) and their Totals (Tot1 & Tot2) for Studies 1, 2 and 3.

Correlations Relating:

| Area of Self-concept | a          |    |    | a          |    |    | a              |    |    | b                 |    |    | b                 |    |    | c                    |    |    |
|----------------------|------------|----|----|------------|----|----|----------------|----|----|-------------------|----|----|-------------------|----|----|----------------------|----|----|
|                      | P1 with P2 |    |    | N1 with N2 |    |    | Tot1 with Tot2 |    |    | Tot1 with P2 & N2 |    |    | Tot2 with P1 & N1 |    |    | P1 & N1 with P2 & N2 |    |    |
|                      | 1          | 2  | 3  | 1          | 2  | 3  | 1              | 2  | 3  | 1                 | 2  | 3  | 1                 | 2  | 3  | 1                    | 2  | 3  |
| Mathematics          | 78         | 91 | 84 | 68         | 86 | 74 | 75             | 91 | 85 | 76                | 91 | 86 | 77                | 91 | 86 | 78                   | 92 | 86 |
| Verbal               | 59         | 84 | 58 | 56         | 83 | 61 | 62             | 88 | 83 | 64                | 88 | 83 | 62                | 88 | 83 | 64                   | 88 | 83 |
| Academic             | 32         | 86 | 81 | 30         | 85 | 67 | 36             | 87 | 71 | 36                | 87 | 71 | 36                | 88 | 74 | 36                   | 88 | 74 |
| Problem Solve        | 42         | 83 | 63 | 41         | 80 | 31 | 46             | 86 | 65 | 47                | 86 | 66 | 48                | 86 | 67 | 51                   | 87 | 67 |
| Phys Ability         | 75         | 86 | 85 | 72         | 82 | 84 | 77             | 88 | 91 | 77                | 88 | 91 | 77                | 88 | 91 | 77                   | 88 | 91 |
| Appearance           | 50         | 83 | 75 | 36         | 81 | 63 | 48             | 85 | 75 | 49                | 85 | 75 | 48                | 85 | 79 | 51                   | 85 | 79 |
| Same Sex             | 46         | 83 | 55 | 39         | 78 | 35 | 45             | 85 | 61 | 45                | 85 | 62 | 47                | 85 | 61 | 47                   | 85 | 62 |
| Opposite Sex         | 51         | 85 | 82 | 46         | 86 | 80 | 51             | 89 | 86 | 52                | 89 | 87 | 52                | 89 | 88 | 52                   | 89 | 88 |
| Parents              | 72         | 85 | 69 | 71         | 84 | 65 | 76             | 87 | 70 | 76                | 88 | 71 | 76                | 88 | 70 | 76                   | 88 | 71 |
| Spiritual            | 78         | 94 | 85 | 78         | 91 | 54 | 82             | 93 | 85 | 82                | 94 | 86 | 82                | 94 | 85 | 82                   | 95 | 88 |
| Honesty              | 29         | 68 | 42 | 38         | 73 | 35 | 37             | 75 | 62 | 37                | 76 | 62 | 38                | 76 | 62 | 39                   | 76 | 62 |
| Emotional            | 54         | 75 | 63 | 63         | 85 | 70 | 63             | 85 | 81 | 63                | 85 | 82 | 63                | 85 | 81 | 63                   | 86 | 83 |
| General              | 41         | 85 | 74 | 41         | 86 | 75 | 44             | 88 | 82 | 44                | 88 | 82 | 44                | 88 | 83 | 44                   | 88 | 83 |
| Mean                 | 54         | 84 | 70 | 52         | 83 | 62 | 57             | 87 | 77 | 57                | 87 | 77 | 58                | 87 | 78 | 58                   | 87 | 78 |
| SD                   | 17         | 07 | 14 | 17         | 05 | 16 | 16             | 04 | 10 | 16                | 04 | 10 | 16                | 04 | 10 | 16                   | 04 | 10 |
| Median               | 51         | 83 | 74 | 46         | 83 | 65 | 51             | 87 | 81 | 51                | 88 | 82 | 52                | 88 | 81 | 52                   | 88 | 83 |

Note. All correlations, presented without decimal points, are statistically significant ( $p < .001$ )

a -- coefficients in these columns are simple bivariate correlations.

b -- coefficients in these columns are multiple regressions relating a total score to the optimally weighted combination of a positive and negative item subscales.

c -- coefficients in this column are canonical correlations relating the optimally weighted combination of one set of positive and negative item subscales to the optimally weighted combination of the second set of positive and negative item subscales.



Table 7.1

Sex and Age Effects in SDQIII Scores Based on the Normative Sample (N=2436)

| SDQ Scales            | Age Effect: |        | Sex Effect | Linear Age<br>x Sex Inter | Multiple R |        |
|-----------------------|-------------|--------|------------|---------------------------|------------|--------|
|                       | Linear      | Quadr  |            |                           | (1)        | (2)    |
| 1) Mathematics        | .07         | -.08*  | -.13**     | -.08**                    | .036**     | .031** |
| 2) Verbal             | .11**       | .01    | .02        | -.03                      | .013**     | .008** |
| 3) Academic           | .17**       | -.06   | .05        | -.03                      | .020**     | .016** |
| 4) Problem Solving    | .06         | .01    | -.21**     | -.03                      | .057**     | .061** |
| 5) Physical Ability   | .04         | -.08*  | -.21**     | .08**                     | .054**     | .054** |
| 6) Appearance         | .23**       | -.11** | -.30**     | .12**                     | .155**     | .137** |
| 7) Same Sex Peers     | -.16**      | .07    | -.01       | .04                       | .018**     | .007** |
| 8) Opposite Sex Peers | .01         | -.01   | .05        | .08**                     | .009**     | .008** |
| 9) Parents            | .00         | -.06   | -.03       | -.01                      | .003       | .001   |
| 10) Religion          | -.02        | .03    | .18**      | -.10**                    | .038**     | .035** |
| 11) Honesty           | .16**       | -.08*  | .07**      | -.02                      | .014**     | .011** |
| 12) Emotional         | .06         | -.07*  | -.13**     | .04                       | .024**     | .021** |
| 13) General           | .03         | -.01   | -.14**     | .03                       | .021**     | .021** |
| 14) Total Score       | .11**       | -.07   | -.09**     | .00                       | .019**     | .020** |

Note. Multiple regression analyses were conducted in which each of the five predictor variables was regressed on each SDQIII score. In unreported analyses the cubic effect of age, the quadratic-age x sex interaction, and the cubic-age x sex interaction were included but did not contribute significantly. In additional unreported analyses, age was dichotomized as in the normative archive and a 2 (sex) by 2 (age) ANOVA was conducted on each SDQIII score. The effects from this analysis were similar to those reported here and the MR squared resulting from this analysis is presented in the last column in this table (under MR squared (2)).

\* p < .01; \*\* p < .001.

Table 8.1

Correlations Between Self-concept Scores and Academic Achievement Measures in English and Math (N=296; Adapted from Marsh &amp; O'Neill, 1984)

| Self-Concepts | Correlations |         | Beta Weights |         | Multiple R |
|---------------|--------------|---------|--------------|---------|------------|
|               | Math         | English | Math         | English |            |
| Math          | .58**        | .19**   | .72**        | -.24**  | .61**      |
| Verbal        | .11          | .42**   | -.25**       | .55**   | .46**      |
| Academic      | .27**        | .24**   | .14*         | .19**   | .29**      |
| Prob Solve    | .03          | .17**   | -.11         | .24**   | .19**      |
| Phys Ability  | .02          | -.11    | .13          | -.19*   | .15*       |
| Phys Appear   | .05          | .02     | .06          | -.02    | .06        |
| Same Sex Peer | -.04         | -.01    | -.05         | .02     | .04        |
| Opposite Sex  | -.08         | -.03    | -.10         | .04     | .09        |
| Parents       | -.08         | -.12    | -.01         | -.12    | .12        |
| Religion      | .00          | .00     | .01          | .00     | .01        |
| Honesty       | -.08         | -.09    | -.04         | -.07    | .09        |
| Emotional     | .08          | .06     | .07          | .02     | .08        |
| General       | .02          | .06     | -.08         | .10     | .09        |

\* p < .05; \*\* p < .01

Note: Beta weights are standardized beta weights resulting from a multiple regression where both academic achievement scores were used to predict each of the self-concept scores.



Table 8.2

Correlations Among Variables Considered in Tests of the I/E Model Relating Responses to Three Self-concept Instruments to School Performance [Adapted from Marsh, Byrne & Shavelson, 1988]

|                                                                             | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|-----------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| 1 SDQ GSC (94)                                                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 2 SDQ SSC 19 (90)                                                           |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 3 SDQ VSC 22 37 (80)                                                        |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 4 SDQ MSC 12 36 -05 (93)                                                    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 5 API GSC 62 20 18 16 (86)                                                  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 6 API SSC 55 59 37 31 62 (85)                                               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 7 API VSC 06 41 68 -05 09 42 (89)                                           |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 8 API MSC 10 41 02 86 16 34 08 (95)                                         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 9 SES GSC 79 24 26 19 62 59 12 19 (87)                                      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 10 SCA SSC 17 65 32 44 17 54 33 47 23 (87)                                  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 11 SCA VSC 04 43 54 -01 06 33 65 03 11 49 (90)                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 12 SSA MSC 07 34 -04 82 13 31 -04 80 12 50 03 (94)                          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 13 Cmb GSC 91 24 25 18 84 66 10 17 91 21 08 12 (94)                         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 14 Cmb SSC 35 87 41 43 39 83 46 48 41 86 49 45 43 (93)                      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 15 Cmb VSC 13 46 85 -04 13 44 90 05 19 44 84 -02 17 52 (94)                 |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 16 Cmb MSC 10 39 -02 95 16 34 -01 94 18 50 02 93 17 48 -00 (97)             |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 17 SACH -02 53 16 38-01 36 15 32 05 69 33 41 07 62 25 40 (--)               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 18 VACH -04 47 24 20-04 32 29 16 03 54 50 18 -02 52 40 19 80 (--)           |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 19 MACH -04 34 02 55-02 26 02 49 01 52 11 62 -02 44 06 59 74 51 (--)        |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| 20 Sex -04 20 12 -17-17 15 25 -17 -11 09 19 -16 -12 17 22 -18 19 26 10 (--) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |

Note. Correlations, presented without decimal points, greater than .07 are statistically significant ( $p < .05$ ). Reliability estimates, coefficient alphas based on standardized responses to individual items, appear in the diagonal values. Because the achievement scores and sex were each measured by a single variable, coefficient alphas could not be computed. SDQ = Self Description Questionnaire; API = Affective Perceptions Inventory; SES = Self-esteem Scale; SCA = Self-concept of Ability Scale; Cmb = Combined self-concept scores; GSC = General Self-concept; SSC = School Self-concept; MSC = Math Self-concept; VSC = Verbal self-concept; SACH = School Achievement; VACH = Verbal Achievement; MACH = Mathematics Achievement; Sex (1=male, 2=female).

Table 9.1

The Effect of Participation in an Outward Bound Program: Means, Standard Deviations, and Mean Comparisons For Times 1-4 [Adapted from Marsh, Barnes & Richards, 1986a]

| t-tests of Significance for Means (& SDs) for: Selected Pair-wise Comparisons |                |                |                |                |         |         |         |
|-------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|---------|---------|---------|
| SDQ Scales                                                                    | T1             | T2             | T3             | T4             | T1-T2   | T2-T3   | T3-T4   |
| Mathematics <sup>a</sup>                                                      | 50.0<br>(10.2) | 50.1<br>(10.1) | 50.6<br>(9.8)  | 50.5<br>(9.8)  | 0.45    | 2.44*   | -0.29   |
| Verbal                                                                        | 50.2<br>(9.9)  | 49.9<br>(9.2)  | 51.4<br>(10.1) | 51.9<br>(9.6)  | -1.22   | 4.74**  | 1.05    |
| Academic <sup>a</sup>                                                         | 50.8<br>(9.2)  | 49.8<br>(9.3)  | 51.1<br>(9.3)  | 50.3<br>(9.3)  | -3.29*  | 4.16**  | -1.69   |
| Problem Solving                                                               | 50.4<br>(10.1) | 48.7<br>(9.4)  | 51.1<br>(10.3) | 51.1<br>(10.1) | -5.13** | 6.20**  | -0.05   |
| Physical Abilities                                                            | 51.5<br>(10.1) | 48.4<br>(10.2) | 51.0<br>(9.8)  | 52.0<br>(9.7)  | -9.91** | 6.91**  | 2.17*   |
| Appearance                                                                    | 49.7<br>(10.4) | 48.6<br>(9.6)  | 52.6<br>(9.5)  | 53.0<br>(8.6)  | -3.27** | 11.20** | 0.78    |
| Same Sex Peers                                                                | 49.8<br>(10.5) | 49.3<br>(9.6)  | 51.4<br>(8.5)  | 51.2<br>(9.9)  | -1.54   | 5.58**  | -0.51   |
| Opp Sex Peers <sup>a</sup>                                                    | 50.6<br>(10.4) | 50.6<br>(9.5)  | 52.0<br>(9.5)  | 52.8<br>(9.2)  | 0.24    | 4.35**  | 2.04*   |
| Parents                                                                       | 50.7<br>(10.1) | 50.1<br>(9.6)  | 52.3<br>(9.6)  | 50.8<br>(9.7)  | -1.46   | 8.47**  | -3.74** |
| Religion <sup>a</sup>                                                         | 50.2<br>(10.2) | 49.8<br>(9.9)  | 50.7<br>(10.8) | 50.8<br>(10.2) | -1.59   | 3.90**  | 0.31    |
| Honesty                                                                       | 50.4<br>(9.2)  | 49.4<br>(9.9)  | 53.0<br>(9.1)  | 51.6<br>(9.3)  | -2.11*  | 7.89**  | -2.60*  |
| Emotional                                                                     | 49.2<br>(10.6) | 50.0<br>(9.6)  | 52.8<br>(9.0)  | 50.3<br>(10.0) | 2.09*   | 7.30**  | -4.92** |
| General                                                                       | 49.4<br>(10.8) | 49.4<br>(10.6) | 52.7<br>(9.1)  | 53.2<br>(8.2)  | 0.30    | 6.84**  | 0.87    |
| LOC Scale                                                                     |                |                |                |                |         |         |         |
| Total Score <sup>b</sup>                                                      | ---            | 10.3<br>(3.8)  | 8.9<br>(4.4)   | 8.9<br>(4.1)   | ----    | 6.67**  | 0.11    |

NOTE. For the SDQIII scales, scores represent factor scores which have been standardized to have Mean = 50 and SD = 10 across responses from time 1, time 2, time 3 and time 4. Thus, the mean difference between responses at time 2 and time 3, divided by 10, provides an estimate of changes in self-concept in standard deviation units. The means and standard deviations presented here are based on only participants who completed responses at time 4.

\*  $p < .05$ , \*\*  $p < .01$

a -- The SDQIII scales chosen a priori to be less relevant to Outward Bound aims by the program Director.

b -- These are raw scores for the Rotter LOC scale scored so that higher scores represent a more external LOC.



Table 10.1

MTM Matrix of Correlations Between SDQIII Ratings Self-ratings (self-concept ratings) and Ratings By Significant Others (inferred self-concept ratings). [Adapted from Marsh & O'Neill, 1984; also see Marsh, Barnes & Hocevar, 1985]

| Self-Ratings    | Ratings by Self |      |          |      |          |            |          |              |        |          |      |
|-----------------|-----------------|------|----------|------|----------|------------|----------|--------------|--------|----------|------|
|                 | Math            | Verb | Academic | Prob | Physical | Appearance | Same Sex | Opposite Sex | Parent | Religion | Emot |
| Math            | 95              |      |          |      |          |            |          |              |        |          |      |
| Verb            | -03             | 84   |          |      |          |            |          |              |        |          |      |
| Academic        | 09              | 40   | 86       |      |          |            |          |              |        |          |      |
| Prob            | 08              | 17   | 30       | 79   |          |            |          |              |        |          |      |
| Physical        | 01              | -14  | -17      | -03  | 96       |            |          |              |        |          |      |
| Appearance      | 07              | 09   | 25       | 15   | 09       | 86         |          |              |        |          |      |
| Same Sex        | 14              | 13   | 16       | 09   | 08       | 16         | 86       |              |        |          |      |
| Opposite Sex    | 05              | 24   | 03       | 05   | 03       | 11         | 21       | 90           |        |          |      |
| Parent          | 05              | 14   | -02      | -14  | -08      | -04        | 18       | 16           | 91     |          |      |
| Religion        | -01             | 00   | -02      | -06  | 02       | -08        | 10       | -05          | 10     | 95       |      |
| Hnst            | 00              | 06   | 13       | -01  | 02       | 01         | 11       | 13           | 05     | 09       | 74   |
| Emot            | 03              | 12   | 10       | 05   | 12       | 08         | 27       | 27           | 14     | -09      | 91   |
| General         | 16              | 07   | 12       | 10   | 08       | 14         | 31       | 28           | 08     | 01       | 28   |
|                 |                 |      |          |      |          |            |          |              |        |          | 93   |
| Others' Ratings |                 |      |          |      |          |            |          |              |        |          |      |
| Math            | 77              |      |          |      |          |            |          |              |        |          |      |
| Verb            | -07             | 51   |          |      |          |            |          |              |        |          |      |
| Academic        | 23              | 15   | 31       |      |          |            |          |              |        |          |      |
| Prob            | 08              | 20   | 17       | 52   |          |            |          |              |        |          |      |
| Physical        | 04              | -17  | -10      | -04  | 78       |            |          |              |        |          |      |
| Appearance      | 04              | 00   | -06      | 10   | 06       | 50         |          |              |        |          |      |
| Same Sex        | 01              | 00   | -12      | -11  | 03       | 06         | 45       |              |        |          |      |
| Opposite Sex    | 01              | -02  | 20       | -10  | 12       | 00         | 12       | 51           |        |          |      |
| Parent          | 07              | 00   | -07      | -10  | 02       | 08         | 17       | 08           | 07     |          |      |
| Religion        | 05              | -08  | 00       | 06   | 06       | -13        | 04       | -08          | 02     |          |      |
| Hnst            | -07             | -05  | 05       | -01  | 04       | 00         | -04      | -02          | 10     | 95       |      |
| Emot            | 02              | 18   | -11      | 03   | 11       | -01        | 12       | 23           | 24     | 27       | 81   |
| General         | 07              | -08  | -00      | 15   | 12       | 15         | 21       | 17           | 15     | 08       | 93   |
|                 |                 |      |          |      |          |            |          |              |        |          | 33   |
|                 |                 |      |          |      |          |            |          |              |        |          | 16   |
|                 |                 |      |          |      |          |            |          |              |        |          | 92   |

Other's Ratings

|              |     |     |     |     |    |    |     |     |    |     |    |
|--------------|-----|-----|-----|-----|----|----|-----|-----|----|-----|----|
| Math         | 95  |     |     |     |    |    |     |     |    |     |    |
| Verb         | 00  | 86  |     |     |    |    |     |     |    |     |    |
| Academic     | 22  | 32  | 88  |     |    |    |     |     |    |     |    |
| Prob         | 13  | 37  | -19 | 82  |    |    |     |     |    |     |    |
| Physical     | 04  | 00  | -05 | 17  | 97 |    |     |     |    |     |    |
| Appearance   | 02  | 14  | -01 | 02  | 09 | 89 |     |     |    |     |    |
| Same Sex     | 01  | 11  | -03 | 19  | 16 | 34 | 90  |     |    |     |    |
| Opposite Sex | 00  | 02  | -03 | -01 | 15 | 08 | 37  | 90  |    |     |    |
| Parent       | 11  | 14  | 10  | -01 | 10 | 04 | -02 | 09  | 93 |     |    |
| Religion     | 05  | -06 | 11  | 03  | 10 | 15 | 15  | -05 | 08 | 95  |    |
| Hnst         | -01 | 17  | 24  | 15  | 12 | 15 | 32  | 03  | 17 | 27  | 81 |
| Emot         | -04 | 12  | 01  | 19  | 15 | 19 | 41  | 41  | 24 | -01 | 93 |
| General      | 02  | 13  | 11  | 22  | 16 | 41 | 29  | 36  | 21 | 08  | 33 |
|              |     |     |     |     |    |    |     |     |    |     | 92 |

Note: Correlations (presented without decimal points) greater than 19 are statistically significant ( $p < .05$ ). Internal consistency estimates (coefficient alpha) are in boldface and convergent validities are in bold italics.

Table 10.2

Internal Consistency and Self-other Agreement in studies on Australian University Students (N=151; Marsh, Barnes & Hocevar, 1985) and Canadian Australian Students (N=941; Marsh & Byrne, 1989).

| SDQIII Scales         | Internal Consistency Self-other Correlations |       |          |       |            |          |
|-----------------------|----------------------------------------------|-------|----------|-------|------------|----------|
|                       | Australian                                   |       | Canadian |       |            |          |
|                       | Self                                         | Other | Self     | Other | Australian | Canadian |
| 1) Mathematics        | .95                                          | .95   | .95      | .95   | .77        | .77      |
| 2) Verbal             | .84                                          | .86   | .86      | .86   | .51        | .61      |
| 3) Academic           | .86                                          | .88   | .87      | .89   | .31        | .44      |
| 4) Problem Solving    | .79                                          | .82   | .80      | .81   | .52        | .40      |
| 5) Physical Ability   | .96                                          | .97   | .96      | .96   | .78        | .75      |
| 6) Appearance         | .86                                          | .89   | .90      | .90   | .49        | .46      |
| 7) Same Sex Peers     | .86                                          | .90   | .85      | .84   | .45        | .47      |
| 8) Opposite Sex Peers | .90                                          | .90   | .91      | .90   | .51        | .59      |
| 9) Parents            | .91                                          | .93   | .89      | .89   | .76        | .66      |
| 10) Religion          | .95                                          | .95   | .94      | .94   | .79        | .75      |
| 11) Honesty           | .74                                          | .81   | .80      | .82   | .44        | .44      |
| 12) Emotional         | .91                                          | .93   | .89      | .89   | .62        | .48      |
| 13) General           | .94                                          | .93   | .94      | .92   | .41        | .42      |
| Mean                  | .88                                          | .90   | .89      | .89   | .57        | .56      |

NOTE: Internal consistency refers to coefficient alpha estimates of reliability. Self-other agreement in both studies is based on factor scores. All correlations in both studies are statistically significant.



