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AUTHOR Byrne, Barbara M.; Shavelson, Richard J.
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ABSTRACT

This study examined the structure of adolescent self-concept (SC) structure for males and females by using three different measures of each SC facet in a covariance structure analysis of the data. Specifically, the purposes of the study were to: (1) test the hypothesis of the invariance of a multidimensional, hierarchical SC structure for males and females; (2) test the invariance of the discriminability of SC from academic grades for males and females; and (3) examine gender differences related to general SC, academic SC, English SC, mathematics SC, and grades in English and mathematics. The original sample consisted of 991 grade 11 and 12 students from two suburban high schools in Ottawa, Canada. Following deletion of missing data, the final sample size was 832 (412 males, 420 females). Different SC structures were found for males and females. The number and nature of the facets of SC were similar, but the hierarchical relations among the facets differed. Moreover, grades could be discriminated from their corresponding subject-specific SCs (i.e., subject-specific SC is not an alternate report of grades). Finally, girls obtained higher grades in English and mathematics than boys, but their mathematics SCs were significantly lower. (PN)

On Gender Differences in the Structure of Adolescent Self Concept

Barbara M. Byrne

University of California, Los Angeles

and

Richard J. Shavelson

University of California, Los Angeles

and

The Rand Corporation

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Abstract

The purposes of the study were to (a) test the invariance of self-concept (SC) structure for males and females; (b) examine the discriminability of SC facets from academic grades; and (c) explore gender differences related to general, academic, English, and mathematics SC, and grades. With a final sample of 832 students (412 males, 420 females) in grades 11 and 12, we found different SC structures for males and females. Specifically, the number and nature of the facets of SC were similar, but the hierarchical relations among the facets differed. Moreover, grades could be discriminated from their corresponding subject-specific SCs (i.e., subject-specific SC is not an alternate report of grades). Finally, girls obtained significantly higher grades in English and mathematics than boys, but their mathematics SCs were significantly lower.

On Gender Differences in the Structure of Adolescent Self-concept

Despite a plethora of studies on self-concept (see Byrne, 1984; Hansford & Hattie, 1982; Purkey, 1970; Wylie, 1979) and gender (see Deaux, 1984; Maccoby & Jacklin, 1974), research focusing on gender differences in self-concept is sparse. Furthermore, findings that have been reported have been inconsistent and indeterminate (see West, Fish, & Stevens, 1980; Wylie, 1979). This ambiguity can be linked to theoretical issues. Specifically, most studies have (a) lacked a clear, theoretical basis; (b) used psychometrically limited measuring instruments; and, (c) used simplistic or inappropriate methodological procedures. In other words, researchers have addressed the substantive question of gender differences in self-concept before theoretical issues of construct definition and construct interpretations have been resolved. The purpose of this study was, broadly speaking, to address these issues and (a) test the invariance of the self-concept (SC) structure between adolescent males and females; (b) explore gender differences related to the specific dimensions of SC for adolescent males and females; and, (c) present a statistically sophisticated methodological approach which integrates concerns about measurement, statistics, and theory into one conceptual, analytic framework.

Structure of Self-concept

To date, four theoretical models of SC have been proposed (see Byrne, 1984). Of these, however, the model presented by Shavelson, Hubner, and Stanton (1976) has undergone the most rigorous examination. Its hypotheses have been tested in both cross-sectional designs (Byrne & Shavelson, in press; Fleming & Courtney, 1984; Fleming & Watts, 1980; Marsh, Barnes, Cairns, & Tidman, 1984), and longitudinal designs (Byrne, in press; Marsh, Smith, Barnes, & Butler, 1983; Shavelson & Bolus, 1982). The academic component of the model is illustrated in Figure 1, and provides the theoretical framework for the present study.

Insert Figure 1 about here

The structure of SC as originally proposed by Shavelson et al., (1976) posited that SC, in general terms, is one's perception of self; these perceptions deriving from interactions with significant others, self-attributions, and the overall experiential aspects of the social environment. More specifically, SC is hypothesized to be both multidimensional and hierarchical, with perceptions of behavior at the base, moving to inferences about self in subareas (e.g., academic--English, mathematics), then to inferences about self in academic and nonacademic areas, and finally, to inferences about self in general. Further, they postulated that SC becomes increasingly multifaceted with age, and is differentiable from other psychological constructs such as academic achievement.