Table 10.3

MTMM Matrix of Correlations Between Ratings By Two External Observers (from Marsh &amp; Richards, 1987).

First External Observer Second External Observer

Phy Apr Oax Ssx Prt Emt Rel Hst Vrb Mth Acd Prb Phy Apr Oax Ssx Prt Emt Rel Hst Vrb Mth Acd Prb

First Observer

|    |                                      |
|----|--------------------------------------|
| 1  | ---                                  |
| 2  | 47 ---                               |
| 3  | 34 65 ---                            |
| 4  | 38 53 69 ---                         |
| 5  | 17 18 24 25 ---                      |
| 6  | 41 29 35 49 45 ---                   |
| 7  | 04 13 14 12 21 17 ---                |
| 8  | 28 19 31 45 38 55 17 ---             |
| 9  | 26 34 42 41 33 33 11 49 ---          |
| 10 | 28 31 26 25 26 33 15 41 63 ---       |
| 11 | 21 29 30 25 32 28 21 36 64 78 ---    |
| 12 | 38 33 37 37 28 34 10 43 68 71 71 --- |

Second Observer

|    |                                                                           |
|----|---------------------------------------------------------------------------|
| 13 | 49* 22 12 12 -05 13 -11 -05 01 04 02 11 ---                               |
| 14 | 19 27* 14 03 -05 -05 -06 -05 03 08 05 04 57 ---                           |
| 15 | 15 28 35* 24 -02 -01 -07 02 16 06 08 08 45 61 ---                         |
| 16 | 13 18 22 28* 09 17 -03 16 12 04 04 04 34 40 66 ---                        |
| 17 | -02 10 08 04 35* 22 13 05 08 09 08 03 17 18 22 31 ---                     |
| 18 | 10 00 05 08 11 21*-03 17 03 05 05 02 31 25 36 45 32 ---                   |
| 19 | -11 -05 -01 07 20 08 41* 23 09 06 13 06 00 01 02 06 19 13 ---             |
| 20 | -05 -07 -01 09 20 15 08 26* 11 08 09 04 12 12 24 37 39 53 26 ---          |
| 21 | 09 08 11 14 10 06 -02 16 25* 25 28 28 28 27 36 36 30 36 14 35 ---         |
| 22 | 08 10 11 04 16 13 01 17 22 36* 35 27 27 32 27 28 28 37 08 30 62 ---       |
| 23 | 09 13 16 09 19 11 04 21 32 37 39* 30 24 34 34 31 31 34 14 33 61 78 ---    |
| 24 | 16 06 09 06 02 04 05 10 19 23 21 26* 38 37 35 33 23 35 14 30 65 66 66 --- |

Note. For each external observer ratings were averaged across "should" and "would" ratings (see Table 10.4 for presentation of convergent validities separately for "would" and "should" ratings). All correlations (presented without decimal points) greater than .12 are statistically significant ( $p < .05$ , two-tailed). The 12 external observer rating scales in the order listed above are: Physical Ability, Physical Appearance, Opposite Sex Relations, Same Sex Relations, Parent Relations, Emotional Stability, Religion/Spiritual Values, Honesty/reliability, Verbal, Math, Academic, Problem Solving.

\* indicates convergent validity coefficients.

Table 10.4

MTMM Matrix of Correlations Between Self-response Ratings and Combined Ratings By External Observers [Adapted from Marsh &amp; Richards, 1987]

Self-Responses to the SDQIII External Observer Ratings

Phy Apr Oax Ssx Prt Emt Rel Hst Vrb Mth Acd Prb Phy Apr Oax Ssx Prt Emt Rel Hst Vrb Mth Acd Prb

Self-responses

|    |                                      |
|----|--------------------------------------|
| 1  | ---                                  |
| 2  | 52 ---                               |
| 3  | 31 42 ---                            |
| 4  | 51 47 53 ---                         |
| 5  | 24 26 15 38 ---                      |
| 6  | 34 41 36 44 31 ---                   |
| 7  | -01 11 13 00 04 01 ---               |
| 8  | 17 16 08 18 27 25 14 ---             |
| 9  | 22 32 37 46 19 35 13 27 ---          |
| 10 | 14 23 01 08 12 08 -03 14 07 ---      |
| 11 | 20 40 22 29 22 26 14 29 53 57 ---    |
| 12 | 33 48 33 33 09 26 08 16 48 40 50 --- |

External Observer Responses

|    |                                                                           |
|----|---------------------------------------------------------------------------|
| 13 | 51* 27 11 21 10 18 -13 00 02 06 09 11 ---                                 |
| 14 | 24 30* 35 24 12 11 -03 09 16 08 15 15 50 ---                              |
| 15 | 13 19 44* 27 14 17 05 07 12 02 15 06 36 64 ---                            |
| 16 | 15 12 22 30* 18 20 -02 09 08 01 12 -03 34 46 69 ---                       |
| 17 | 09 08 06 12 42* 07 17 21 08 10 19 03 09 14 18 25 ---                      |
| 18 | 18 03 -05 14 08 19* 00 17 05 08 11 -01 36 18 29 47 43 ---                 |
| 19 | -01 03 07 -01 09 09 60* 21 07 03 12 01-07 01 03 08 25 13 ---              |
| 20 | -05 01 -06 00 10 11 15 24* 07 10 19 -05 12 07 21 42 40 57 28 ---          |
| 21 | 09 21 12 17 14 29 05 24 33* 21 39 23 24 26 40 39 30 32 11 45 ---          |
| 22 | 12 15 01 10 15 19 00 17 23 42* 42 26 24 30 26 23 29 34 11 37 66 ---       |
| 23 | 05 15 05 10 11 16 07 21 29 29 47* 22 20 29 32 25 33 30 18 37 70 82 ---    |
| 24 | 16 21 08 09 04 21 07 13 21 28 32 28* 38 30 34 31 21 31 12 34 72 71 71 --- |
| rx | 96 91 92 88 87 89 85 94 90 96 85 89 66 43 52 43 51 35 57 41 40 53 56 46   |

Note. Self-response ratings are the mean of T1 and T2 responses. External observer ratings are the mean of "should" and "would" ratings by both external observers. All correlations presented without decimal points) greater than .12 are statistically significant ( $p < .05$ , two-tailed). See Table 5.1 for variable names.

\* indicates convergent validity coefficients.

a -- The reliability estimate for the mean of Time1 and 2 self-rating scales is the test-retest correlation corrected by the Spearman-Brown equation. Test-retest correlations were slightly smaller than coefficient alphas at Time 1 and 2 (see Marsh, Richards & Barnes, 1986a, 1986b), due in part to the intervention, so that this may be a conservative estimate for present purposes. The reliability estimate for the total observer rating is the correlation between the two observer responses (i.e., the convergent validity diagonal of Table 10.3) corrected by the Spearman-Brown equation. This estimate is appropriate for evaluating the convergent validities, but many of the correlations among the observer rating scales "would" be greater than 1.0 if corrected by these reliability estimates. This is consistent with the earlier observation that there is substantial method/halo effect associated with the responses by each observer.



Table 10.5

Mean Responses For Self-ratings at Times 1 and 2 (T1, T2) to Multi-item and Single-item Scales and For External Observer "Would" (W1, W2) and "Should" (S1, S2) Ratings at T2 [Adapted from Marsh & Richards, 1987]

Self-ratings on

| Multi-item Scales |      | Self- and Observer-ratings on Single-item Scales |       |               |      |                              |       |      |       |       |        |       |      |
|-------------------|------|--------------------------------------------------|-------|---------------|------|------------------------------|-------|------|-------|-------|--------|-------|------|
|                   |      | a                                                |       |               |      | b                            |       |      |       |       |        |       |      |
| Mean Response     |      | t-ratio                                          |       | Mean Response |      | t-ratios of Mean Differences |       |      |       |       |        |       |      |
|                   |      | T1                                               | T2    | T1            | T2   | W1+W2                        | S1+S2 | T1   | T2    | W1+W2 | S1+S2  | T1    | T2   |
| Scale             |      | vs.                                              |       | vs.           |      | vs.                          |       | vs.  |       | vs.   |        | vs.   |      |
|                   |      | T2                                               |       | T2            |      | T2                           |       | T2   |       | T2    |        | T2    |      |
| Phy               | 5.87 | 6.11                                             | 4.88  | 6.46          | 6.71 | 6.10                         | 6.49  | 4.73 | -3.69 | .27   | -5.88  | -1.98 | 4.56 |
| Apr               | 5.21 | 5.68                                             | 11.80 | 6.20          | 6.48 | 5.48                         | 6.00  | 5.32 | -8.59 | -2.04 | -11.09 | -4.82 | 6.94 |
| c                 |      |                                                  |       |               |      |                              |       |      |       |       |        |       |      |
| Osx               | 5.25 | 5.45                                             | 5.62  | 6.56          | 6.63 | 5.93                         | 6.07  | 1.21 | -6.28 | -4.60 | -6.47  | -5.13 | 2.11 |
| Ssx               | 5.73 | 5.89                                             | 4.16  | 7.02          | 7.01 | 6.47                         | 6.64  | -.13 | -6.00 | -3.91 | -5.77  | -3.80 | 2.17 |
| Prt               | 5.79 | 6.07                                             | 7.18  | 7.02          | 7.13 | 6.54                         | 6.93  | 2.64 | -4.04 | -.76  | -5.12  | -1.75 | 4.60 |
| Emt               | 5.47 | 5.84                                             | 9.33  | 6.94          | 6.90 | 6.78                         | 7.06  | -.74 | -1.53 | -1.23 | -1.02  | 1.54  | 2.94 |
| c                 |      |                                                  |       |               |      |                              |       |      |       |       |        |       |      |
| Rel               | 4.31 | 4.53                                             | 5.43  | 4.63          | 4.60 | 4.18                         | 4.44  | -.39 | -3.56 | -1.58 | -3.35  | -1.38 | 2.77 |
| Hst               | 6.10 | 6.28                                             | 5.27  | 7.31          | 7.34 | 7.25                         | 7.41  | .44  | -.79  | .97   | -1.02  | .62   | 1.61 |
| Vrb               | 5.51 | 5.69                                             | 4.70  | 6.75          | 6.80 | 6.36                         | 6.72  | .94  | -4.05 | -.46  | -4.39  | -.83  | 4.11 |
| c                 |      |                                                  |       |               |      |                              |       |      |       |       |        |       |      |
| Mth               | 5.30 | 5.42                                             | 3.40  | 6.37          | 6.54 | 6.11                         | 6.33  | 3.57 | -2.41 | -.43  | -3.84  | -1.98 | 2.59 |
| c                 |      |                                                  |       |               |      |                              |       |      |       |       |        |       |      |
| Acid              | 5.63 | 5.78                                             | 3.93  | 6.33          | 6.46 | 6.23                         | 6.35  | 2.79 | -1.04 | -.06  | -2.38  | -1.26 | 1.53 |
| Prb               | 5.28 | 5.50                                             | 5.67  | 6.55          | 6.60 | 6.14                         | 6.33  | .72  | -4.25 | -2.32 | -4.39  | -2.54 | 2.18 |
| Estm              | 5.82 | 6.33                                             | 11.29 |               |      |                              |       |      |       |       |        |       |      |
| Tot               | 5.48 | 5.74                                             | 11.00 | 6.51          | 6.60 | 6.13                         | 6.40  | 2.87 | -7.14 | -1.97 | -7.77  | -3.09 | 5.36 |

Note. Self-ratings were collected at both Times 1 and 2 (T1, T2) for both multi-item and single-item scales. External observer "would" ratings (W1+W2) and "should" ratings (S1+S2), the mean of responses by two observers, were collected for single-item scales at Time 2 only. The rating scales in the order listed above are: Physical Ability, Physical Appearance, Opposite Sex Relations, Same Sex Relations, Parent Relations, Emotional Stability, Religion/Spiritual Values, Honesty/reliability, Verbal, Math, Academic, Problem Solving, General Esteem (for multi-item scales only), and Total of all 12 (or 13) scales.

a -- Multi-item scale ratings are on a 1 to 8 scale whereas single-item response scales are on a 1 to 9 scale.

b -- t-ratios (the mean difference divided by the standard error of the difference for correlated variables) greater or equal to 1.97 are statistically significant ( $p < .05$ , two-tailed).

c -- Marsh, Richards and Barnes (1986a, 1986b) selected these scales a priori to be less relevant to program goals and used them as control scales. The pre-test/post-test change in these scales was significantly less positive than for the other scales for both single-item and multi-item scales ( $t(275) = 4.89$  and  $5.54$ , respectively).

Table 11.1

Correlations Between Scores From the SDQ III and From Tennessee Self Concept Scales (TSCS; N=343) [Adapted from Marsh & Richards, 1988b]

| TSCS Scores      | SDQ III Scores |     |     |     |     |     |      |     |     |     |      |     |     | rxx |
|------------------|----------------|-----|-----|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|
|                  | Prt            | Ssx | Osx | Phy | Apr | Hst | Spt  | Gen | Emt | Prb | Acid | Mth | Vrb |     |
| TSCS Total151    | 52             | 37  | 40  | 56  | 47  | 05  | 69   | 57  | 24  | 37  | 16   | 40  | 71  | 93  |
| External Scales  |                |     |     |     |     |     |      |     |     |     |      |     |     |     |
| Family           | 68*            | 33  | 16  | 19  | 32  | 39  | 01   | 48  | 39  | 14  | 28   | 10  | 24  | 84  |
| Social           | 33             | 61* | 59* | 32  | 40  | 31  | 07   | 55  | 48  | 25  | 25   | 01  | 35  | 81  |
| Physical         | 33             | 43  | 28  | 53* | 71* | 29  | 10   | 60  | 44  | 30  | 29   | 14  | 27  | 81  |
| Moral            | 25             | 23  | 10  | 19  | 30  | 53* | 03*  | 41  | 36  | 28  | 30   | 17  | 33  | 69  |
| Personal         | 38             | 47  | 34  | 33  | 50  | 38  | 01   | 71* | 60* | 39  | 36   | 21  | 39  | 82  |
| Internal Scales  |                |     |     |     |     |     |      |     |     |     |      |     |     |     |
| Identity         | 51             | 52  | 42  | 41  | 52  | 44  | 25   | 65  | 48  | 30  | 36   | 12  | 37  | 86  |
| Satisfaction     | 42             | 41  | 25  | 26  | 51  | 32  | -17  | 59  | 48  | 29  | 26   | 16  | 28  | 87  |
| Behavior         | 43             | 48  | 33  | 39  | 45  | 51  | 14   | 60  | 56  | 31  | 38   | 13  | 41  | 82  |
| Ext/Int scales   |                |     |     |     |     |     |      |     |     |     |      |     |     |     |
| Fam/Id           | 65*            | 36  | 21  | 27  | 31  | 33  | 08   | 45  | 28  | 11  | 25   | 08  | 21  | 75  |
| Fam/Sat          | 54*            | 19  | 05  | 08  | 24  | 28  | -08  | 37  | 34  | 12  | 19   | 08  | 16  | 74  |
| Fam/Beh          | 52*            | 29  | 17  | 16  | 25  | 37  | 06   | 37  | 35  | 13  | 30   | 10  | 25  | 48  |
| Soc/Id           | 25             | 53* | 53* | 34  | 37  | 24  | 10   | 45  | 36  | 24  | 24   | 05  | 30  | 65  |
| Soc/Sat          | 32             | 48* | 41* | 22  | 29  | 22  | -14  | 46  | 37  | 14  | 15   | 00  | 24  | 63  |
| Soc/Beh          | 21             | 49* | 49* | 23  | 30  | 29  | 23   | 44  | 43  | 23  | 23   | -03 | 31  | 69  |
| Phy/Id           | 30             | 32  | 22  | 39* | 51* | 27  | 19   | 44  | 28  | 21  | 23   | 10  | 20  | 58  |
| Phy/Sat          | 19             | 31  | 25  | 34* | 69* | 18  | 04   | 51  | 36  | 26  | 21   | 12  | 21  | 68  |
| Phy/Beh          | 34             | 43  | 23  | 60* | 53* | 28  | 05   | 51  | 45  | 24  | 27   | 13  | 27  | 58  |
| Mor/Id           | 25             | 23  | 24  | 21  | 32  | 45* | 51*  | 44  | 27  | 29  | 31   | 08  | 34  | 51  |
| Mor/Sat          | 11             | 16  | 04  | 09  | 16  | 23* | -38* | 23  | 23  | 22  | 15   | 18  | 16  | 60  |
| Mor/Beh          | 21             | 14  | -02 | 12  | 20  | 50* | 08*  | 25  | 29  | 14  | 24   | 10  | 26  | 53  |
| Per/Id           | 33             | 45  | 36  | 30  | 42  | 36  | 10   | 60* | 58* | 29  | 32   | 14  | 36  | 61  |
| Per/Sat          | 32             | 39  | 24  | 24  | 49  | 25  | -09  | 61* | 46* | 32  | 27   | 21  | 27  | 69  |
| Per/Beh          | 26             | 33  | 29  | 28  | 29  | 35  | 05   | 54* | 46* | 37  | 32   | 18  | 36  | 64  |
| Physical Factors |                |     |     |     |     |     |      |     |     |     |      |     |     |     |
| Fit/healthy body | 25             | 29  | 14  | 66* | 55  | 16  | 08   | 43  | 30  | 22  | 20   | 09  | 18  | 48  |
| Neat appearance  | 32             | 30  | 26  | 25  | 41  | 20  | 15   | 36  | 15  | 14  | 14   | 08  | 14  | 39  |
| Attractiveness   | 20             | 36  | 29  | 36  | 76* | 17  | 05   | 55  | 35  | 29  | 22   | 14  | 20  | 52  |
| Sickness         | 27             | 35  | 16  | 41  | 44  | 33  | 06   | 48  | 47  | 26  | 31   | 14  | 32  | 53  |
| Moral Factors    |                |     |     |     |     |     |      |     |     |     |      |     |     |     |
| Honesty          | 31             | 28  | 16  | 23  | 30  | 54* | 00   | 44  | 36  | 28  | 30   | 17  | 33  | 47  |
| Bipolar Religion | 06             | -07 | 05  | -06 | 01  | 08  | 76*  | 00  | -07 | -06 | 02   | -10 | 02  | 15  |
| Religion         | 13             | 14  | 08  | 13  | 24  | 25  | 24*  | 31  | 23  | 21  | 21   | 07  | 22  | 34  |
| rxx              | 90             | 90  | 92  | 92  | 88  | 77  | 96   | 90  | 90  | 84  | 93   | 86  | 94  | 96  |

Note. All correlations, presented without decimal points, greater than .12 are statistically significant ( $p < .05$ , two-tailed).

a -- The 13 SDQIII scores are: Parent Relations, Same Sex Relations, Opposite Sex Relations, Physical Abilities, Physical Appearance, Honesty/trustworthiness, Spiritual Values/Religion, General Esteem, Emotional Stability, Problem Solving, Academic, Math, and Verbal.

b -- Coefficient alpha estimates of reliability for all TSCS scale scores.

c -- Empirically derived factors scores from factor analyses of the 18 TSCS Physical items and of the 18 TSCS Moral items.

d -- Coefficient alpha estimates of reliability for SDQIII scale scores.

\* Correlations between TSCS and SDQIII scales hypothesized to be matching (i.e., convergent validities).



Table 11.2

Correlations Between External Observer Ratings and Self-response Ratings to the SDQIII and Tennessee Self Scales (TSCS; N=280) [Adapted from Marsh &amp; Richards, 1988b]

| Scores                   | External Observer Ratings |     |     |     |     |     |      |     |     |      |     |     |     |  |
|--------------------------|---------------------------|-----|-----|-----|-----|-----|------|-----|-----|------|-----|-----|-----|--|
|                          | Prt                       | Ssx | Osx | Phy | Apr | Hst | Spt  | Emt | Prb | Acid | Mth | Vrb | Tot |  |
| TSCS Total               | 18                        | 20  | 16  | 20  | 21  | 08  | 07   | 11  | 19  | 17   | 16  | 26  | 28  |  |
| TSCS External Scales     |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| Family                   | 24*                       | 18  | 09  | 14  | 09  | 05  | 04   | 06  | 12  | 11   | 15  | 21  | 21  |  |
| Social                   | 15                        | 26* | 29* | 13  | 24  | 03  | 07   | 06  | 10  | 12   | 05  | 25  | 25  |  |
| Physical                 | 10                        | 15  | 08  | 31* | 22* | 03  | 07   | 07  | 21  | 14   | 15  | 13  | 24  |  |
| Moral                    | 07                        | 04  | 02  | 01  | 08  | 16* | 05*  | 08  | 15  | 18   | 16  | 22  | 17  |  |
| Personal                 | 12                        | 19  | 16  | 18  | 22  | 11  | 05   | 18* | 22  | 16   | 15  | 25  | 28  |  |
| TSCS Internal Scales     |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| Identity                 | 23                        | 20  | 20  | 17  | 24  | 08  | 19   | 11  | 17  | 15   | 14  | 22  | 31  |  |
| Satisfaction             | 12                        | 22  | 14  | 18  | 19  | 08  | -09  | 12  | 21  | 14   | 16  | 25  | 23  |  |
| Behavior                 | 13                        | 13  | 10  | 17  | 14  | 09  | 13   | 07  | 12  | 16   | 16  | 26  | 28  |  |
| TSCS Ext/Int scales      |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| Fam/Id                   | 31*                       | 19  | 14  | 16  | 16  | 09  | 09   | 12  | 09  | 15   | 17  | 17  | 26  |  |
| Fam/Sat                  | 17*                       | 10  | 02  | 11  | 04  | 03  | -04  | 02  | 13  | 05   | 10  | 20  | 13  |  |
| Fam/Beh                  | 10*                       | 16  | 08  | 05  | 05  | 01  | 09   | 00  | 03  | 05   | 09  | 13  | 13  |  |
| Soc/Id                   | 10                        | 21* | 31* | 14  | 26  | -04 | 06   | 06  | 10  | 09   | 07  | 18  | 22  |  |
| Soc/Sat                  | 11                        | 25* | 23* | 14  | 20  | 06  | -09  | 07  | 10  | 12   | 04  | 21  | 19  |  |
| Soc/Beh                  | 15                        | 17* | 18* | 03  | 11  | 05  | 21   | 00  | 05  | 09   | 00  | 22  | 19  |  |
| Phy/Id                   | 08                        | 08  | 03  | 17* | 14* | 02  | 14   | 02  | 15  | 09   | 11  | 09  | 17  |  |
| Phy/Sat                  | 06                        | 15  | 11  | 26* | 21* | 04  | 02   | 09  | 20  | 14   | 10  | 20  | 13  |  |
| Phy/Beh                  | 05                        | 06  | 10  | 21* | 19* | 06  | 09   | 13  | 17  | 16   | 11  | 10  | 19  |  |
| Mor/Id                   | 13                        | 01  | 06  | 03  | 13  | 09* | 29*  | 03  | 11  | 09   | 06  | 11  | 18  |  |
| Mor/Sat                  | -02                       | 09  | 02  | 00  | 07  | 06* | -17* | 08  | 14  | 07   | 13  | 15  | 07  |  |
| Mor/Beh                  | 05                        | 00  | -02 | -01 | -01 | 21* | 05*  | 05  | 07  | 21   | 14  | 19  | 13  |  |
| Per/Id                   | 15                        | 20  | 18  | 09  | 18  | 14  | 11   | 15* | 17  | 10   | 07  | 22  | 25  |  |
| Per/Sat                  | 09                        | 24  | 15  | 14  | 19  | 09  | -05  | 16* | 21  | 15   | 15  | 22  | 24  |  |
| Per/Beh                  | 06                        | 06  | 10  | 21  | 19  | 06  | 09   | 13* | 17  | 16   | 16  | 18  | 23  |  |
| TSCS Physical Factors    |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| Fit/healthy body         | 05                        | 02  | 00  | 32* | 13  | -11 | -02  | 03  | 15  | 06   | 08  | 05  | 11  |  |
| Neat appearance          | 15                        | 15  | 08  | 14  | 20  | 01  | 14   | 09  | 21  | 14   | 15  | 16  | 24  |  |
| Attractiveness           | 05                        | 17  | 13  | 27  | 26* | 04  | 03   | 06  | 22  | 15   | 16  | 14  | 24  |  |
| Sickness                 | 09                        | 05  | -01 | 19  | 04  | 09  | 05   | 06  | 08  | 09   | 08  | 08  | 13  |  |
| TSCS Moral Factors       |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| Honesty                  | 08                        | 06  | 07  | 07  | 15  | 08* | 00   | 07  | 11  | 12   | 14  | 19  | 15  |  |
| Bipolar Religion         | 09                        | -08 | -01 | -09 | -05 | 06  | 40*  | -07 | -05 | -01  | -05 | -05 | 04  |  |
| Religion                 | 09                        | 01  | -01 | -01 | 06  | 07  | 19*  | 05  | 17  | 12   | 07  | 14  | 14  |  |
| SDQIII Scales            |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| Parents                  | 37*                       | 16  | 15  | 16  | 13  | 10  | 09   | 10  | 07  | 11   | 15  | 13  | 25  |  |
| Same Sex Peers           | 15                        | 26* | 26  | 21  | 21  | 06  | -01  | 14  | 08  | 11   | 10  | 15  | 24  |  |
| Opp Sex Peer             | 08                        | 24  | 45* | 12  | 32  | -03 | 05   | -01 | 07  | 04   | -01 | 10  | 20  |  |
| Phys Ability             | 11                        | 11  | 13  | 49* | 18  | -08 | -03  | 19  | 11  | 02   | 08  | 05  | 20  |  |
| Phys Appear              | 07                        | 16  | 21  | 30  | 32* | 01  | 04   | 06  | 25  | 16   | 16  | 18  | 28  |  |
| Honesty/Trust            | 22                        | 07  | 03  | -04 | 04  | 26* | 14   | 18  | 07  | 22   | 15  | 21  | 21  |  |
| Spiritual/Relig          | 14                        | -01 | 02  | -12 | -05 | 14  | 57*  | -01 | 04  | 06   | -01 | 01  | 15  |  |
| Emotional Stabil         | 05                        | 19  | 16  | 15  | 12  | 11  | 08   | 17* | 21  | 13   | 17  | 28  | 26  |  |
| Problem Solving          | 00                        | 00  | 09  | 08  | 15  | -01 | 01   | 07  | 28* | 21   | 24  | 21  | 19  |  |
| Academic                 | 22                        | 11  | 13  | 07  | 17  | 21  | 09   | 12  | 30  | 44*  | 41  | 37  | 38  |  |
| Math                     | 11                        | 04  | 03  | 10  | 15  | 13  | 01   | 13  | 28  | 27   | 42* | 23  | 27  |  |
| Verbal                   | 08                        | 04  | 14  | 02  | 17  | 11  | 07   | 07  | 22  | 26   | 21  | 31* | 25  |  |
| General Esteem           | 13                        | 23  | 24  | 24  | 30  | 07  | 14   | 13  | 27  | 20   | 22  | 25  | 35  |  |
| Total Score              | 24                        | 21  | 28  | 24  | 30  | 15  | 21   | 18  | 32  | 31   | 32  | 34  | 45  |  |
| External Rater Agreement |                           |     |     |     |     |     |      |     |     |      |     |     |     |  |
| r12                      | 35                        | 23  | 39  | 46  | 23  | 06  | 33   | 15  | 24  | 35   | 33  | 28  | 28  |  |
| rx                       | 52                        | 38  | 56  | 63  | 37  | 11  | 50   | 27  | 39  | 52   | 50  | 43  | 44  |  |

Note. All correlations, presented without decimal points, greater than .12 are statistically significant (two-tailed). See Table 11.2 for names of SDQIII scales.

a -- These factors were derived from factor analyses of items designed to measure the same TSCS external s  
b -- r12 is the correlation between two different external observers whereas rx is the coefficient alpha the total of the two ratings.

Table 11.3

MTMM Matrix Relating Responses From Three Different Self-concept Instruments [Adapted from Marsh, Byrne &amp; Shavelson, 1988]

|                | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13  |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| 1 SDQ GSC (94) |      |      |      |      |      |      |      |      |      |      |      |      |     |
| 2 SDQ ASC      | 19   | (90) |      |      |      |      |      |      |      |      |      |      |     |
| 3 SDQ VSC      | 22   | 37   | (80) |      |      |      |      |      |      |      |      |      |     |
| 4 SDQ MSC      | 12   | 36   | -05  | (93) |      |      |      |      |      |      |      |      |     |
| 5 API GSC      | <62> | 20   | 18   | 16   | (86) |      |      |      |      |      |      |      |     |
| 6 API ASC      | 55   | <59> | 37   | 31   | 62   | (85) |      |      |      |      |      |      |     |
| 7 API VSC      | 06   | 41   | <68> | -05  | 09   | 42   | (89) |      |      |      |      |      |     |
| 8 API MSC      | 10   | 41   | 02   | <86> | 16   | 34   | 08   | (95) |      |      |      |      |     |
| 9 SES GSC      | <79> | 24   | 26   | 19   | <62> | 59   | 12   | 19   | (87) |      |      |      |     |
| 10 SCA ASC     | 17   | <65> | 32   | 44   | 17   | <54> | 33   | 47   | 23   | (87) |      |      |     |
| 11 SCA VSC     | 04   | 43   | <54> | -01  | 06   | 33   | <65> | 03   | 11   | 49   | (90) |      |     |
| 12 SSC MSC     | 07   | 34   | -04  | <82> | 13   | 31   | -04  | <80> | 12   | 50   | 03   | (94) |     |
| 13 Sex         | -04  | 20   | 12   | -17  | -17  | 15   | 25   | -17  | -11  | 09   | 19   | -16  | --- |

Note. Correlations, presented without decimal points, greater than .07 are statistically significant (p < .05). Convergent validities, correlations between the same facet of self-concept inferred from different instruments, appear within arrow heads (i.e. "< >"). Coefficient alpha estimates of reliability appear in parentheses. SDQ = Self Description Questionnaire III; API = Affective Perceptions Inventory; SES = Self-esteem Scale; SCA = Self-concept of Ability Scale; GSC = General Self-concept; ASC = Academic Self-concept; MSC = Math Self-concept; VSC = Verbal self-concept; Sex (1=male, 2=female).



## Appendix IA

Cumulative Percentage Distribution For Total Normative Group (N=2436)

| Self-concept scale |       |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| Raw                | Score | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT |
| 8                  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 9                  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 10                 | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 11                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 12                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 13                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 14                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   |
| 15                 | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   |
| 16                 | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 02   | 00   | 00   |
| 17                 | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 03   | 00   | 00   |
| 18                 | 02    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 01   | 00   | 03   | 00   | 00   |
| 19                 | 03    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 00   | 04   | 00   | 00   |
| 20                 | 04    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 00   | 05   | 00   | 01   |
| 21                 | 04    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 01   | 06   | 00   | 01   |
| 22                 | 05    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 01   | 06   | 00   | 01   |
| 23                 | 06    | 00   | 01   | 00   | 01   | 02   | 00   | 02   | 01   | 07   | 00   | 01   | 00   |
| 24                 | 06    | 01   | 01   | 00   | 01   | 02   | 00   | 02   | 01   | 08   | 00   | 01   | 00   |
| 25                 | 07    | 01   | 01   | 00   | 01   | 02   | 00   | 02   | 01   | 09   | 00   | 02   | 00   |
| 26                 | 08    | 01   | 02   | 00   | 02   | 03   | 01   | 03   | 01   | 10   | 00   | 02   | 00   |
| 27                 | 09    | 01   | 02   | 00   | 02   | 03   | 01   | 04   | 01   | 11   | 00   | 02   | 01   |
| 28                 | 10    | 01   | 02   | 01   | 02   | 04   | 01   | 04   | 01   | 12   | 00   | 03   | 01   |
| 29                 | 11    | 02   | 03   | 01   | 02   | 04   | 01   | 05   | 02   | 13   | 00   | 03   | 01   |
| 30                 | 12    | 02   | 03   | 01   | 03   | 05   | 01   | 06   | 02   | 15   | 00   | 03   | 01   |
| 31                 | 13    | 02   | 03   | 02   | 03   | 05   | 01   | 07   | 02   | 16   | 00   | 04   | 01   |
| 32                 | 14    | 02   | 03   | 02   | 03   | 06   | 02   | 07   | 02   | 17   | 00   | 04   | 01   |
| 33                 | 15    | 03   | 04   | 03   | 04   | 07   | 02   | 08   | 03   | 19   | 00   | 05   | 01   |
| 34                 | 16    | 03   | 04   | 03   | 05   | 07   | 02   | 09   | 03   | 20   | 00   | 05   | 01   |
| 35                 | 17    | 03   | 05   | 04   | 05   | 08   | 03   | 11   | 04   | 22   | 00   | 06   | 01   |
| 36                 | 18    | 04   | 06   | 05   | 05   | 09   | 03   | 12   | 04   | 24   | 00   | 07   | 02   |
| 37                 | 19    | 05   | 07   | 05   | 06   | 10   | 03   | 13   | 05   | 25   | 00   | 08   | 02   |
| 38                 | 20    | 06   | 07   | 06   | 07   | 11   | 04   | 14   | 06   | 27   | 00   | 09   | 02   |
| 39                 | 22    | 07   | 08   | 08   | 07   | 12   | 04   | 15   | 06   | 28   | 00   | 10   | 03   |
| 40                 | 24    | 08   | 09   | 09   | 08   | 13   | 05   | 17   | 07   | 29   | 00   | 11   | 03   |
| 41                 | 25    | 09   | 10   | 11   | 08   | 15   | 06   | 19   | 08   | 31   | 00   | 12   | 03   |
| 42                 | 26    | 10   | 11   | 13   | 10   | 17   | 06   | 20   | 09   | 32   | 00   | 13   | 04   |
| 43                 | 28    | 12   | 12   | 16   | 11   | 19   | 07   | 22   | 10   | 34   | 00   | 15   | 04   |
| 44                 | 30    | 13   | 13   | 18   | 12   | 21   | 09   | 24   | 11   | 35   | 00   | 16   | 04   |
| 45                 | 32    | 15   | 15   | 21   | 13   | 23   | 10   | 26   | 12   | 36   | 00   | 18   | 05   |
| 46                 | 34    | 18   | 17   | 25   | 14   | 26   | 12   | 28   | 13   | 37   | 00   | 21   | 06   |
| 47                 | 36    | 21   | 18   | 28   | 16   | 28   | 14   | 30   | 14   | 38   | 00   | 24   | 06   |
| 48                 | 38    | 23   | 20   | 31   | 17   | 32   | 16   | 33   | 15   | 40   | 01   | 27   | 07   |
| 49                 | 40    | 26   | 23   | 35   | 19   | 35   | 18   | 35   | 17   | 41   | 01   | 29   | 07   |
| 50                 | 42    | 29   | 26   | 39   | 21   | 38   | 20   | 37   | 18   | 43   | 01   | 32   | 08   |
| 51                 | 45    | 32   | 28   | 43   | 23   | 41   | 23   | 40   | 20   | 44   | 01   | 35   | 09   |
| 52                 | 47    | 36   | 31   | 47   | 25   | 45   | 26   | 42   | 22   | 45   | 01   | 38   | 10   |
| 53                 | 49    | 39   | 34   | 51   | 27   | 49   | 29   | 45   | 24   | 46   | 01   | 41   | 10   |
| 54                 | 51    | 43   | 37   | 55   | 30   | 53   | 33   | 48   | 27   | 48   | 02   | 44   | 11   |
| 55                 | 54    | 46   | 40   | 59   | 32   | 57   | 36   | 51   | 29   | 49   | 02   | 47   | 12   |
| 56                 | 56    | 50   | 43   | 62   | 34   | 61   | 40   | 54   | 32   | 51   | 03   | 50   | 13   |
| 57                 | 58    | 54   | 46   | 66   | 37   | 65   | 44   | 57   | 35   | 52   | 04   | 53   | 14   |
| 58                 | 61    | 58   | 49   | 69   | 40   | 69   | 48   | 61   | 38   | 54   | 05   | 57   | 16   |
| 59                 | 64    | 61   | 52   | 73   | 42   | 72   | 52   | 64   | 42   | 55   | 06   | 61   | 17   |
| 60                 | 67    | 64   | 55   | 76   | 46   | 76   | 56   | 67   | 45   | 57   | 07   | 64   | 18   |
| 61                 | 70    | 67   | 60   | 80   | 49   | 80   | 61   | 70   | 49   | 58   | 08   | 67   | 20   |
| 62                 | 72    | 71   | 63   | 82   | 52   | 83   | 65   | 73   | 53   | 60   | 09   | 71   | 21   |
| 63                 | 75    | 74   | 67   | 85   | 55   | 85   | 70   | 76   | 56   | 61   | 11   | 74   | 23   |

|    |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 64 | 77   | 77   | 70   | 87   | 59   | 87   | 73   | 79   | 61   | 63   | 13   | 77   | 25   |
| 65 | 80   | 80   | 73   | 90   | 63   | 89   | 77   | 82   | 65   | 64   | 15   | 80   | 27   |
| 66 | 82   | 83   | 77   | 92   | 67   | 91   | 80   | 85   | 69   | 66   | 18   | 84   | 29   |
| 67 | 85   | 86   | 80   | 93   | 71   | 92   | 83   | 87   | 73   | 67   | 20   | 86   | 31   |
| 68 | 87   | 88   | 83   | 94   | 75   | 94   | 87   | 89   | 77   | 69   | 23   | 88   | 34   |
| 69 | 89   | 90   | 86   | 96   | 79   | 95   | 89   | 92   | 81   | 70   | 26   | 91   | 36   |
| 70 | 91   | 92   | 89   | 97   | 83   | 96   | 92   | 94   | 85   | 72   | 30   | 93   | 38   |
| 71 | 93   | 94   | 92   | 97   | 86   | 97   | 94   | 96   | 88   | 73   | 34   | 95   | 41   |
| 72 | 94   | 95   | 94   | 98   | 89   | 98   | 95   | 97   | 90   | 74   | 38   | 96   | 44   |
| 73 | 95   | 96   | 95   | 98   | 91   | 99   | 96   | 97   | 93   | 76   | 41   | 96   | 47   |
| 74 | 96   | 97   | 96   | 99   | 93   | 99.2 | 97   | 98   | 95   | 78   | 46   | 97   | 50   |
| 75 | 97   | 98   | 97   | 99.0 | 94   | 99.5 | 98   | 98   | 96   | 79   | 50   | 98   | 54   |
| 76 | 97   | 99   | 98   | 99.2 | 96   | 99.7 | 98   | 99   | 97   | 81   | 55   | 98   | 57   |
| 77 | 98   | 99.0 | 99   | 99.4 | 97   | 99.8 | 99   | 99.2 | 98   | 82   | 60   | 99   | 61   |
| 78 | 99.0 | 99.4 | 99   | 99.6 | 98   | 99.9 | 99.2 | 99.5 | 99   | 84   | 64   | 99.2 | 65   |
| 79 | 99.4 | 99.6 | 99.4 | 99.8 | 99   | 99.9 | 99.5 | 99.8 | 99.3 | 85   | 68   | 99.7 | 69   |
| 80 | 99.8 | 99.8 | 99.8 | 99.9 | 99.6 | 99.9 | 99.8 | 99.9 | 99.8 | 86   | 72   | 99.9 | 72   |
| 81 |      |      |      |      |      |      |      |      |      | 87   | 77   |      | 76   |
| 82 |      |      |      |      |      |      |      |      |      | 88   | 81   |      | 80   |
| 83 |      |      |      |      |      |      |      |      |      | 89   | 84   |      | 83   |
| 84 |      |      |      |      |      |      |      |      |      | 91   | 87   |      | 86   |
| 85 |      |      |      |      |      |      |      |      |      | 92   | 90   |      | 88   |
| 86 |      |      |      |      |      |      |      |      |      | 93   | 92   |      | 91   |
| 87 |      |      |      |      |      |      |      |      |      | 94   | 94   |      | 92   |
| 88 |      |      |      |      |      |      |      |      |      | 95   | 95   |      | 94   |
| 89 |      |      |      |      |      |      |      |      |      | 96   | 96   |      | 95   |
| 90 |      |      |      |      |      |      |      |      |      | 97   | 97   |      | 96   |
| 91 |      |      |      |      |      |      |      |      |      | 97   | 98   |      | 97   |
| 92 |      |      |      |      |      |      |      |      |      | 98   | 99   |      | 98   |
| 93 |      |      |      |      |      |      |      |      |      | 98   | 99.4 |      | 98   |
| 94 |      |      |      |      |      |      |      |      |      | 99   | 99.6 |      | 99   |
| 95 |      |      |      |      |      |      |      |      |      | 99.2 | 99.8 |      | 99.2 |
| 96 |      |      |      |      |      |      |      |      |      | 99.7 | 99.9 |      | 99.8 |

| Score  | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG  | HNST | EMOT | GENR | TOTAL |
|--------|------|------|------|------|------|------|------|------|------|-------|------|------|------|-------|
| Mean   | 51.2 | 5.55 | 56.8 | 52.8 | 59.1 | 52.1 | 57.6 | 52.9 | 59.3 | 54.8  | 74.3 | 54.8 | 71.3 | 752.3 |
| Median | 5.30 | 5.60 | 58.0 | 53.0 | 62.0 | 53.0 | 58.0 | 55.0 | 61.0 | 56.0  | 75.0 | 56.0 | 74.0 | 755.0 |
| SD     | 15.5 | 10.6 | 11.7 | 09.7 | 12.2 | 11.2 | 9.9  | 12.8 | 11.3 | 21.3  | 8.9  | 11.6 | 13.3 | 86.5  |
| Skew   | -.49 | -.38 | -.72 | -.06 | -.86 | -.59 | -.57 | -.52 | -.92 | -.04  | -.37 | -.54 | -.90 | -.18  |
| Kurt   | -.44 | .10  | .53  | -.11 | .61  | .49  | .56  | -.20 | .85  | -1.02 | .03  | .19  | .81  | .15   |
| Rxx    | .94  | .86  | .92  | .84  | .94  | .90  | .87  | .92  | .89  | .95   | .74  | .89  | .93  | .96   |

Corr's With:

| Year | .04  | .11  | .13 | .12  | .03  | .23  | -.12 | .00 | -.03 | -.05 | .09 | .05  | .06  | .08  |
|------|------|------|-----|------|------|------|------|-----|------|------|-----|------|------|------|
| Sex  | -.16 | -.01 | .00 | -.23 | -.21 | -.33 | .03  | .16 | -.03 | .17  | .03 | -.14 | -.14 | -.12 |