Several studies of adolescents have empirically supported this model with respect to its multidimensionality (e.g., Byrne, in press; Byrne & Shavelson, in press; Fleming & Watts, 1980; Marsh & O'Neill, 1984; Shavelson & Bolus, 1982): its hierarchical structure (e.g., Byrne, in press; Byrne & Shavelson, in press; Fleming & Courtney, 1984; Shavelson & Bolus, 1982); and its discriminability from academic achievement (e.g., Byrne, in press; Byrne & Shavelson, in press; Shavelson & Bolus, 1982).

Recently, however, there has been some debate in the literature concerning the hierarchial structure of SC as originally hypothesized by Shavelson et al. (1976). Marsh (Marsh, Relich, & Smith, 1983; Marsh, Smith, Barnes, & Butler, 1983) has argued that the negligible correlation between English and mathematics SC facets produced a slightly different hierarchical structure. A reanalysis of Marsh's data using second order confirmatory factor analyses led Marsh and Shavelson (1985) to hypothesize that the English and mathematics SC facets each combine separately with a school-subjects facet to form two academic SCs: academic/English and academic/mathematics. With these data from the Self-description Questionnaire, the two academic facets could not be incorporated into a single academic SC dimension. A schematic presentation of this alternative hiearchical structure is presented in Figure 2.

Insert Figure 2 about here

Gender differences in the multidimensional, hierarchical structure of self-concept. Although the invariance of SC structure for males and females has not been tested directly with adolescents, a number of correlational studies bear on this issue. With respect to hierarchical structure, varying correlations between facets of SC have been reported for males and females. Jones and Grieneeks (1970), and Primavera, Simon, and Primavera (1974), found higher correlations for males than females, between general SC and academic achievement, and others (e.g., Kubiniec, 1970) have reported significant correlations for males only. These findings suggest the possibility that SC structure differs hierarchically for males and females.

Gender differences in the discriminability of self-concept from academic grades. The SC literature shows that although the academic SC and subject-specific SCs are correlated among themselves, each can be measured as a separate construct. Particularly important is the fact that English SC and mathematics SC are discriminable from grades in English and mathematics, respectively (Byrne & Shavelson, in press; Shavelson & Bolus, 1982). Of interest in the present study was whether this discriminability holds for males and females. To date, no findings pertinent to the question have been reported.

Gender Differences in Dimensions of Self-concept

Substantive research examining gender effects on adolescent SC, albeit sparse, has yielded a potpourri of findings. In studies of general SC, researchers have reported no gender differences (Drummond, McIntire, & Ryan, 1977; Edgar, Powell, Watkins, Moore, & Zakharov, 1974; Maccoby & Jacklin, 1974; Wylie, 1979); and, higher general SC for males than females (Bakan, 1971; Bush, Simmons, Hutchinson, & Blyth, 1977-1978; Byrne, 1986; Connell, Stroobant, Sinclair, Connell, & Rogers, 1982; O'Malley & Bachman, 1979; Simmons & Rosenberg, 1975). Findings reported for academic SC are equally inconsistent. While Byrne (1986) reported no significant gender differences for high school students (grades 9-12), Calsyn and Kenny (1977) found that males exhibited higher academic SC than females for the same grade levels; both studies reported higher achievement levels for females. Indeed, following a review of gender differences in SC, West, et al. (1980) concluded a total lack of agreement among studies for general SC and academic SC.

West et al. (1980) argued that given the multidimensionality of SC, systematic gender differences are more likely to be found in specific SCs, rather than general or academic SC (see also, Marsh & Shavelson, 1985). However, only findings related to mathematics SC are reported for adolescents in the literature. A recent review reported consistent findings (Meece, Parsons, Kaczala, Goff, & Futterman, 1982). While few gender differences were found among elementary school children, large and consistent differences were found among adolescents; boys exhibited higher mathematics SC than girls. Findings show that mathematics SC decreases for both sexes in high school; the decrease, however, begins earlier and is more extensive for females than males (Meece et al., 1982). These differences appeared despite the fact that mathematics achievement for females has been equivalent to males (Fennema, 1974; Sherman, 1980).