## Appendix IA

Cumulative Percentage Distribution For Total Normative Group (N=2436)

| Self-concept scale |       |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| Raw                | Score | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT |
| 8                  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 9                  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 10                 | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 11                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |
| 12                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 13                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   |
| 14                 | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   |
| 15                 | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   |
| 16                 | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 02   | 00   | 00   |
| 17                 | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 03   | 00   | 00   |
| 18                 | 02    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 01   | 00   | 03   | 00   | 00   |
| 19                 | 03    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 00   | 04   | 00   | 00   |
| 20                 | 04    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 00   | 05   | 00   | 01   |
| 21                 | 04    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 01   | 06   | 00   | 01   |
| 22                 | 05    | 00   | 01   | 00   | 01   | 01   | 00   | 01   | 01   | 01   | 06   | 00   | 01   |
| 23                 | 06    | 00   | 01   | 00   | 01   | 02   | 00   | 02   | 02   | 01   | 07   | 00   | 01   |
| 24                 | 06    | 01   | 01   | 00   | 01   | 02   | 00   | 02   | 02   | 01   | 08   | 00   | 01   |
| 25                 | 07    | 01   | 01   | 00   | 01   | 02   | 00   | 02   | 02   | 01   | 09   | 00   | 02   |
| 26                 | 08    | 01   | 02   | 00   | 02   | 03   | 01   | 03   | 03   | 01   | 10   | 00   | 02   |
| 27                 | 09    | 01   | 02   | 00   | 02   | 03   | 01   | 04   | 04   | 01   | 11   | 00   | 02   |
| 28                 | 10    | 01   | 02   | 01   | 02   | 04   | 01   | 04   | 04   | 01   | 12   | 00   | 03   |
| 29                 | 11    | 02   | 03   | 01   | 02   | 04   | 01   | 05   | 05   | 02   | 13   | 00   | 03   |
| 30                 | 12    | 02   | 03   | 01   | 03   | 05   | 01   | 06   | 06   | 02   | 15   | 00   | 03   |
| 31                 | 13    | 02   | 03   | 02   | 03   | 05   | 01   | 07   | 07   | 02   | 16   | 00   | 04   |
| 32                 | 14    | 02   | 03   | 02   | 03   | 06   | 02   | 07   | 07   | 02   | 17   | 00   | 04   |
| 33                 | 15    | 03   | 04   | 03   | 04   | 07   | 02   | 08   | 08   | 03   | 19   | 00   | 05   |
| 34                 | 16    | 03   | 04   | 03   | 05   | 07   | 02   | 09   | 09   | 03   | 20   | 00   | 05   |
| 35                 | 17    | 03   | 05   | 04   | 05   | 08   | 03   | 11   | 11   | 04   | 22   | 00   | 06   |
| 36                 | 18    | 04   | 06   | 05   | 05   | 09   | 03   | 12   | 12   | 04   | 24   | 00   | 07   |
| 37                 | 19    | 05   | 07   | 06   | 06   | 10   | 03   | 13   | 13   | 05   | 25   | 00   | 08   |
| 38                 | 20    | 06   | 07   | 06   | 07   | 11   | 04   | 14   | 14   | 06   | 27   | 00   | 09   |
| 39                 | 22    | 07   | 08   | 08   | 07   | 12   | 04   | 15   | 15   | 06   | 28   | 00   | 10   |
| 40                 | 24    | 08   | 09   | 09   | 08   | 13   | 05   | 17   | 17   | 07   | 29   | 00   | 11   |
| 41                 | 25    | 09   | 10   | 11   | 08   | 15   | 06   | 19   | 19   | 08   | 31   | 00   | 12   |
| 42                 | 26    | 10   | 11   | 13   | 10   | 17   | 06   | 20   | 20   | 09   | 32   | 00   | 13   |
| 43                 | 28    | 12   | 12   | 16   | 11   | 19   | 07   | 22   | 22   | 10   | 34   | 00   | 15   |
| 44                 | 30    | 13   | 13   | 18   | 12   | 21   | 09   | 24   | 24   | 11   | 35   | 00   | 16   |
| 45                 | 32    | 15   | 15   | 21   | 13   | 23   | 10   | 26   | 26   | 12   | 36   | 00   | 18   |
| 46                 | 34    | 18   | 17   | 25   | 14   | 26   | 12   | 28   | 28   | 13   | 37   | 00   | 21   |
| 47                 | 36    | 21   | 18   | 28   | 16   | 28   | 14   | 30   | 30   | 14   | 38   | 00   | 24   |
| 48                 | 38    | 23   | 20   | 31   | 17   | 32   | 16   | 33   | 33   | 15   | 40   | 01   | 27   |
| 49                 | 40    | 26   | 23   | 35   | 19   | 35   | 18   | 35   | 35   | 17   | 41   | 01   | 29   |
| 50                 | 42    | 29   | 26   | 39   | 21   | 38   | 20   | 37   | 37   | 18   | 43   | 01   | 32   |
| 51                 | 45    | 32   | 28   | 43   | 23   | 41   | 23   | 40   | 40   | 20   | 44   | 01   | 35   |
| 52                 | 47    | 36   | 31   | 47   | 25   | 45   | 26   | 42   | 42   | 22   | 45   | 01   | 38   |
| 53                 | 49    | 39   | 34   | 51   | 27   | 49   | 29   | 45   | 45   | 24   | 46   | 01   | 41   |
| 54                 | 51    | 43   | 37   | 55   | 30   | 53   | 33   | 48   | 48   | 27   | 48   | 02   | 44   |
| 55                 | 54    | 46   | 40   | 59   | 32   | 57   | 36   | 51   | 51   | 29   | 49   | 02   | 47   |
| 56                 | 56    | 50   | 43   | 62   | 34   | 61   | 40   | 54   | 54   | 32   | 51   | 03   | 50   |
| 57                 | 58    | 54   | 46   | 66   | 37   | 65   | 44   | 57   | 57   | 35   | 52   | 04   | 53   |
| 58                 | 61    | 58   | 49   | 69   | 40   | 69   | 48   | 61   | 61   | 38   | 54   | 05   | 57   |
| 59                 | 64    | 61   | 52   | 73   | 42   | 72   | 52   | 64   | 64   | 42   | 55   | 06   | 61   |
| 60                 | 67    | 64   | 55   | 76   | 46   | 76   | 56   | 67   | 67   | 45   | 57   | 07   | 64   |
| 61                 | 70    | 67   | 60   | 80   | 49   | 80   | 61   | 70   | 70   | 49   | 58   | 08   | 67   |
| 62                 | 72    | 71   | 63   | 82   | 52   | 83   | 65   | 73   | 73   | 53   | 60   | 09   | 71   |
| 63                 | 75    | 74   | 67   | 85   | 55   | 85   | 70   | 76   | 76   | 56   | 61   | 11   | 74   |

|    |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 64 | 77   | 77   | 70   | 87   | 59   | 87   | 73   | 79   | 61   | 63   | 13   | 77   | 25   |
| 65 | 80   | 80   | 73   | 90   | 63   | 89   | 77   | 82   | 65   | 64   | 15   | 80   | 27   |
| 66 | 82   | 83   | 77   | 92   | 67   | 91   | 80   | 85   | 69   | 66   | 18   | 84   | 29   |
| 67 | 85   | 86   | 80   | 93   | 71   | 92   | 83   | 87   | 73   | 67   | 20   | 86   | 31   |
| 68 | 87   | 88   | 83   | 94   | 75   | 94   | 87   | 89   | 77   | 69   | 23   | 88   | 34   |
| 69 | 89   | 90   | 86   | 96   | 79   | 95   | 89   | 92   | 81   | 70   | 26   | 91   | 36   |
| 70 | 91   | 92   | 89   | 97   | 83   | 96   | 92   | 94   | 85   | 72   | 30   | 93   | 38   |
| 71 | 93   | 94   | 92   | 97   | 86   | 97   | 94   | 96   | 88   | 73   | 34   | 95   | 41   |
| 72 | 94   | 95   | 94   | 98   | 89   | 98   | 95   | 97   | 90   | 74   | 38   | 96   | 44   |
| 73 | 95   | 96   | 95   | 98   | 91   | 99   | 96   | 97   | 93   | 76   | 41   | 96   | 47   |
| 74 | 96   | 97   | 96   | 99   | 93   | 99.2 | 97   | 98   | 95   | 78   | 46   | 97   | 50   |
| 75 | 97   | 98   | 97   | 99.0 | 94   | 99.5 | 98   | 98   | 96   | 79   | 50   | 98   | 54   |
| 76 | 97   | 99   | 98   | 99.2 | 96   | 99.7 | 98   | 99   | 97   | 81   | 55   | 98   | 57   |
| 77 | 98   | 99.0 | 99   | 99.4 | 97   | 99.8 | 99   | 99.2 | 98   | 82   | 60   | 99   | 61   |
| 78 | 99.0 | 99.4 | 99   | 99.6 | 98   | 99.9 | 99.2 | 99.5 | 99   | 84   | 64   | 99.2 | 65   |
| 79 | 99.4 | 99.6 | 99.4 | 99.8 | 99   | 99.9 | 99.5 | 99.8 | 99.3 | 85   | 68   | 99.7 | 69   |
| 80 | 99.8 | 99.8 | 99.8 | 99.9 | 99.6 | 99.9 | 99.8 | 99.9 | 99.8 | 86   | 72   | 99.9 | 72   |
| 81 |      |      |      |      |      |      |      |      |      | 87   | 77   |      | 76   |
| 82 |      |      |      |      |      |      |      |      |      | 88   | 81   |      | 80   |
| 83 |      |      |      |      |      |      |      |      |      | 89   | 84   |      | 83   |
| 84 |      |      |      |      |      |      |      |      |      | 91   | 87   |      | 86   |
| 85 |      |      |      |      |      |      |      |      |      | 92   | 90   |      | 88   |
| 86 |      |      |      |      |      |      |      |      |      | 93   | 92   |      | 91   |
| 87 |      |      |      |      |      |      |      |      |      | 94   | 94   |      | 92   |
| 88 |      |      |      |      |      |      |      |      |      | 95   | 95   |      | 94   |
| 89 |      |      |      |      |      |      |      |      |      | 96   | 96   |      | 95   |
| 90 |      |      |      |      |      |      |      |      |      | 97   | 97   |      | 96   |
| 91 |      |      |      |      |      |      |      |      |      | 97   | 98   |      | 97   |
| 92 |      |      |      |      |      |      |      |      |      | 98   | 99   |      | 98   |
| 93 |      |      |      |      |      |      |      |      |      | 98   | 99.4 |      | 98   |
| 94 |      |      |      |      |      |      |      |      |      | 99   | 99.6 |      | 99   |
| 95 |      |      |      |      |      |      |      |      |      | 99.2 | 99.8 |      | 99.2 |
| 96 |      |      |      |      |      |      |      |      |      | 99.7 | 99.9 |      | 99.8 |

| Score  | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG  | HNST | EMOT | GENR | TOTAL |
|--------|------|------|------|------|------|------|------|------|------|-------|------|------|------|-------|
| Mean   | 51.2 | 5.55 | 56.8 | 52.8 | 59.1 | 52.1 | 57.6 | 52.9 | 59.3 | 54.8  | 74.3 | 54.8 | 71.3 | 752.3 |
| Median | 5.30 | 5.60 | 58.0 | 53.0 | 62.0 | 53.0 | 58.0 | 55.0 | 61.0 | 56.0  | 75.0 | 56.0 | 74.0 | 755.0 |
| SD     | 15.5 | 10.6 | 11.7 | 09.7 | 12.2 | 11.2 | 9.9  | 12.8 | 11.3 | 21.3  | 8.9  | 11.6 | 13.3 | 86.5  |
| Skew   | -.49 | -.38 | -.72 | -.06 | -.86 | -.59 | -.57 | -.52 | -.92 | -.04  | -.37 | -.54 | -.90 | -.18  |
| Kurt   | -.44 | .10  | .53  | -.11 | .61  | .49  | .56  | -.20 | .85  | -1.02 | .03  | .19  | .81  | .15   |
| Rxx    | .94  | .86  | .92  | .84  | .94  | .90  | .87  | .92  | .89  | .95   | .74  | .89  | .93  | .96   |

## Corr's With:

| Year | .04  | .11  | .13 | .12  | .03  | .23  | -.12 | .00 | -.03 | -.05 | .09 | .05  | .06  | .08  |
|------|------|------|-----|------|------|------|------|-----|------|------|-----|------|------|------|
| Sex  | -.16 | -.01 | .00 | -.23 | -.21 | -.33 | .03  | .16 | -.03 | .17  | .03 | -.14 | -.14 | -.12 |



## Appendix IB

Cumulative Percentage Distribution For Men Less Than 21 Years Old (N=611)

## Self-concept scale

| Raw | Score | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT | GENR |
|-----|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 8   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 9   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 10  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 11  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 12  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 13  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 00   |
| 14  | 00    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 02   | 00   | 00   | 00   |
| 15  | 00    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 03   | 00   | 00   | 00   |
| 16  | 01    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 04   | 00   | 00   | 00   |
| 17  | 01    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 05   | 00   | 00   | 00   |
| 18  | 01    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 06   | 00   | 01   | 00   |
| 19  | 02    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 08   | 00   | 00   | 00   |
| 20  | 02    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 09   | 00   | 00   | 00   |
| 21  | 03    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 10   | 00   | 00   | 00   |
| 22  | 03    | 00   | 01   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 10   | 00   | 00   | 00   |
| 23  | 04    | 00   | 02   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 11   | 00   | 01   | 00   |
| 24  | 05    | 00   | 02   | 00   | 00   | 01   | 00   | 01   | 00   | 00   | 13   | 00   | 01   | 00   |
| 25  | 05    | 00   | 02   | 00   | 00   | 01   | 00   | 02   | 01   | 00   | 14   | 00   | 01   | 01   |
| 26  | 05    | 01   | 02   | 00   | 00   | 01   | 00   | 02   | 01   | 01   | 15   | 00   | 01   | 01   |
| 27  | 06    | 01   | 03   | 00   | 00   | 01   | 00   | 02   | 01   | 01   | 16   | 00   | 01   | 01   |
| 28  | 07    | 01   | 03   | 00   | 00   | 01   | 00   | 03   | 01   | 01   | 17   | 00   | 01   | 01   |
| 29  | 08    | 01   | 04   | 00   | 00   | 01   | 01   | 03   | 01   | 01   | 19   | 00   | 01   | 01   |
| 30  | 09    | 02   | 05   | 00   | 01   | 01   | 01   | 04   | 01   | 01   | 21   | 00   | 01   | 01   |
| 31  | 10    | 02   | 05   | 00   | 02   | 01   | 01   | 06   | 01   | 01   | 22   | 00   | 02   | 01   |
| 32  | 12    | 02   | 05   | 00   | 02   | 02   | 01   | 07   | 01   | 01   | 24   | 00   | 02   | 01   |
| 33  | 13    | 02   | 06   | 00   | 02   | 02   | 01   | 08   | 01   | 01   | 26   | 00   | 03   | 01   |
| 34  | 15    | 02   | 07   | 00   | 02   | 02   | 01   | 09   | 02   | 02   | 28   | 00   | 03   | 01   |
| 35  | 16    | 03   | 08   | 01   | 02   | 03   | 02   | 10   | 03   | 03   | 30   | 00   | 04   | 02   |
| 36  | 17    | 04   | 09   | 01   | 02   | 04   | 02   | 11   | 04   | 04   | 32   | 00   | 04   | 02   |
| 37  | 17    | 05   | 10   | 01   | 02   | 04   | 02   | 13   | 05   | 05   | 34   | 00   | 05   | 02   |
| 38  | 18    | 06   | 11   | 01   | 02   | 05   | 02   | 14   | 05   | 05   | 35   | 00   | 06   | 03   |
| 39  | 20    | 07   | 12   | 03   | 02   | 06   | 03   | 15   | 05   | 05   | 36   | 00   | 07   | 03   |
| 40  | 22    | 08   | 13   | 05   | 02   | 06   | 03   | 17   | 06   | 06   | 38   | 00   | 08   | 03   |
| 41  | 24    | 10   | 13   | 06   | 03   | 07   | 03   | 18   | 07   | 07   | 39   | 00   | 10   | 03   |
| 42  | 25    | 11   | 14   | 06   | 03   | 08   | 04   | 20   | 07   | 07   | 41   | 00   | 12   | 04   |
| 43  | 26    | 13   | 15   | 11   | 04   | 10   | 04   | 22   | 08   | 08   | 43   | 00   | 13   | 04   |
| 44  | 28    | 16   | 17   | 13   | 05   | 11   | 05   | 23   | 09   | 09   | 45   | 00   | 15   | 04   |
| 45  | 30    | 18   | 19   | 16   | 05   | 14   | 07   | 25   | 10   | 10   | 46   | 00   | 17   | 04   |
| 46  | 31    | 21   | 21   | 19   | 06   | 16   | 08   | 28   | 11   | 11   | 47   | 01   | 20   | 04   |
| 47  | 33    | 24   | 22   | 22   | 08   | 19   | 09   | 31   | 13   | 13   | 48   | 01   | 22   | 05   |
| 48  | 35    | 27   | 24   | 26   | 09   | 23   | 12   | 34   | 14   | 14   | 49   | 01   | 25   | 05   |
| 49  | 37    | 30   | 27   | 30   | 11   | 26   | 14   | 36   | 16   | 16   | 51   | 01   | 28   | 05   |
| 50  | 39    | 33   | 31   | 34   | 13   | 30   | 16   | 38   | 18   | 18   | 52   | 01   | 31   | 05   |
| 51  | 42    | 37   | 34   | 39   | 14   | 34   | 19   | 42   | 20   | 20   | 54   | 01   | 35   | 06   |
| 52  | 45    | 41   | 37   | 44   | 16   | 39   | 22   | 45   | 23   | 23   | 55   | 01   | 37   | 06   |
| 53  | 48    | 45   | 40   | 48   | 18   | 44   | 25   | 47   | 25   | 25   | 56   | 02   | 39   | 07   |
| 54  | 51    | 48   | 42   | 52   | 20   | 48   | 29   | 50   | 28   | 28   | 57   | 03   | 43   | 08   |
| 55  | 54    | 52   | 46   | 56   | 23   | 52   | 34   | 54   | 30   | 30   | 58   | 04   | 46   | 09   |
| 56  | 57    | 56   | 48   | 61   | 26   | 55   | 39   | 57   | 33   | 33   | 60   | 05   | 51   | 10   |
| 57  | 59    | 59   | 51   | 65   | 29   | 59   | 43   | 60   | 36   | 36   | 61   | 06   | 56   | 11   |
| 58  | 63    | 63   | 54   | 70   | 31   | 65   | 48   | 63   | 39   | 39   | 63   | 08   | 59   | 13   |
| 59  | 66    | 68   | 57   | 75   | 34   | 69   | 52   | 67   | 42   | 42   | 65   | 09   | 63   | 13   |
| 60  | 70    | 71   | 62   | 79   | 37   | 74   | 56   | 70   | 45   | 45   | 66   | 11   | 66   | 14   |
| 61  | 73    | 74   | 66   | 83   | 40   | 79   | 60   | 73   | 49   | 49   | 68   | 13   | 69   | 16   |
| 62  | 77    | 77   | 70   | 85   | 43   | 82   | 65   | 76   | 52   | 52   | 69   | 13   | 69   | 16   |

|    |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 63 | 78   | 81   | 73   | 87   | 47   | 85   | 70   | 79   | 57   | 69   | 15   | 72   | 18   |
| 64 | 80   | 83   | 75   | 90   | 51   | 88   | 74   | 82   | 62   | 71   | 18   | 75   | 20   |
| 65 | 82   | 85   | 79   | 93   | 57   | 90   | 78   | 84   | 66   | 72   | 21   | 79   | 23   |
| 66 | 85   | 87   | 82   | 94   | 62   | 91   | 81   | 86   | 69   | 73   | 23   | 82   | 25   |
| 67 | 87   | 89   | 85   | 95   | 66   | 93   | 84   | 88   | 73   | 74   | 26   | 84   | 27   |
| 68 | 89   | 91   | 88   | 95   | 71   | 94   | 87   | 90   | 77   | 75   | 29   | 87   | 30   |
| 69 | 91   | 92   | 90   | 96   | 75   | 95   | 89   | 92   | 82   | 77   | 33   | 91   | 33   |
| 70 | 93   | 94   | 93   | 97   | 80   | 96   | 91   | 93   | 85   | 78   | 37   | 93   | 35   |
| 71 | 94   | 95   | 95   | 97   | 86   | 97   | 94   | 94   | 89   | 79   | 41   | 95   | 38   |
| 72 | 94   | 96   | 96   | 97   | 89   | 98   | 95   | 96   | 91   | 80   | 45   | 96   | 42   |
| 73 | 95   | 97   | 97   | 98   | 91   | 98   | 96   | 97   | 93   | 81   | 49   | 97   | 46   |
| 74 | 96   | 97   | 98   | 98   | 93   | 99   | 97   | 97   | 94   | 82   | 53   | 98   | 49   |
| 75 | 96   | 98   | 99   | 99   | 94   | 99.4 | 97   | 98   | 96   | 83   | 57   | 99   | 53   |
| 76 | 97   | 99   | 99.0 | 99   | 95   | 99.6 | 98   | 98   | 97   | 84   | 61   | 99.0 | 57   |
| 77 | 97   | 99.1 | 99.4 | 99   | 97   | 99.7 | 98   | 99   | 98   | 85   | 66   | 99.4 | 61   |
| 78 | 98   | 99.2 | 99.4 | 99.0 | 98   | 99.9 | 99   | 99.3 | 99   | 86   | 70   | 99.6 | 65   |
| 79 | 99.2 | 99.6 | 99.6 | 99.1 | 98   | 99.9 | 99   | 99.4 | 99.1 | 87   | 74   | 99.7 | 69   |
| 80 | 99.7 | 99.9 | 99.8 | 99.7 | 99.2 | 99.9 | 99.5 | 99.8 | 99.6 | 88   | 79   | 99.9 | 72   |
| 81 |      |      |      |      |      |      |      |      |      | 89   | 82   |      | 76   |
| 82 |      |      |      |      |      |      |      |      |      | 90   | 86   |      | 79   |
| 83 |      |      |      |      |      |      |      |      |      | 90   | 89   |      | 83   |
| 84 |      |      |      |      |      |      |      |      |      | 91   | 91   |      | 86   |
| 85 |      |      |      |      |      |      |      |      |      | 91   | 93   |      | 88   |
| 86 |      |      |      |      |      |      |      |      |      | 92   | 94   |      | 91   |
| 87 |      |      |      |      |      |      |      |      |      | 92   | 95   |      | 93   |
| 88 |      |      |      |      |      |      |      |      |      | 93   | 96   |      | 94   |
| 89 |      |      |      |      |      |      |      |      |      | 94   | 97   |      | 95   |
| 90 |      |      |      |      |      |      |      |      |      | 95   | 98   |      | 96   |
| 91 |      |      |      |      |      |      |      |      |      | 96   | 99   |      | 96   |
| 92 |      |      |      |      |      |      |      |      |      | 97   | 99.0 |      | 97   |
| 93 |      |      |      |      |      |      |      |      |      | 97   | 99.5 |      | 97   |
| 94 |      |      |      |      |      |      |      |      |      | 98   | 99.6 |      | 98   |
| 95 |      |      |      |      |      |      |      |      |      | 98   | 99.9 |      | 98.  |
| 96 |      |      |      |      |      |      |      |      |      | 99.2 | 99.9 |      | 99.4 |

Score MATH VERB ACAD PROB PHYS APPR SSEX OSEX PRNT RELG HNST EMOT GENR TOTAL

Mean 51.6 54.3 54.7 53.6 61.9 54.2 58.3 52.7 59.5 51.1 72.7 55.9 72.4 752.8

Median 54.0 55.0 57.0 54.0 64.0 55.0 59.0 54.0 61.0 49.0 73.0 57.0 74.0 755.0

SD 14.6 10.3 12.3 8.4 9.7 6.1 9.0 12.3 10.8 22.2 9.0 10.5 12.4 82.0

Skew -.45 -.15 -.81 .28 -.75 -.38 -.37 -.32 -.79 .22 -.25 -.45 -1.0 -.14

Kurt -.30 -.03 .62 .19 .71 .70 .66 -.35 .69 -.89 -.16 .06 1.7 .09



## Appendix IC

Cumulative Percentage Distribution For Men Greater Than 21 Years Old (N=878)

## Self-concept scale

| Raw | Score | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT | GENR |
|-----|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 8   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 9   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 10  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 11  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 12  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 13  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 14  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 00   |
| 15  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 02   | 00   | 00   | 00   |
| 16  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 02   | 00   | 00   | 00   |
| 17  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 03   | 00   | 00   | 00   |
| 18  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 04   | 00   | 00   | 00   |
| 19  | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 04   | 00   | 01   | 00   |
| 20  | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 05   | 00   | 00   | 00   |
| 21  | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 06   | 00   | 01   | 00   |
| 22  | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 07   | 00   | 01   | 00   |
| 23  | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 02   | 00   | 08   | 00   | 01   | 00   |
| 24  | 03    | 00   | 00   | 00   | 00   | 01   | 01   | 00   | 02   | 00   | 09   | 00   | 01   | 00   |
| 25  | 03    | 01   | 00   | 00   | 00   | 01   | 01   | 01   | 03   | 01   | 10   | 00   | 01   | 00   |
| 26  | 04    | 01   | 01   | 00   | 00   | 01   | 01   | 01   | 04   | 01   | 11   | 00   | 02   | 00   |
| 27  | 05    | 01   | 01   | 00   | 00   | 01   | 01   | 01   | 05   | 01   | 12   | 00   | 02   | 00   |
| 28  | 06    | 01   | 01   | 00   | 00   | 01   | 02   | 01   | 05   | 01   | 13   | 00   | 02   | 00   |
| 29  | 07    | 01   | 01   | 00   | 00   | 01   | 02   | 01   | 06   | 01   | 16   | 00   | 02   | 00   |
| 30  | 08    | 01   | 01   | 00   | 00   | 01   | 02   | 02   | 07   | 01   | 18   | 00   | 03   | 00   |
| 31  | 08    | 02   | 01   | 00   | 00   | 02   | 03   | 02   | 08   | 01   | 19   | 00   | 03   | 00   |
| 32  | 09    | 02   | 02   | 00   | 00   | 02   | 03   | 02   | 09   | 02   | 21   | 00   | 03   | 00   |
| 33  | 10    | 02   | 02   | 01   | 00   | 02   | 03   | 02   | 10   | 02   | 22   | 00   | 04   | 00   |
| 34  | 11    | 02   | 02   | 01   | 00   | 02   | 04   | 03   | 11   | 02   | 24   | 00   | 04   | 00   |
| 35  | 12    | 03   | 03   | 01   | 00   | 02   | 04   | 03   | 12   | 03   | 26   | 00   | 04   | 01   |
| 36  | 13    | 03   | 03   | 02   | 00   | 03   | 04   | 04   | 13   | 03   | 28   | 00   | 05   | 01   |
| 37  | 13    | 04   | 04   | 02   | 00   | 03   | 04   | 04   | 15   | 04   | 29   | 00   | 06   | 01   |
| 38  | 14    | 04   | 05   | 03   | 00   | 03   | 05   | 05   | 16   | 05   | 31   | 00   | 07   | 01   |
| 39  | 15    | 05   | 06   | 04   | 00   | 04   | 06   | 06   | 17   | 05   | 32   | 00   | 08   | 01   |
| 40  | 17    | 06   | 07   | 05   | 00   | 05   | 07   | 07   | 18   | 06   | 34   | 00   | 09   | 01   |
| 41  | 18    | 07   | 08   | 06   | 00   | 05   | 08   | 08   | 20   | 07   | 36   | 00   | 10   | 02   |
| 42  | 20    | 08   | 10   | 08   | 00   | 06   | 10   | 09   | 22   | 09   | 38   | 00   | 11   | 02   |
| 43  | 21    | 09   | 11   | 10   | 00   | 07   | 11   | 10   | 24   | 10   | 39   | 00   | 12   | 03   |
| 44  | 23    | 10   | 12   | 12   | 00   | 08   | 12   | 12   | 26   | 11   | 40   | 00   | 14   | 03   |
| 45  | 25    | 12   | 13   | 15   | 00   | 09   | 14   | 13   | 28   | 11   | 42   | 00   | 15   | 04   |
| 46  | 27    | 15   | 15   | 18   | 00   | 10   | 15   | 15   | 30   | 12   | 43   | 00   | 18   | 04   |
| 47  | 29    | 18   | 16   | 21   | 00   | 12   | 17   | 17   | 32   | 13   | 43   | 00   | 21   | 04   |
| 48  | 31    | 21   | 17   | 25   | 00   | 13   | 19   | 18   | 35   | 15   | 44   | 00   | 23   | 05   |
| 49  | 33    | 24   | 20   | 27   | 00   | 15   | 22   | 21   | 37   | 16   | 46   | 00   | 25   | 06   |
| 50  | 35    | 26   | 23   | 31   | 00   | 16   | 24   | 24   | 39   | 17   | 47   | 00   | 28   | 06   |
| 51  | 37    | 29   | 25   | 35   | 00   | 18   | 26   | 28   | 42   | 18   | 48   | 01   | 31   | 07   |
| 52  | 40    | 33   | 28   | 38   | 00   | 20   | 30   | 31   | 44   | 20   | 50   | 01   | 34   | 07   |
| 53  | 42    | 36   | 30   | 42   | 00   | 23   | 35   | 34   | 47   | 22   | 51   | 01   | 37   | 08   |
| 54  | 45    | 40   | 33   | 46   | 00   | 25   | 41   | 37   | 49   | 25   | 52   | 02   | 40   | 09   |
| 55  | 47    | 44   | 36   | 49   | 00   | 27   | 46   | 40   | 53   | 27   | 53   | 02   | 43   | 10   |
| 56  | 49    | 47   | 38   | 53   | 00   | 30   | 50   | 44   | 56   | 30   | 55   | 02   | 46   | 11   |
| 57  | 51    | 51   | 41   | 57   | 00   | 33   | 55   | 47   | 60   | 33   | 56   | 03   | 49   | 12   |
| 58  | 54    | 55   | 44   | 60   | 00   | 36   | 59   | 51   | 63   | 37   | 58   | 04   | 53   | 13   |
| 59  | 56    | 58   | 47   | 64   | 00   | 39   | 63   | 54   | 66   | 41   | 59   | 05   | 57   | 14   |
| 60  | 59    | 61   | 50   | 68   | 00   | 43   | 68   | 58   | 70   | 44   | 60   | 05   | 60   | 15   |
| 61  | 63    | 63   | 54   | 71   | 00   | 46   | 72   | 62   | 73   | 49   | 61   | 06   | 63   | 16   |
| 62  | 66    | 67   | 58   | 75   | 00   | 50   | 76   | 66   | 76   | 52   | 62   | 08   | 67   | 17   |

|    |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 63 | 68   | 70   | 62   | 78   | 54   | 78   | 71   | 79   | 56   | 63   | 10   | 71   | 19   |
| 64 | 71   | 74   | 66   | 81   | 58   | 81   | 75   | 82   | 61   | 64   | 12   | 74   | 20   |
| 65 | 75   | 78   | 69   | 85   | 62   | 84   | 78   | 84   | 65   | 65   | 14   | 78   | 21   |
| 66 | 78   | 81   | 72   | 87   | 67   | 86   | 82   | 87   | 70   | 66   | 17   | 82   | 23   |
| 67 | 80   | 83   | 76   | 89   | 70   | 89   | 85   | 89   | 74   | 68   | 19   | 85   | 26   |
| 68 | 83   | 86   | 79   | 91   | 74   | 91   | 88   | 91   | 78   | 69   | 22   | 87   | 28   |
| 69 | 85   | 88   | 83   | 93   | 78   | 93   | 92   | 93   | 82   | 71   | 24   | 90   | 31   |
| 70 | 88   | 91   | 88   | 95   | 81   | 94   | 94   | 95   | 86   | 72   | 28   | 92   | 33   |
| 71 | 90   | 93   | 91   | 96   | 84   | 96   | 95   | 96   | 89   | 74   | 32   | 94   | 36   |
| 72 | 93   | 95   | 93   | 97   | 87   | 97   | 97   | 97   | 91   | 75   | 36   | 94   | 38   |
| 73 | 94   | 96   | 94   | 97   | 89   | 98   | 97   | 98   | 94   | 76   | 38   | 95   | 41   |
| 74 | 95   | 97   | 95   | 98   | 92   | 99   | 98   | 98   | 96   | 78   | 42   | 96   | 45   |
| 75 | 96   | 98   | 96   | 98   | 94   | 99.1 | 99   | 99   | 97   | 79   | 47   | 96   | 49   |
| 76 | 97   | 99   | 97   | 99   | 95   | 99.3 | 99   | 99.1 | 98   | 80   | 52   | 97   | 53   |
| 77 | 98   | 99.1 | 98   | 99.2 | 97   | 99.6 | 99.3 | 99.3 | 99   | 82   | 57   | 98   | 57   |
| 78 | 9.0  | 99.5 | 98   | 99.6 | 98   | 99.7 | 99.7 | 99.4 | 99.2 | 83   | 61   | 98   | 61   |
| 79 | 99.3 | 99.7 | 99   | 99.7 | 99   | 99.9 | 99.8 | 99.6 | 99.7 | 85   | 65   | 99.1 | 66   |
| 80 | 99.7 | 99.9 | 99.6 | 99.9 | 99.5 | 99.9 | 99.9 | 99.8 | 99.9 | 86   | 69   | 99.7 | 69   |
| 81 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 82 |      |      |      |      |      |      |      |      |      | 87   | 73   |      | 72   |
| 83 |      |      |      |      |      |      |      |      |      | 88   | 78   |      | 77   |
| 84 |      |      |      |      |      |      |      |      |      | 89   | 82   |      | 81   |
| 85 |      |      |      |      |      |      |      |      |      | 90   | 85   |      | 85   |
| 86 |      |      |      |      |      |      |      |      |      | 91   | 88   |      | 87   |
| 87 |      |      |      |      |      |      |      |      |      | 92   | 91   |      | 89   |
| 88 |      |      |      |      |      |      |      |      |      | 93   | 93   |      | 91   |
| 89 |      |      |      |      |      |      |      |      |      | 95   | 95   |      | 92   |
| 90 |      |      |      |      |      |      |      |      |      | 96   | 96   |      | 94   |
| 91 |      |      |      |      |      |      |      |      |      | 97   | 97   |      | 95   |
| 92 |      |      |      |      |      |      |      |      |      | 98   | 98   |      | 96   |
| 93 |      |      |      |      |      |      |      |      |      | 99   | 99   |      | 97   |
| 94 |      |      |      |      |      |      |      |      |      | 99   | 99.1 |      | 98   |
| 95 |      |      |      |      |      |      |      |      |      | 99   | 99.6 |      | 98   |
| 96 |      |      |      |      |      |      |      |      |      | 99.3 | 99.9 |      | 99.3 |
|    |      |      |      |      |      |      |      |      |      | 99.8 | 99.9 |      | 99.8 |

| Score  | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT | GENR | TOTAL |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Mean   | 54.2 | 56.5 | 58.2 | 55.1 | 60.4 | 55.4 | 56.6 | 52.0 | 59.6 | 53.2 | 74.9 | 56.0 | 73.0 | 765.1 |
| Median | 56.0 | 57.0 | 60.0 | 55.0 | 62.0 | 56.0 | 58.0 | 54.0 | 61.0 | 52.0 | 76.0 | 57.0 | 75.0 | 767.5 |
| SD     | 14.2 | 10.3 | 11.0 | 9.4  | 10.9 | 10.0 | 10.2 | 12.9 | 10.7 | 21.9 | 8.8  | 11.4 | 12.4 | 86.8  |
| Skew   | -.55 | -.39 | -.54 | -.02 | -.81 | -.63 | -.61 | -.49 | -.88 | .08  | -.36 | -.54 | -.88 | -.22  |
| Kurt   | -.36 | .07  | -.07 | -.43 | .82  | .94  | .32  | -.34 | .67  | -1.1 | -.07 | .37  | .70  | .33   |



## Appendix ID

Cumulative Percentage Distribution For Women Less Than 21 Years Old (N=585)

## Self-concept scale

| Raw | Score | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT | GENR |
|-----|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 8   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 9   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 10  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 11  | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 12  | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 13  | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 14  | 03    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 01   | 00   | 00   | 00   | 00   | 00   |
| 15  | 03    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 01   | 00   | 00   | 00   | 00   | 00   |
| 16  | 03    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 01   | 00   | 00   | 00   | 00   | 00   |
| 17  | 04    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 01   | 00   | 01   | 00   | 00   | 00   |
| 18  | 05    | 00   | 00   | 00   | 00   | 01   | 02   | 00   | 01   | 00   | 01   | 00   | 01   | 00   |
| 19  | 05    | 00   | 00   | 00   | 00   | 01   | 02   | 00   | 02   | 00   | 02   | 00   | 01   | 00   |
| 20  | 06    | 00   | 00   | 00   | 00   | 01   | 03   | 00   | 02   | 00   | 02   | 00   | 01   | 00   |
| 21  | 07    | 00   | 01   | 00   | 02   | 03   | 00   | 02   | 00   | 02   | 00   | 00   | 01   | 00   |
| 22  | 07    | 00   | 01   | 00   | 02   | 04   | 00   | 02   | 01   | 03   | 00   | 00   | 02   | 00   |
| 23  | 08    | 00   | 01   | 00   | 03   | 05   | 00   | 03   | 01   | 04   | 00   | 00   | 02   | 00   |
| 24  | 09    | 00   | 01   | 00   | 03   | 06   | 00   | 03   | 01   | 04   | 00   | 00   | 02   | 00   |
| 25  | 10    | 00   | 01   | 01   | 04   | 07   | 00   | 03   | 01   | 05   | 00   | 00   | 03   | 00   |
| 26  | 11    | 01   | 02   | 01   | 04   | 08   | 00   | 04   | 01   | 05   | 00   | 00   | 03   | 01   |
| 27  | 11    | 01   | 02   | 01   | 05   | 09   | 00   | 05   | 01   | 06   | 00   | 00   | 04   | 01   |
| 28  | 12    | 01   | 03   | 02   | 06   | 10   | 00   | 05   | 02   | 06   | 00   | 00   | 04   | 01   |
| 29  | 13    | 01   | 03   | 02   | 06   | 11   | 00   | 06   | 02   | 07   | 00   | 00   | 05   | 01   |
| 30  | 14    | 01   | 03   | 03   | 07   | 13   | 01   | 07   | 03   | 07   | 00   | 00   | 05   | 01   |
| 31  | 16    | 02   | 03   | 03   | 07   | 14   | 01   | 08   | 03   | 08   | 00   | 00   | 06   | 01   |
| 32  | 17    | 02   | 03   | 05   | 09   | 16   | 01   | 08   | 03   | 08   | 00   | 00   | 07   | 01   |
| 33  | 18    | 03   | 03   | 06   | 10   | 18   | 02   | 09   | 04   | 09   | 00   | 00   | 08   | 01   |
| 34  | 20    | 03   | 04   | 06   | 11   | 20   | 02   | 10   | 05   | 11   | 00   | 00   | 09   | 01   |
| 35  | 21    | 04   | 04   | 08   | 12   | 21   | 02   | 11   | 06   | 12   | 00   | 00   | 10   | 02   |
| 36  | 22    | 04   | 05   | 09   | 13   | 23   | 02   | 12   | 07   | 12   | 00   | 00   | 11   | 02   |
| 37  | 23    | 05   | 05   | 10   | 14   | 24   | 03   | 13   | 07   | 13   | 00   | 00   | 13   | 03   |
| 38  | 25    | 06   | 06   | 11   | 15   | 26   | 03   | 14   | 08   | 14   | 00   | 00   | 15   | 04   |
| 39  | 27    | 07   | 07   | 12   | 16   | 27   | 03   | 16   | 08   | 15   | 00   | 00   | 17   | 04   |
| 40  | 29    | 07   | 07   | 14   | 17   | 29   | 03   | 18   | 09   | 15   | 00   | 00   | 19   | 04   |
| 41  | 31    | 09   | 08   | 16   | 19   | 32   | 04   | 19   | 10   | 16   | 00   | 00   | 21   | 05   |
| 42  | 33    | 10   | 09   | 19   | 20   | 35   | 04   | 21   | 11   | 17   | 00   | 00   | 21   | 05   |
| 43  | 35    | 11   | 10   | 22   | 21   | 39   | 05   | 24   | 12   | 18   | 00   | 00   | 22   | 06   |
| 44  | 37    | 13   | 11   | 26   | 23   | 41   | 07   | 26   | 12   | 20   | 00   | 00   | 24   | 06   |
| 45  | 40    | 16   | 13   | 30   | 24   | 44   | 08   | 28   | 13   | 21   | 00   | 00   | 26   | 07   |
| 46  | 42    | 18   | 15   | 34   | 26   | 47   | 10   | 29   | 14   | 21   | 00   | 00   | 29   | 07   |
| 47  | 44    | 20   | 18   | 38   | 27   | 51   | 12   | 30   | 16   | 23   | 00   | 00   | 32   | 08   |
| 48  | 47    | 23   | 20   | 42   | 28   | 55   | 14   | 32   | 17   | 24   | 00   | 00   | 36   | 09   |
| 49  | 48    | 26   | 23   | 47   | 30   | 59   | 15   | 34   | 18   | 26   | 00   | 00   | 38   | 10   |
| 50  | 50    | 29   | 26   | 52   | 33   | 62   | 17   | 36   | 20   | 28   | 01   | 01   | 41   | 11   |
| 51  | 52    | 33   | 29   | 57   | 36   | 66   | 20   | 39   | 22   | 30   | 01   | 01   | 44   | 12   |
| 52  | 55    | 37   | 32   | 62   | 38   | 70   | 23   | 41   | 24   | 31   | 01   | 01   | 48   | 14   |
| 53  | 56    | 41   | 35   | 67   | 41   | 73   | 26   | 44   | 26   | 33   | 01   | 01   | 51   | 14   |
| 54  | 58    | 45   | 39   | 70   | 42   | 76   | 28   | 47   | 29   | 34   | 02   | 02   | 53   | 15   |
| 55  | 60    | 48   | 43   | 73   | 45   | 79   | 32   | 50   | 31   | 36   | 02   | 02   | 56   | 16   |
| 56  | 62    | 52   | 47   | 76   | 47   | 81   | 37   | 53   | 34   | 37   | 03   | 03   | 59   | 18   |
| 57  | 65    | 56   | 51   | 78   | 50   | 83   | 41   | 56   | 37   | 39   | 04   | 04   | 63   | 20   |
| 58  | 67    | 60   | 53   | 81   | 52   | 85   | 46   | 59   | 40   | 41   | 05   | 05   | 65   | 21   |
| 59  | 70    | 63   | 56   | 83   | 56   | 87   | 52   | 62   | 43   | 43   | 06   | 06   | 69   | 22   |
| 60  | 72    | 67   | 59   | 85   | 60   | 89   | 56   | 65   | 46   | 45   | 07   | 07   | 72   | 24   |
| 61  | 74    | 70   | 64   | 88   | 62   | 91   | 60   | 68   | 50   | 46   | 08   | 08   | 74   | 26   |
| 62  | 76    | 73   | 69   | 89   | 66   | 93   | 64   | 71   | 54   | 48   | 09   | 09   | 77   | 28   |

|    |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 63 | 78   | 77   | 72   | 91   | 69   | 94   | 69   | 73   | 58   | 51   | 11   | 79   | 30   |
| 64 | 80   | 80   | 75   | 92   | 71   | 95   | 71   | 77   | 61   | 53   | 13   | 82   | 32   |
| 65 | 83   | 82   | 78   | 94   | 74   | 96   | 74   | 80   | 65   | 54   | 14   | 85   | 35   |
| 66 | 85   | 84   | 81   | 95   | 77   | 97   | 77   | 83   | 68   | 57   | 16   | 87   | 38   |
| 67 | 88   | 87   | 84   | 96   | 80   | 98   | 81   | 86   | 72   | 58   | 19   | 89   | 41   |
| 68 | 90   | 90   | 86   | 97   | 83   | 99   | 85   | 88   | 76   | 60   | 22   | 91   | 44   |
| 69 | 91   | 92   | 88   | 97   | 86   | 99   | 89   | 91   | 81   | 61   | 26   | 93   | 46   |
| 70 | 92   | 93   | 91   | 98   | 88   | 99.3 | 91   | 93   | 84   | 63   | 29   | 95   | 48   |
| 71 | 94   | 94   | 92   | 99   | 90   | 99.6 | 93   | 95   | 86   | 64   | 33   | 96   | 51   |
| 72 | 95   | 95   | 94   | 99.0 | 92   | 99.7 | 95   | 96   | 88   | 66   | 37   | 97   | 54   |
| 73 | 96   | 96   | 95   | 99.3 | 94   | 99.9 | 96   | 97   | 91   | 68   | 42   | 98   | 56   |
| 74 | 96   | 97   | 96   | 99.6 | 95   | 99.9 | 96   | 98   | 93   | 71   | 48   | 98   | 59   |
| 75 | 97   | 98   | 97   | 99.9 | 96   | 99.9 | 97   | 98   | 96   | 73   | 54   | 98   | 62   |
| 76 | 98   | 98   | 98   | 99.9 | 98   | 99.9 | 98   | 99   | 97   | 76   | 58   | 99   | 66   |
| 77 | 99   | 99   | 99   | 99.9 | 99   | 99.9 | 99   | 99.2 | 98   | 78   | 62   | 99.4 | 70   |
| 78 | 99.3 | 99.0 | 99.0 | 99.9 | 99   | 99.9 | 99.1 | 99.3 | 99   | 80   | 66   | 99.9 | 73   |
| 79 | 99.7 | 99.2 | 99.4 | 99.9 | 99.4 | 99.9 | 99.6 | 99.6 | 99.1 | 81   | 69   | 99.9 | 76   |
| 80 | 99.9 | 99.6 | 99.7 | 99.9 | 99.9 | 99.9 | 99.9 | 99.9 | 99.6 | 83   | 75   | 99.9 | 80   |
| 81 |      |      |      |      |      |      |      |      |      | 84   | 79   |      | 84   |
| 82 |      |      |      |      |      |      |      |      |      | 85   | 83   |      | 86   |
| 83 |      |      |      |      |      |      |      |      |      | 87   | 86   |      | 88   |
| 84 |      |      |      |      |      |      |      |      |      | 90   | 88   |      | 90   |
| 85 |      |      |      |      |      |      |      |      |      | 92   | 90   |      | 92   |
| 86 |      |      |      |      |      |      |      |      |      | 93   | 93   |      | 93   |
| 87 |      |      |      |      |      |      |      |      |      | 94   | 95   |      | 95   |
| 88 |      |      |      |      |      |      |      |      |      | 95   | 96   |      | 96   |
| 89 |      |      |      |      |      |      |      |      |      | 96   | 97   |      | 97   |
| 90 |      |      |      |      |      |      |      |      |      | 97   | 98   |      | 98   |
| 91 |      |      |      |      |      |      |      |      |      | 98   | 99   |      | 98   |
| 92 |      |      |      |      |      |      |      |      |      | 99   | 99.0 |      | 99   |
| 93 |      |      |      |      |      |      |      |      |      | 99.2 | 99.4 |      | 99.0 |
| 94 |      |      |      |      |      |      |      |      |      | 99.6 | 99.6 |      | 99.3 |
| 95 |      |      |      |      |      |      |      |      |      | 99.7 | 99.7 |      | 99.6 |
| 96 |      |      |      |      |      |      |      |      |      | 99.9 | 99.9 |      | 99.9 |

MATH VERB ACAD PROB PHYS APPR SSEX OSEX PRNT RELG HNST EMOT GENR Total

Mean 48.6 55.2 56.3 49.7 54.4 45.3 58.4 53.0 58.8 61.0 74.0 52.0 68.4 734.9

Median 50.0 56.0 57.0 50.0 57.0 47.0 59.0 55.0 61.0 63.0 74.0 53.0 71.0 735.0

SD 16.2 10.5 11.2 9.7 14.2 12.2 9.4 13.5 12.1 18.8 8.6 12.4 13.8 84.0

Skew -.37 -.30 -.67 -.02 -.62 -.36 -.51 -.62 -.89 -.41 -.41 -.42 -.74 -.07

Kurt -.57 .24 .96 .14 -.24 -.32 .63 -.08 .56 -.59 .24 -.16 .38 .20



## Appendix IE

Cumulative Percentage Distribution For Women Greater Than 21 Years Old (N=311)

## Self-concept scale

| Raw | Score | MATH | VERB | ACAD | PROB | PHYS | APPR | SSEX | OSEX | PRNT | RELG | HNST | EMOT | GENR |
|-----|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 8   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 9   | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 10  | 00    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 11  | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |      |      | 00   |      |
| 12  | 01    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 13  | 02    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 14  | 04    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 15  | 04    | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   |
| 16  | 05    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 01   | 01   | 00   | 00   | 00   |
| 17  | 06    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 01   | 01   | 00   | 00   | 00   |
| 18  | 07    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 01   | 01   | 00   | 00   | 00   |
| 19  | 08    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 01   | 01   | 00   | 00   | 00   |
| 20  | 10    | 00   | 00   | 00   | 00   | 00   | 01   | 00   | 00   | 01   | 02   | 00   | 00   | 00   |
| 21  | 11    | 00   | 01   | 00   | 01   | 01   | 01   | 00   | 00   | 02   | 02   | 00   | 01   | 00   |
| 22  | 12    | 00   | 01   | 00   | 01   | 01   | 01   | 00   | 00   | 02   | 03   | 00   | 01   | 00   |
| 23  | 14    | 01   | 01   | 00   | 01   | 01   | 01   | 01   | 01   | 02   | 04   | 00   | 01   | 00   |
| 24  | 16    | 01   | 01   | 00   | 01   | 01   | 01   | 01   | 01   | 02   | 04   | 00   | 02   | 01   |
| 25  | 17    | 01   | 02   | 00   | 02   | 01   | 01   | 01   | 01   | 02   | 05   | 00   | 02   | 01   |
| 26  | 18    | 02   | 02   | 00   | 02   | 02   | 01   | 01   | 01   | 02   | 06   | 00   | 03   | 01   |
| 27  | 19    | 02   | 02   | 00   | 02   | 02   | 01   | 01   | 01   | 03   | 07   | 00   | 03   | 01   |
| 28  | 21    | 03   | 03   | 01   | 02   | 03   | 01   | 01   | 01   | 03   | 07   | 00   | 04   | 01   |
| 29  | 22    | 03   | 03   | 02   | 02   | 03   | 01   | 02   | 02   | 03   | 07   | 00   | 04   | 02   |
| 30  | 22    | 03   | 04   | 03   | 02   | 03   | 02   | 02   | 02   | 03   | 08   | 00   | 05   | 02   |
| 31  | 23    | 03   | 04   | 04   | 02   | 04   | 02   | 02   | 02   | 03   | 09   | 00   | 05   | 03   |
| 32  | 25    | 04   | 02   | 05   | 03   | 04   | 02   | 03   | 04   | 10   | 00   | 06   | 06   | 03   |
| 33  | 27    | 04   | 05   | 07   | 04   | 04   | 02   | 04   | 04   | 11   | 00   | 06   | 06   | 03   |
| 34  | 28    | 04   | 05   | 08   | 05   | 05   | 03   | 05   | 05   | 12   | 00   | 07   | 07   | 03   |
| 35  | 29    | 05   | 06   | 09   | 06   | 06   | 04   | 06   | 05   | 15   | 00   | 08   | 08   | 03   |
| 36  | 29    | 06   | 06   | 11   | 06   | 07   | 05   | 07   | 06   | 17   | 00   | 08   | 08   | 03   |
| 37  | 30    | 07   | 07   | 13   | 07   | 09   | 05   | 08   | 06   | 18   | 00   | 09   | 09   | 03   |
| 38  | 32    | 08   | 08   | 15   | 08   | 11   | 06   | 09   | 07   | 20   | 00   | 09   | 09   | 03   |
| 39  | 32    | 09   | 09   | 16   | 10   | 12   | 06   | 10   | 08   | 22   | 00   | 10   | 10   | 04   |
| 40  | 34    | 10   | 10   | 18   | 12   | 15   | 06   | 12   | 09   | 23   | 00   | 11   | 11   | 05   |
| 41  | 35    | 11   | 11   | 20   | 13   | 18   | 07   | 13   | 10   | 25   | 00   | 12   | 12   | 05   |
| 42  | 35    | 12   | 12   | 23   | 14   | 21   | 07   | 14   | 10   | 27   | 00   | 13   | 13   | 05   |
| 43  | 37    | 13   | 13   | 28   | 16   | 23   | 08   | 16   | 11   | 27   | 00   | 15   | 15   | 06   |
| 44  | 39    | 16   | 14   | 31   | 17   | 26   | 10   | 17   | 12   | 29   | 00   | 17   | 17   | 07   |
| 45  | 41    | 18   | 15   | 33   | 19   | 30   | 11   | 18   | 13   | 30   | 00   | 19   | 19   | 08   |
| 46  | 43    | 20   | 17   | 37   | 21   | 33   | 13   | 20   | 14   | 32   | 00   | 23   | 23   | 09   |
| 47  | 44    | 22   | 19   | 39   | 23   | 35   | 15   | 22   | 14   | 33   | 00   | 27   | 27   | 10   |
| 48  | 46    | 24   | 20   | 42   | 24   | 39   | 17   | 25   | 16   | 34   | 00   | 29   | 29   | 11   |
| 49  | 48    | 26   | 21   | 46   | 25   | 44   | 20   | 28   | 17   | 36   | 00   | 32   | 32   | 12   |
| 50  | 52    | 28   | 23   | 49   | 27   | 47   | 22   | 31   | 19   | 37   | 00   | 36   | 36   | 12   |
| 51  | 54    | 31   | 26   | 52   | 28   | 50   | 24   | 32   | 21   | 38   | 00   | 38   | 38   | 13   |
| 52  | 56    | 34   | 29   | 55   | 31   | 52   | 27   | 34   | 23   | 39   | 01   | 42   | 42   | 14   |
| 53  | 57    | 36   | 32   | 58   | 32   | 55   | 31   | 37   | 25   | 40   | 01   | 44   | 44   | 15   |
| 54  | 59    | 38   | 34   | 61   | 35   | 58   | 34   | 39   | 27   | 42   | 02   | 47   | 47   | 16   |
| 55  | 61    | 41   | 36   | 64   | 38   | 62   | 37   | 42   | 29   | 45   | 02   | 50   | 50   | 17   |
| 56  | 62    | 44   | 39   | 66   | 39   | 66   | 40   | 44   | 31   | 46   | 02   | 52   | 52   | 18   |
| 57  | 64    | 49   | 41   | 70   | 41   | 70   | 44   | 46   | 33   | 48   | 03   | 56   | 56   | 19   |
| 58  | 67    | 53   | 45   | 74   | 42   | 74   | 47   | 51   | 36   | 49   | 03   | 59   | 59   | 21   |
| 59  | 69    | 57   | 48   | 77   | 44   | 76   | 51   | 55   | 40   | 50   | 04   | 62   | 62   | 23   |
| 60  | 72    | 59   | 51   | 81   | 45   | 79   | 56   | 60   | 43   | 52   | 05   | 65   | 65   | 24   |
| 61  | 74    | 62   | 54   | 84   | 47   | 81   | 60   | 63   | 47   | 54   | 06   | 69   | 69   | 26   |
| 62  | 76    | 66   | 57   | 86   | 50   | 83   | 64   | 67   | 52   | 55   | 07   | 72   | 72   | 28   |

|    |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 63 | 78   | 69   | 61   | 87   | 54   | 84   | 68   | 71   | 55   | 58   | 08   | 76   | 30   |
| 64 | 81   | 73   | 64   | 89   | 57   | 86   | 72   | 75   | 59   | 60   | 09   | 81   | 32   |
| 65 | 84   | 77   | 67   | 92   | 59   | 88   | 75   | 77   | 63   | 61   | 11   | 84   | 34   |
| 66 | 86   | 81   | 71   | 94   | 62   | 90   | 78   | 80   | 68   | 64   | 13   | 86   | 36   |
| 67 | 88   | 84   | 75   | 95   | 66   | 91   | 81   | 83   | 72   | 66   | 16   | 88   | 37   |
| 68 | 90   | 86   | 78   | 96   | 72   | 93   | 84   | 87   | 76   | 69   | 18   | 90   | 39   |
| 69 | 92   | 89   | 82   | 97   | 77   | 95   | 87   | 92   | 80   | 71   | 21   | 92   | 41   |
| 70 | 94   | 93   | 86   | 98   | 81   | 96   | 90   | 96   | 84   | 72   | 25   | 95   | 42   |
| 71 | 94   | 95   | 89   | 98   | 85   | 98   | 93   | 98   | 87   | 74   | 29   | 96   | 45   |
| 72 | 95   | 96   | 91   | 99   | 88   | 99   | 95   | 99   | 91   | 76   | 33   | 98   | 48   |
| 73 | 95   | 96   | 94   | 99.2 | 90   | 99.1 | 95   | 99.0 | 93   | 77   | 36   | 98   | 50   |
| 74 | 96   | 98   | 95   | 99.7 | 92   | 99.5 | 96   | 99.2 | 95   | 79   | 39   | 98   | 53   |
| 75 | 97   | 99   | 97   | 99.9 | 94   | 99.8 | 97   | 99.7 | 96   | 82   | 43   | 99   | 55   |
| 76 | 99   | 99.5 | 99   | 99.9 | 96   | 99.9 | 98   | 99.9 | 97   | 84   | 48   | 99.4 | 58   |
| 77 | 99   | 99.8 | 99.5 | 99.9 | 97   | 99.9 | 99   | 99.9 | 98   | 85   | 53   | 99.9 | 60   |
| 78 | 99.1 | 99.9 | 99.8 | 99.9 | 98   | 99.9 | 99.2 | 99.9 | 99   | 86   | 58   | 99.9 | 63   |
| 79 | 99.7 | 99.9 | 99.9 | 99.9 | 9.2  | 99.9 | 99.5 | 99.9 | 99.1 | 87   | 61   | 99.9 | 65   |
| 80 | 99.9 | 99.9 | 99.9 | 99.9 | 99.8 | 99.9 | 99.8 | 99.9 | 99.7 | 88   | 66   | 99.9 | 68   |
| 81 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 82 |      |      |      |      |      |      |      |      |      | 89   | 72   |      | 72   |
| 83 |      |      |      |      |      |      |      |      |      | 89   | 75   |      | 76   |
| 84 |      |      |      |      |      |      |      |      |      | 90   | 77   |      | 79   |
| 85 |      |      |      |      |      |      |      |      |      | 91   | 82   |      | 83   |
| 86 |      |      |      |      |      |      |      |      |      | 93   | 85   |      | 86   |
| 87 |      |      |      |      |      |      |      |      |      | 94   | 88   |      | 90   |
| 88 |      |      |      |      |      |      |      |      |      | 96   | 90   |      | 92   |
| 89 |      |      |      |      |      |      |      |      |      | 97   | 91   |      | 94   |
| 90 |      |      |      |      |      |      |      |      |      | 98   | 93   |      | 96   |
| 91 |      |      |      |      |      |      |      |      |      | 98   | 95   |      | 98   |
| 92 |      |      |      |      |      |      |      |      |      | 98   | 97   |      | 98   |
| 93 |      |      |      |      |      |      |      |      |      | 99   | 98   |      | 98   |
| 94 |      |      |      |      |      |      |      |      |      | 99   | 99.4 |      | 99   |
| 95 |      |      |      |      |      |      |      |      |      | 99   | 99.8 |      | 99.5 |
| 96 |      |      |      |      |      |      |      |      |      | 99.2 | 99.9 |      | 99.8 |
|    |      |      |      |      |      |      |      |      |      | 99.7 | 99.9 |      | 99.9 |

Score MATH VERB ACAD PROB PHYS APPR SSEX OSEX PRNT RELG HNST EMOT GENR TOTAL

Mean 46.8 55.7 57.6 50.2 58.2 51.1 57.4 55.4 59.1 56.9 75.8 53.9 69.6 747.8

Median 50.0 57.0 60.0 50.0 62.0 51.0 59.0 58.0 62.0 59.0 76.0 55.0 73.0 757.0

SD 17.8 11.5 12.4 10.7 13.3 11.1 10.7 11.4 12.4 19.0 8.8 11.7 15.4 89.0

Skew -.32 -.68 -.85 -.07 -.72 -.28 -.73 -.75 -1.2 -.14 -.37 -.60 -.88 -.34

Kurt -.97 .15 .44 -.69 -.15 .24 .14 .24 1.5 -.84 -.04 .17 .34 -.06



## Appendix IF

Percentile Conversion Table: Raw Score Ranges of Total Self Concept Scores for Each Percentile Value  
For Total the Total Normative Group (N=2436), Males not over 21 years of age, Males Over 21 Years,  
Females under 21 Years, and Females over 21 Years.

|    | Total<br>Group | Males<br>Under 21 | Males<br>Over 21 | Females<br>Under 21 | Females<br>Over 21 |
|----|----------------|-------------------|------------------|---------------------|--------------------|
| 1  | 503-554        | 521-566           | 506-566          | 498-536             | 486-527            |
| 2  | 555-571        | 567-582           | 567-584          | 537-557             | 528-559            |
| 3  | 572-588        | 583-596           | 585-603          | 558-577             | 560-576            |
| 4  | 589-601        | 597-606           | 604-612          | 578-592             | 577-586            |
| 5  | 602-611        | 607-610           | 613-618          | 593-602             | 587-599            |
| 6  | 612-618        | 611-619           | 619-626          | 603-609             | 600-611            |
| 7  | 619-624        | 620-626           | 627-635          | 610-616             | 612-619            |
| 8  | 625-631        | 627-634           | 636-640          | 617-621             | 620-625            |
| 9  | 632-638        | 635-638           | 641-648          | 622-628             | 626-638            |
| 10 | 639-642        | 639-646           | 649-656          | 629-633             | 639-639            |
| 11 | 643-647        | 647-650           | 657-663          | 634-637             | 640-641            |
| 12 | 648-653        | 651-657           | 664-667          | 638-642             | 642-645            |
| 13 | 653-658        | 658-660           | 668-671          | 643-646             | 646-648            |
| 14 | 659-661        | 661-664           | 672-676          | 647-650             | 649-649            |
| 15 | 661-665        | 665-668           | 677-679          | 651-655             | 650-653            |
| 16 | 666-669        | 669-671           | 680-684          | 656-658             | 654-656            |
| 17 | 670-672        | 672-674           | 685-686          | 659-660             | 657-661            |
| 18 | 673-675        | 675-679           | 687-690          | 661-663             | 662-664            |
| 19 | 676-679        | 680-683           | 691-695          | 664-667             | 665-668            |
| 20 | 680-682        | 684-687           | 696-698          | 668-669             | 669-669            |
| 21 | 682-685        | 688-691           | 699-701          | 670-671             | 670-673            |
| 22 | 686-688        | 692-693           | 702-704          | 671-673             | 674-675            |
| 23 | 689-692        | 694-695           | 705-707          | 674-675             | 676-679            |
| 24 | 693-695        | 696-697           | 708-710          | 676-679             | 680-681            |
| 25 | 696-697        | 698-701           | 711-712          | 680-681             | 682-685            |
| 26 | 698-700        | 702-704           | 713-714          | 682-682             | 686-686            |
| 27 | 701-703        | 705-708           | 715-716          | 683-685             | 687-688            |
| 28 | 704-706        | 709-710           | 717-718          | 686-688             | 689-694            |
| 29 | 707-709        | 711-712           | 719-720          | 689-692             | 695-696            |
| 30 | 710-711        | 713-713           | 721-721          | 693-694             | 697-705            |
| 31 | 712-713        | 714-717           | 722-725          | 695-696             | 706-707            |
| 32 | 714-716        | 718-720           | 726-727          | 697-698             | 708-709            |
| 33 | 717-718        | 721-724           | 728-729          | 699-700             | 710-711            |
| 34 | 719-721        | 725-726           | 730-732          | 701-702             | 712-717            |
| 35 | 722-723        | 727-727           | 733-734          | 703-704             | 718-718            |
| 36 | 724-726        | 728-729           | 734-738          | 705-706             | 719-723            |
| 37 | 727-727        | 739-731           | 739-742          | 707-709             | 724-724            |
| 38 | 728-729        | 732-733           | 743-744          | 710-711             | 725-728            |
| 39 | 730-731        | 734-735           | 745-746          | 712-715             | 729-730            |
| 40 | 732-733        | 736-737           | 747-748          | 716-716             | 731-731            |
| 41 | 734-736        | 738-739           | 749-750          | 717-718             | 732-732            |
| 42 | 737-739        | 740-740           | 751-752          | 719-720             | 733-735            |
| 43 | 740-742        | 741-743           | 753-754          | 721-722             | 736-739            |
| 44 | 743-744        | 744-744           | 755-757          | 723-724             | 740-742            |
| 45 | 745-746        | 745-746           | 758-759          | 725-726             | 743-746            |
| 46 | 747-748        | 747-747           | 760-761          | 727-728             | 747-749            |
| 47 | 749-750        | 748-750           | 762-762          | 729-729             | 750-752            |
| 48 | 751-752        | 751-752           | 763-764          | 730-731             | 753-754            |
| 49 | 753-754        | 753-754           | 765-766          | 732-733             | 755-756            |
| 50 | 755-756        | 755-755           | 767-768          | 734-736             | 757-757            |
| 51 | 757-757        | 756-756           | 769-770          | 737-739             | 758-758            |
| 52 | 758-759        | 757-757           | 771-771          | 740-741             | 759-761            |
| 53 | 760-762        | 758-759           | 772-773          | 742-743             | 762-764            |
| 54 | 763-764        | 760-762           | 774-777          | 743-745             | 765-765            |
| 55 | 765-766        | 763-764           | 778-780          | 746-747             | 766-766            |
| 56 | 767-768        | 765-766           | 781-782          | 748-748             | 767-768            |
| 57 | 769-769        | 767-768           | 783-784          | 749-751             | 769-770            |
| 58 | 770-771        | 769-770           | 785-785          | 752-752             | 771-772            |
| 59 | 772-773        | 771-771           | 786-787          | 753-754             | 773-774            |
| 60 | 774-776        | 772-773           | 788-790          | 755-756             | 775-775            |

|      |          |          |           |          |          |
|------|----------|----------|-----------|----------|----------|
| 61   | 777-779  | 774-774  | 791-792   | 757-758  | 776-777  |
| 62   | 780-781  | 775-779  | 793-796   | 759-762  | 778-778  |
| 63   | 782-782  | 780-781  | 797-798   | 763-765  | 779-779  |
| 64   | 783-784  | 782-782  | 799-799   | 766-767  | 780-784  |
| 65   | 785-786  | 783-784  | 800-801   | 768-769  | 785-786  |
| 66   | 787-788  | 785-787  | 802-805   | 770-770  | 787-788  |
| 67   | 789-792  | 788-789  | 806-807   | 771-772  | 789-791  |
| 68   | 793-794  | 790-792  | 808-810   | 773-774  | 792-794  |
| 69   | 795-797  | 793-795  | 811-812   | 775-776  | 795-797  |
| 70   | 798-800  | 796-799  | 813-814   | 777-779  | 798-800  |
| 71   | 801-801  | 800-801  | 815-816   | 780-781  | 801-803  |
| 72   | 802-804  | 802-802  | 817-818   | 782-783  | 804-807  |
| 73   | 805-807  | 803-804  | 819-819   | 784-784  | 808-813  |
| 74   | 808-811  | 805-809  | 820-823   | 785-786  | 814-815  |
| 75   | 812-813  | 810-812  | 824-825   | 787-789  | 816-817  |
| 76   | 814-816  | 813-814  | 826-828   | 790-792  | 818-819  |
| 77   | 817-818  | 815-817  | 829-830   | 793-795  | 820-822  |
| 78   | 819-820  | 818-819  | 831-833   | 796-797  | 823-823  |
| 79   | 821-823  | 820-821  | 834-836   | 798-800  | 824-825  |
| 80   | 824-827  | 822-827  | 837-837   | 801-801  | 826-827  |
| 81   | 828-830  | 828-831  | 838-840   | 802-805  | 828-829  |
| 82   | 831-834  | 832-834  | 841-843   | 806-807  | 830-832  |
| 83   | 835-836  | 835-837  | 844-846   | 808-811  | 833-835  |
| 84   | 837-839  | 838-839  | 847-849   | 812-815  | 836-837  |
| 85   | 840-842  | 840-840  | 850-853   | 816-817  | 838-840  |
| 86   | 843-845  | 841-843  | 854-857   | 818-819  | 841-844  |
| 87   | 846-849  | 844-849  | 858-859   | 820-826  | 845-846  |
| 88   | 850-854  | 850-852  | 860-863   | 827-834  | 847-848  |
| 89   | 855-858  | 853-857  | 864-868   | 835-839  | 849-851  |
| 90   | 859-862  | 858-860  | 869-874   | 840-845  | 852-855  |
| 91   | 863-868  | 861-861  | 875-877   | 846-852  | 856-866  |
| 92   | 869-872  | 862-867  | 878-883   | 853-861  | 867-871  |
| 93   | 873-877  | 868-872  | 884-890   | 862-865  | 872-880  |
| 94   | 878-883  | 873-876  | 890-898   | 866-871  | 881-882  |
| 95   | 884-892  | 877-884  | 899-905   | 872-879  | 883-885  |
| 96   | 893-901  | 885-893  | 906-915   | 880-890  | 886-887  |
| 97   | 902-911  | 894-902  | 916-932   | 891-904  | 888-900  |
| 98   | 912-935  | 903-910  | 933-949   | 905-924  | 901-906  |
| 99.0 | 936-953  | 911-947  | 950-969   | 925-939  | 907-926  |
| 99.3 | 954-961  | 948-972  | 970-994   | 940-949  | 927-934  |
| 99.6 | 962-988  | 973-995  | 995-1005  | 950-954  | 935-940  |
| 99.9 | 989-1026 | 996-1026 | 1006-1026 | 955-1026 | 941-1026 |

|          |       |       |       |       |       |
|----------|-------|-------|-------|-------|-------|
| Mean     | 752.3 | 752.8 | 765.1 | 734.9 | 747.8 |
| Median   | 755.0 | 755.0 | 767.5 | 735.0 | 757.0 |
| SD       | 86.5  | 82.0  | 86.8  | 84.0  | 89.0  |
| Skew     | -.18  | -.14  | -.22  | -.07  | -.32  |
| Kurtosis | .15   | .09   | .33   | .20   | -.06  |



## APPENDIX II -- INSTRUCTIONS FOR USING THE HAND-SCORING SHEET

The number in the lower left-hand corner of each box corresponds to the SDQIII item with the same number. The response to each SDQIII item is to be translated into a number and put into the appropriate box. For the positive items -- those items without asterisks -- simply record the subjects' response. For the negative items -- those items marked with asterisks -- the responses should be "reversed scored." Do this by subtracting the subject's response from 9 (e.g., a response of "1" to a negatively worded item becomes an "8" when reverse scored). The mean response for an item should be substituted for missing values (the mean values for the normative group are presented in Table xxx), as long as no more than 10 responses have been left blank. When more than 10 responses have been left blank, the responses should not be scored at all, or the results should be interpreted cautiously.

After responses to all the SDQIII items have been put in the boxes, examine the pattern of responses to determine if respondents have answered the questions appropriately. A comparison of responses to positively and negatively worded items may be particularly useful for this purpose. If respondents are not paying attention, responses to negative items may be quite different than those to positive items. For example, respondents may have responses indicating a high self-concept to nearly all the positive items, but responses indicating a low self-concept for negative items. Also, a respondent may give the same response to all items. While there is no absolute guideline for determining if respondents are answering appropriately, scoring sheets which appear unusual should be interpreted cautiously.

After checking the pattern of responses, sum the responses to the 10 or 12 items in each column of the score sheet to obtain the total scores. These should then be divided by the number of items (10 or 12) to obtain scale scores corresponding to those that appear in normative comparisons in Appendix I. All scale scores should vary from 1 to 8 the same as responses to each individual item. Percentile ranks for each of the scale scores and for the total scores can be obtained from Appendix I. Since there are small sex and age effects in responses to the SDQIII, be sure to use the normative table that is appropriate for the subject.

## APPENDIX III

## Computation of Factor Scores Based on the SDQIII Archive

| Item  | Pair  | Mean  | SD    | Factor Score Coefficients (FSC) For Each SDQIII Factor |       |       |       |       |       |       |       |       |       |       |       |      |
|-------|-------|-------|-------|--------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
|       |       |       |       | MATH                                                   | VERB  | ACAD  | PROB  | PHYS  | APPR  | SSEX  | OSEX  | PRNT  | RELG  | HONS  | EMOT  | GENL |
| Math1 | 5.293 | 1.773 | .157  | -.059                                                  | .015  | .007  | .003  | -.015 | -.010 | -.006 | .010  | .009  | -.001 | .002  | -.016 |      |
| Math2 | 5.132 | 1.728 | .215  | -.040                                                  | -.032 | -.027 | .004  | -.003 | -.015 | -.004 | .006  | .008  | .007  | .015  | .005  |      |
| Math3 | 5.482 | 1.662 | .362  | .075                                                   | -.072 | -.033 | -.008 | .006  | .017  | -.002 | -.007 | .003  | -.022 | -.005 | -.008 |      |
| Math4 | 5.390 | 1.666 | .272  | .008                                                   | -.017 | -.031 | -.013 | -.003 | .025  | .010  | -.003 | -.012 | .013  | -.021 | -.003 |      |
| Math5 | 4.307 | 1.746 | .123  | -.065                                                  | .026  | .024  | -.016 | .003  | .001  | .016  | -.017 | .007  | .008  | -.001 | -.001 |      |
| Verb1 | 5.389 | 1.550 | -.015 | .158                                                   | -.009 | .014  | -.000 | .003  | .007  | -.003 | -.009 | -.003 | .006  | .038  | -.018 |      |
| Verb2 | 5.487 | 1.419 | -.006 | .185                                                   | -.011 | .001  | -.005 | -.006 | -.008 | -.014 | -.009 | -.003 | .019  | -.002 | -.007 |      |
| Verb3 | 5.576 | 1.285 | -.008 | .232                                                   | -.019 | .018  | -.005 | -.001 | .002  | -.001 | -.002 | .001  | -.031 | -.017 | .007  |      |
| Verb4 | 5.164 | 1.249 | .004  | .274                                                   | -.043 | .032  | -.016 | .002  | .010  | -.003 | -.005 | .005  | .003  | .020  | -.017 |      |
| Verb5 | 6.141 | 1.298 | .011  | .275                                                   | -.016 | -.072 | -.011 | -.013 | -.009 | -.008 | .007  | .003  | -.001 | -.002 | -.010 |      |
| Acad1 | 5.206 | 1.546 | -.017 | -.060                                                  | .144  | .917  | -.002 | .012  | -.009 | .003  | -.002 | -.001 | .012  | .001  | -.008 |      |
| Acad2 | 5.786 | 1.314 | -.047 | -.008                                                  | .375  | -.034 | .004  | -.011 | -.006 | -.005 | -.010 | -.005 | .020  | .010  | -.017 |      |
| Acad3 | 5.745 | 1.306 | -.032 | .002                                                   | .341  | -.038 | -.004 | -.010 | .014  | -.013 | -.005 | -.015 | -.009 | -.027 | .016  |      |
| Acad4 | 5.843 | 1.229 | -.004 | .061                                                   | .236  | -.014 | .003  | -.021 | .008  | -.002 | .009  | -.012 | -.035 | .003  | -.007 |      |
| Acad5 | 5.808 | 1.306 | .006  | .061                                                   | .049  | .010  | .001  | .015  | -.005 | .003  | -.000 | .001  | -.034 | -.006 | -.004 |      |
| Prob1 | 5.297 | 1.197 | -.012 | -.018                                                  | -.011 | .321  | -.003 | -.026 | -.021 | -.003 | .009  | -.001 | -.015 | .003  | -.019 |      |
| Prob2 | 4.754 | 1.279 | -.014 | -.918                                                  | -.017 | .214  | -.011 | .012  | -.006 | -.009 | .005  | .000  | .004  | .006  | -.022 |      |
| Prob3 | 5.679 | 1.166 | .022  | .036                                                   | .029  | .207  | .003  | -.019 | -.031 | -.024 | -.010 | -.005 | .002  | -.009 | .007  |      |
| Prob4 | 5.401 | 1.287 | -.028 | .033                                                   | -.037 | .279  | -.013 | -.016 | .028  | -.003 | -.011 | .011  | .005  | -.017 | -.004 |      |
| Prob5 | 5.261 | 1.309 | -.002 | -.040                                                  | .007  | .152  | -.000 | -.001 | -.004 | -.001 | -.004 | .006  | -.006 | -.009 | -.007 |      |
| Phys1 | 5.653 | 1.395 | .056  | .006                                                   | -.026 | .008  | .160  | .049  | .003  | -.018 | .002  | .002  | -.039 | .009  | -.016 |      |
| Phys2 | 6.126 | 1.272 | -.015 | -.017                                                  | .090  | .008  | .229  | -.023 | -.001 | -.019 | .005  | -.001 | -.014 | .003  | -.015 |      |
| Phys3 | 5.772 | 1.382 | .003  | .016                                                   | -.041 | -.001 | .291  | .004  | -.007 | -.013 | -.013 | .001  | -.001 | -.017 | .014  |      |
| Phys4 | 5.793 | 1.434 | -.008 | -.008                                                  | .016  | -.012 | .286  | -.022 | -.034 | .011  | -.006 | .002  | -.002 | -.008 | -.010 |      |
| Phys5 | 6.197 | 1.322 | -.013 | -.005                                                  | .023  | -.009 | .180  | -.044 | -.001 | .018  | -.008 | .000  | .038  | -.011 | -.004 |      |
| Appr1 | 5.604 | 1.265 | -.011 | .020                                                   | -.007 | -.022 | -.005 | .266  | -.014 | .003  | -.006 | .004  | -.024 | -.021 | .002  |      |
| Appr2 | 5.088 | 1.397 | -.005 | .001                                                   | -.001 | -.013 | -.002 | .334  | -.023 | -.024 | -.001 | .003  | .009  | .025  | -.056 |      |
| Appr3 | 5.625 | 1.422 | .010  | -.003                                                  | -.010 | -.024 | .001  | .164  | -.008 | -.011 | -.001 | -.015 | -.010 | -.020 | .015  |      |
| Appr4 | 4.710 | 1.272 | -.011 | -.003                                                  | .022  | .003  | -.025 | .185  | .007  | -.005 | -.003 | .009  | .032  | -.012 | -.022 |      |
| Appr5 | 5.012 | 1.211 | -.006 | -.015                                                  | -.002 | .037  | -.025 | .219  | -.005 | .016  | .003  | -.002 | -.015 | -.027 | -.018 |      |
| SSex1 | 5.651 | 1.346 | .001  | .004                                                   | .043  | -.006 | -.010 | -.007 | .114  | -.009 | -.002 | -.005 | -.004 | .007  | -.012 |      |
| SSex2 | 6.049 | 1.131 | -.001 | -.004                                                  | -.005 | -.007 | -.012 | -.017 | .240  | -.011 | -.007 | .008  | .031  | -.011 | -.005 |      |
| SSex3 | 5.822 | 1.162 | .002  | .001                                                   | -.020 | -.000 | .002  | .001  | .253  | -.035 | -.013 | -.001 | -.026 | -.007 | -.003 |      |
| SSex4 | 5.890 | 1.083 | -.006 | .001                                                   | -.004 | -.012 | -.012 | .017  | .263  | -.004 | -.008 | -.010 | .024  | -.013 | -.021 |      |
| SSex5 | 5.370 | 1.386 | -.005 | -.027                                                  | .004  | -.002 | -.021 | -.011 | .315  | -.016 | -.009 | .006  | -.042 | -.017 | -.020 |      |
| OSEX1 | 4.892 | 1.389 | -.003 | -.019                                                  | .006  | .006  | -.016 | .043  | -.007 | .175  | .004  | -.000 | -.033 | -.006 | -.020 |      |
| OSEX2 | 5.174 | 1.544 | .006  | -.011                                                  | -.005 | .005  | -.007 | -.018 | .025  | .242  | -.011 | .005  | -.000 | -.021 | -.026 |      |
| OSEX3 | 5.571 | 1.473 | .010  | -.001                                                  | -.003 | -.031 | -.011 | -.036 | -.029 | .301  | -.021 | .004  | -.002 | -.000 | .000  |      |
| OSEX4 | 5.232 | 1.502 | -.002 | -.004                                                  | .002  | -.013 | -.011 | -.014 | -.007 | .278  | .006  | -.012 | .015  | .012  | -.018 |      |
| OSEX5 | 5.626 | 1.411 | .003  | -.011                                                  | -.001 | .005  | .014  | -.014 | -.021 | .167  | .004  | .010  | -.005 | -.006 | -.004 |      |
| Prnt1 | 5.177 | 1.507 | -.003 | -.020                                                  | .005  | .0090 | -.010 | .006  | -.001 | -.008 | .206  | .005  | -.029 | .002  | -.018 |      |
| Prnt2 | 6.188 | 1.436 | -.004 | .018                                                   | .002  | -.010 | -.000 | .010  | -.013 | -.001 | .200  | -.001 | .017  | .005  | -.018 |      |
| Prnt3 | 6.114 | 1.216 | .009  | .004                                                   | -.019 | -.018 | -.003 | -.007 | -.007 | -.005 | .247  | -.010 | .019  | -.017 | -.005 |      |
| Prnt4 | 5.898 | 1.376 | -.010 | .008                                                   | -.012 | .008  | -.008 | -.016 | -.016 | .004  | .239  | -.006 | -.010 | -.000 | -.016 |      |
| Prnt5 | 6.270 | 1.237 | -.006 | -.023                                                  | .001  | .009  | -.000 | -.011 | .007  | .005  | .276  | .002  | .000  | -.025 | .010  |      |



|       |       |       |       |       |       |       |       |       |       |       |       |      |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Relg1 | 4.603 | 1.859 | .005  | -.013 | -.011 | .019  | .000  | -.005 | .013  | -.003 | .022  | .099 | -.026 | -.014 | .003  |
| Relg2 | 4.470 | 2.111 | -.011 | .014  | -.001 | -.008 | .011  | -.016 | -.004 | .003  | -.009 | .301 | .038  | -.005 | .005  |
| Relg3 | 4.061 | 2.146 | .013  | .007  | -.004 | -.021 | -.005 | .010  | -.016 | -.003 | .006  | .314 | -.010 | .006  | -.010 |
| Relg4 | 4.123 | 2.091 | .005  | .007  | -.004 | .007  | .001  | .014  | -.001 | -.008 | -.012 | .192 | -.035 | .013  | .007  |
| Relg5 | 5.736 | 1.999 | -.004 | -.006 | .005  | -.009 | .005  | -.005 | .015  | .006  | -.001 | .061 | .010  | -.001 | -.003 |
| Relg6 | 4.404 | 1.834 | -.002 | -.015 | .015  | .002  | -.012 | .006  | -.008 | .007  | -.010 | .102 | .017  | .010  | -.002 |

|       |       |       |       |       |       |       |       |       |       |       |       |       |      |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| Hons1 | 5.565 | 1.083 | -.004 | -.002 | -.013 | .027  | -.003 | .005  | .001  | -.004 | -.005 | .000  | .221 | .021  | -.021 |
| Hons2 | 6.786 | 0.936 | .001  | .008  | -.016 | -.012 | .006  | -.005 | .003  | -.001 | -.002 | .002  | .253 | -.007 | .003  |
| Hons3 | 6.136 | 1.296 | -.002 | .002  | -.005 | -.007 | -.008 | -.002 | .002  | -.005 | -.004 | -.019 | .225 | -.004 | -.006 |
| Hons4 | 6.136 | 1.108 | -.003 | -.008 | -.005 | .004  | -.004 | .013  | -.009 | .001  | -.011 | -.000 | .253 | .001  | -.003 |
| Hons5 | 6.083 | 1.054 | -.006 | -.008 | .018  | .004  | -.000 | -.004 | -.018 | .004  | -.003 | -.006 | .185 | -.011 | .010  |
| Hons6 | 6.083 | 1.054 | .002  | .013  | .002  | -.022 | -.002 | -.006 | .008  | -.003 | .007  | -.017 | .160 | -.007 | .006  |

|       |       |       |       |       |       |       |       |       |       |       |       |       |       |      |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| Emot1 | 5.355 | 1.455 | -.003 | -.040 | -.005 | .034  | -.002 | -.004 | -.016 | -.016 | -.026 | -.007 | -.038 | .288 | -.021 |
| Emot2 | 5.789 | 1.210 | -.001 | .027  | -.014 | -.038 | -.007 | -.010 | .005  | -.004 | -.003 | .017  | .026  | .208 | -.018 |
| Emot3 | 5.297 | 1.458 | -.002 | -.006 | -.008 | -.029 | -.014 | -.019 | .014  | -.012 | .007  | -.003 | .016  | .286 | -.036 |
| Emot4 | 5.367 | 1.416 | -.003 | -.020 | .005  | .001  | -.016 | .005  | -.008 | -.015 | -.005 | .009  | -.019 | .265 | -.034 |
| Emot5 | 5.566 | 1.298 | -.010 | .030  | .012  | .001  | .005  | -.033 | -.014 | .015  | -.014 | .014  | -.006 | .130 | .004  |

|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |      |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Gen11 | 5.743 | 1.340 | -.003 | -.912 | .0103 | .023  | -.008 | -.011 | -.019 | .013  | -.010 | -.007 | -.029 | .005  | .203 |
| Gen12 | 6.165 | 1.198 | .002  | -.019 | -.014 | -.031 | -.013 | -.010 | .006  | -.046 | -.008 | -.010 | .020  | -.020 | .255 |
| Gen13 | 5.538 | 1.326 | .002  | -.017 | -.018 | .033  | -.019 | -.026 | -.008 | -.004 | -.013 | -.013 | -.006 | -.005 | .234 |
| Gen14 | 6.229 | 1.169 | -.010 | -.004 | .002  | -.005 | .002  | -.019 | .001  | .002  | .000  | -.004 | .022  | -.021 | .185 |
| Gen15 | 6.189 | 1.387 | -.007 | .002  | -.005 | -.047 | -.010 | .017  | -.018 | -.025 | -.009 | .009  | -.045 | .013  | .294 |
| Gen16 | 5.794 | 1.240 | -.001 | -.024 | -.001 | .016  | -.002 | -.013 | .003  | .008  | .001  | -.002 | .033  | -.016 | .128 |

Note. The variables used to define the factor scores are the mean of responses to pairs of items; the first two items in each scale form the first item pair, the next two the second item pair, etc. In order to compute each factor score use the equation:

$$\text{FACTOR SCORE} = \text{SUM} [ (X - \text{MEAN}) / \text{SD} \times \text{FSC} ] \text{ where}$$

X is the mean of responses to the items in a particular item pair for a given subject (see earlier discussion of item pairs), MEAN = item-pair mean given above, SD = item-pair standard deviation given above, FSC = Factor Score Coefficients given above for each SDQII scale. Each factor score will consist of the sum of 68 products consisting of each item-pair z-score (i.e.,  $(X - \text{Mean}) / \text{SD}$ ) multiplied by its corresponding factor score coefficient. A total of 13 separate factor scores corresponding to the 13 SDQIII scales are computed for each subject. Since the 13 factor scores are computed in relation to the normative archive, factor scores greater than 0.00 or less than 0.00 represent scores above or below the normative archive mean. Alternatively, the MEAN and SD from a user's own data can be used instead of the MEAN and SD based on the normative archive. In this case, the mean factor score should be approximately 0.00 for each factor.

## APPENDIX II -- Scoring Sheet For Hand Scoring Responses to the SDQIII

| NAME _____ |                    | AGE _____ |         | SEX _____       |        |                |        |
|------------|--------------------|-----------|---------|-----------------|--------|----------------|--------|
| TRUTH      | RECIGION<br>APPEAR | GENERAL   | HONESTY | OPPOSITE<br>SEX | VERBAL | EMO-<br>TIONAL | PARENT |
| 1          | 2*                 | 3         | 4*      | 5               | 6*     | 7              | 8*     |
| 14*        | 15                 | 16*       | 17      | 18*             | 19     | 20*            | 21     |
| 27         | 28*                | 29        | 30*     | 31              | 32*    | 33             | 34*    |
| 40*        | 41                 | 42*       | 43      | 44*             | 45     | 46*            | 47*    |
| 53         | 54                 | 55        | 56*     | 57              | 58*    | 59             | 60     |
| 66*        | 67                 | 68        | 69      | 70*             | 71     | 72*            | 73*    |
| 79         | 80*                | 81*       | 82*     | 83              | 84*    | 85             | 86     |
| 92*        | 93                 | 94        | 95      | 96*             | 97     | 98*            | 99*    |
| 105        | 106*               | 107*      | 108*    | 109             | 110*   | 111            | 112    |
| 118*       | 119                | 120*      | 121     | 122*            | 123    | 124*           | 125    |
|            | 133*               | 131       | 132*    |                 |        |                |        |
|            | 116*               | 135*      | 134     |                 |        |                |        |

TOTALS (Sum of responses in each column after reverse scoring items with \*)

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|

SCALE SCORES (Totals divided by the number of items in scale (10 or 12))

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|



NAME \_\_\_\_\_ AGE \_\_\_\_\_ SEX \_\_\_\_\_

| ACAD | PROBLEM SOLVING | PHYSICAL APPEAR | SAME SEX | PHYSICAL ABILITY |
|------|-----------------|-----------------|----------|------------------|
| 9    | 10*             | 11              | 12*      | 13               |
| 22*  | 23              | 24*             | 25       | 26*              |
| 35   | 36              | 37              | 38*      | 39               |
| 48*  | 49              | 50*             | 51       | 52*              |
| 61   | 62*             | 63              | 64*      | 65               |
| 74*  | 75              | 76              | 77       | 78*              |
| 87   | 88*             | 89              | 90*      | 91               |
| 100* | 101             | 102*            | 103      | 104*             |
| 113  | 114*            | 115*            | 116*     | 117              |
| 126* | 127             | 128             | 129      | 130*             |

TOTALS (Sum of responses in each column after reverse scoring items with \*)

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|

SCALE SCORES (Totals divided by the number of items in scale (10 or 12))

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|

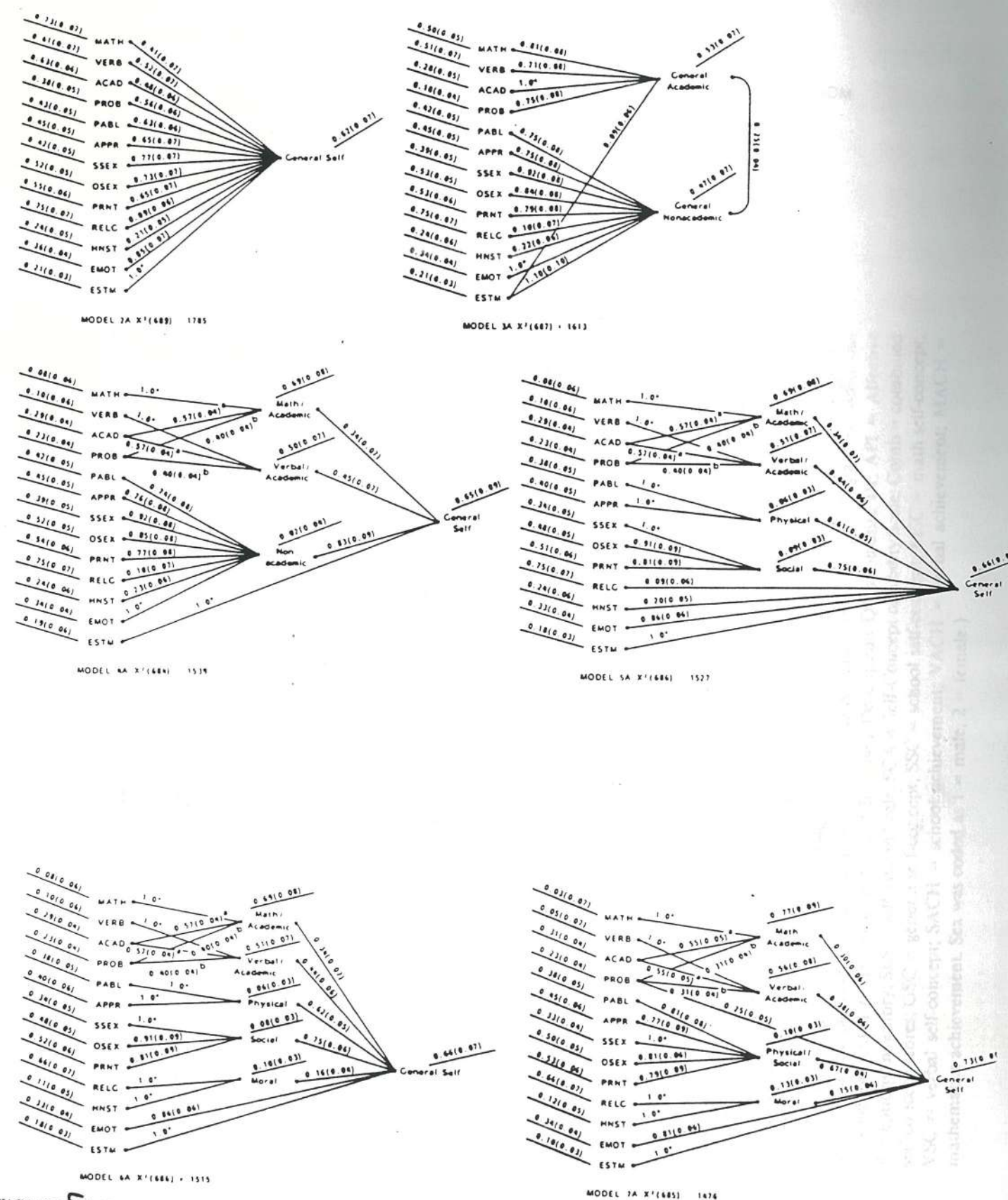


FIGURE 5.1 Results from six HCFA models: residual variances, factor loadings, and standard errors (in parentheses) for each estimate parameter. (See Table 1 for factor names.)

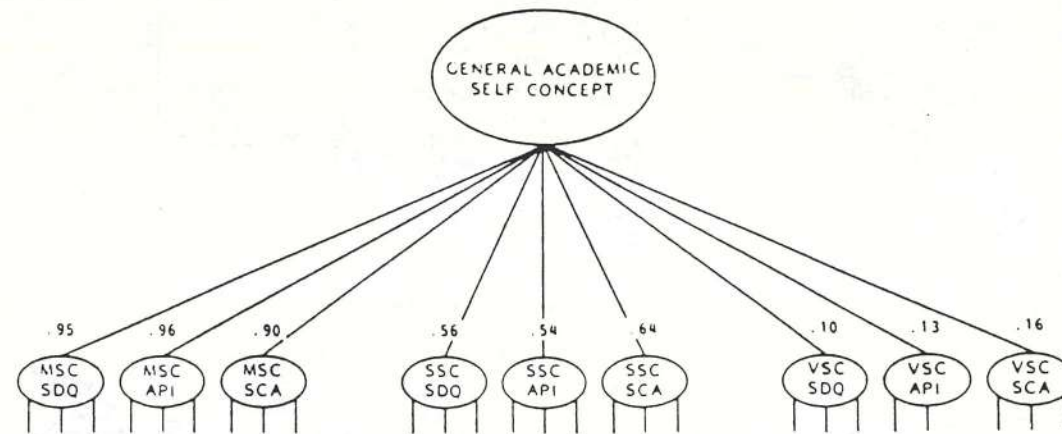
\*Indicates parameters fixed at 1.0

\*Academic self-concept was constrained to load equally on the two second-order academic factors

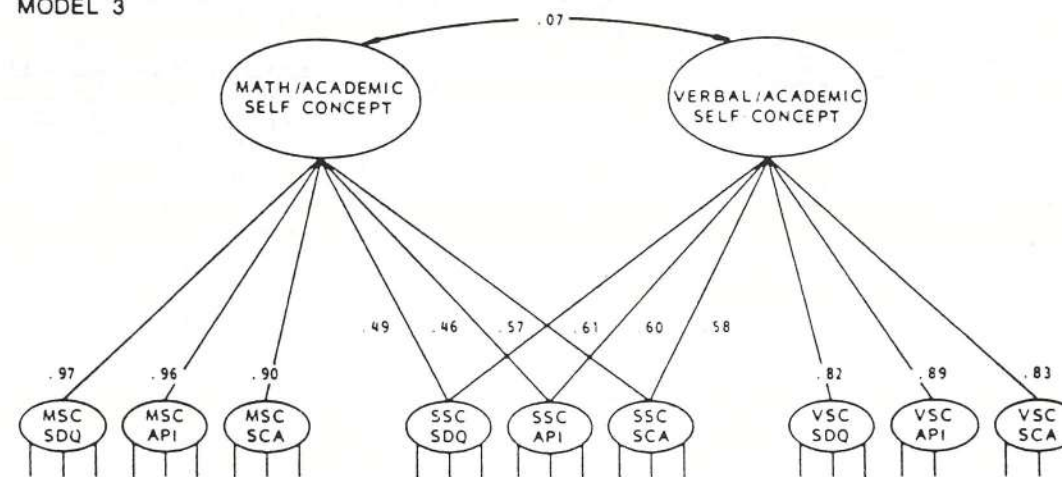
\*Problem Solving was constrained to load equally on the two second-order academic factors



MODEL 2



MODEL 3



MODEL 4

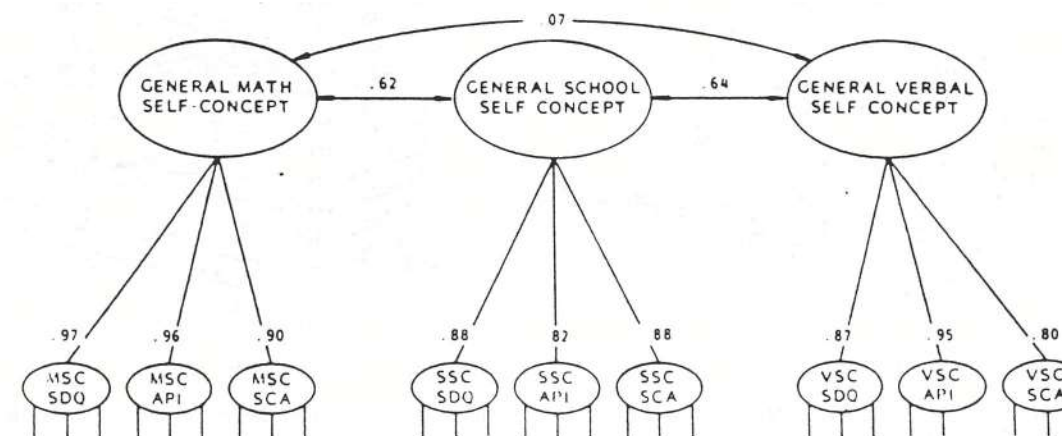
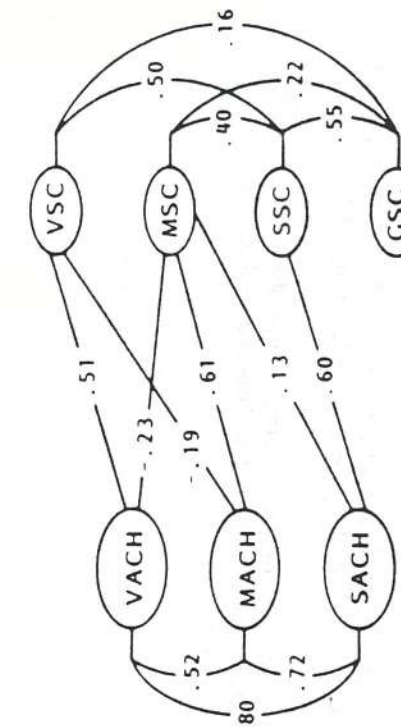
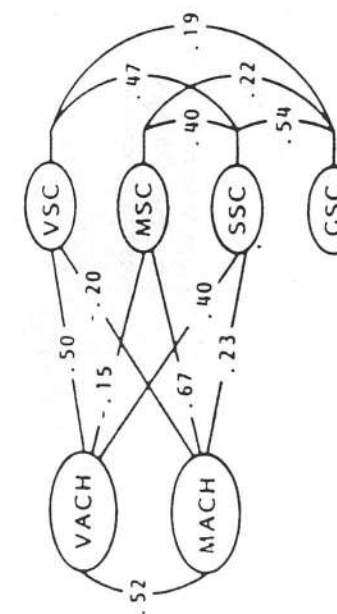


Figure 5.2 Three hierarchical models designed to explain covariation among the nine first-order academic factors. (The first-order factors represent math self-concept [MSC], school self-concept [SSC], and verbal self-concept [VSC], measured by three different self-concept instruments; see Table 1 for a representation of the first-order factors. SDQIII = Self Description Questionnaire III; API = Affective Perceptions Inventory; SES = Self-esteem Scale; SCA = Self-Concept of Ability Scale.

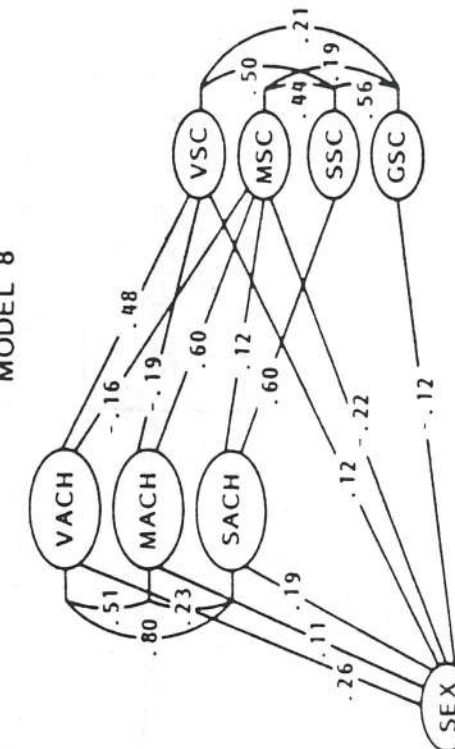
MODEL 7



MODEL 5



MODEL 8



MODEL 6

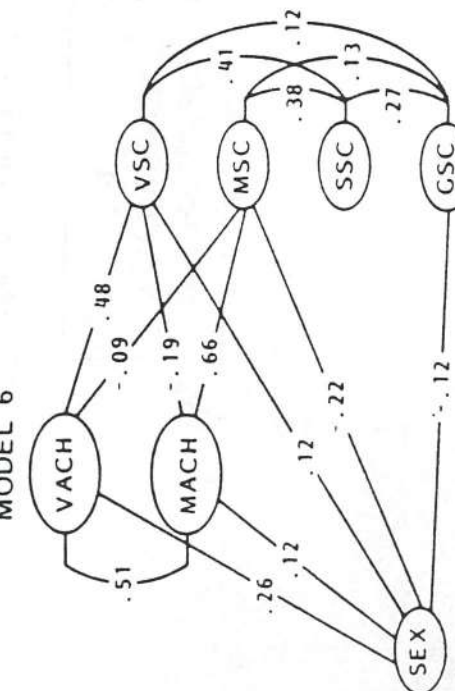
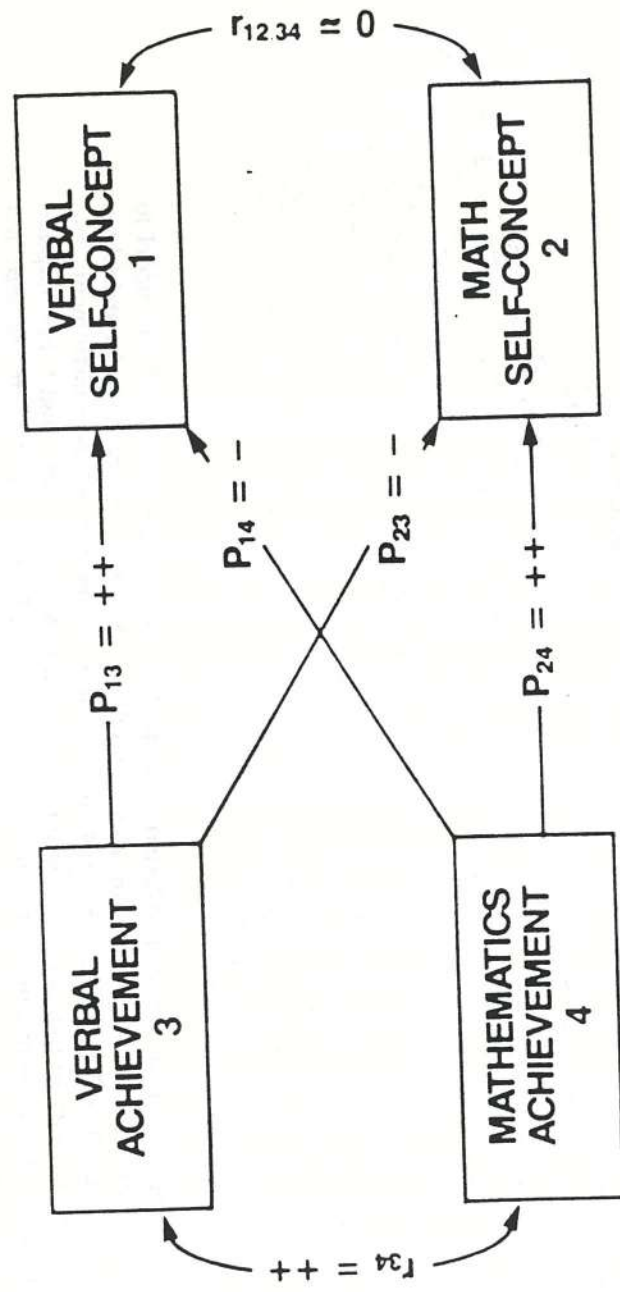


Figure 8.2 Empirical tests of the internal/external model (Model 5) and extensions of this model to include gender (Model 6), achievement across all school subjects (Model 7), and both gender and school achievement (Model 8). (These results are based on self-concept scores from all three instruments, and the corresponding results for each separate instrument are summarized in Tables 4 and 5. For purposes of presentation, path coefficients that failed to reach statistical significance [ $p < .05$ ] are excluded, but they are presented in Tables 4 or 5. SDQIII = Self Description Questionnaire III; API = Affective Perceptions Inventory; SES = Self-esteem Scale; SCA = Self-Concept of Ability Scale; Comb = combined self-concept scores; GSC = general self-concept; SSC = school self-concept; MSC = math self-concept; VSC = verbal self-concept; SACH = school achievement; VACH = verbal achievement; MACH = mathematics achievement. Sex was coded as 1 = male, 2 = female.)





Coefficients indicated to be "++", "--", and "0" are predicted to be high positive, low negative, and approximately zero respectively

Figure 8.1 Path Model of Relationships Among Achievements and Reading and Math Self-Concepts: Internal/External Frame of Reference Model

From Marsh, H.W. (1986). Verbal and math self-concepts: An internal/external frame of reference model. *American Educational Research Journal*, 23, p. 134. Copyright 1986 by the American Educational Research Association. Reprinted by permission of the publisher.