In examining adolescent SC and, in particular, academic and subject-specific SCs, it is prudent to also investigate academic performance, since the two constructs are so closely linked (see Hansford & Hattie, 1982). Maruyama, Rubin, and Kingsbury (1981) have argued that grades rather than standardized achievement tests are more likely to influence a student's SC since they represent a more salient benchmark of academic performance. For high school students, in particular, this would appear to be the case, since feedback from grades is assured, while feedback from achievement tests is not always guaranteed.

Relations among general and academic SC, academic achievement, and gender are inconsistent (Hansford & Hattie, 1982; Purkey, 1970; West & Fish, 1973; West, et al. 1980; Wylie, 1979). Regardless, gender differences in grades have been quite consistent for high school students; girls receive higher grades than boys (Bakan, 1971; Byrne, in press; Calsyn & Kenny, 1977; Grabe, 1976).

Based on the literature reviewed, we conclude that little is known regarding gender differences in the structure of adolescent SC. Although correlational studies give the impression that there may be differences in the hierarchical structure of SC for males and females, a direct test has not been made. While gender differences in general and academic SC are discordant, they are not so as the SC facet under study becomes more specific, at least with respect to mathematics SC: males have consistently higher mathematics SC than females. Finally, gender differences in SC/academic achievement relations are varied, despite the fact that academic achievement for high school girls is consistently higher than for boys.

Several limitations in this research are evident. First, studies have largely focused on substantive gender interpretations, rather than grounding these findings in SC theory. Indeed, substantive interpretations based on an ill-defined construct and/or derived from an invalid measure, yield unstable and questionable results. Second, studies have employed a variety of SC instruments, most of which have not been validated against a specific theoretical model of SC. Third, many of the gender differences reported in the literature have not been tested for statistical significance. Fourth, the analyses have typically relied on traditional statistical procedures and used only one measuring instrument. As such, the measure is assumed to be perfectly reliable, and a valid representation of the construct under study. It has been argued that this assumption is unrealistic (Zimmerman & Williams, 1980) and is particularly so for females (Hamilton, 1981). Finally, most studies have focused on general SC, rather than the more specific facets.

The present study goes beyond previous research in this area by examining the structure of adolescent SC for males and females, and by using three different measures of each SC facet in a covariance structure analysis of the data. Specifically, the purposes of the study were to: (a) test the hypothesis of the invariance of a multidimensional, hierarchical SC structure for males and females; (b) test the invariance of the discriminability of SC from academic grades for males and females; and, (c) examine gender differences related to general SC, academic SC, English SC, mathematics SC, and grades in English and mathematics.

Method

Sample and Procedure

The original sample comprised 991 (516 males, 475 females) grades 11 and 12 students from two suburban high schools in Ottawa, Canada. Following listwise deletion of missing data, the final sample size was 832 (412 males, 420 females). Since English is part of the core curriculum for high schools in Ontario (i.e., compulsory), only mathematics classes were tested for the study.

A battery of SC instruments (described below) was administered to intact classroom groups during one 50-minute period. The testing was completed approximately two weeks following the April report cards. The students therefore had the opportunity of being fully cognizant of their academic performance prior to completing the tests for the study. This factor was considered important in the measurement of academic and subject-specific SCs.

Instrumentation

The SC test battery consisted of 12 measures; three for each of general SC, academic SC, English SC, and mathematics SC. All were self-report rating scales that were designed for use with a high school population. General SC was measured using the General-Self subscale of the Self-description Questionnaire (SDQ III; Marsh & O'Neill, 1984), the Self Concept subscale of the

Affective Perception Inventory (API; Soares & Soares, 1979), and the Self-esteem Scale (SES; Rosenberg, 1965). Measures of academic SC were the SDQ III Academic Self-concept Scale, the API Student Self subscale, and the Self-concept of Ability Scale Form A (SCA; Brookover, 1962). English SC was measured with the SDQ III Verbal Self-concept subscale, the API English Perceptions subscale, and the SCA Form B. Items on Form B are identical to those on Form A, except that they elicit responses relative to specific academic content (e.g., "How do you rate your ability in English compared to your close friends'?"). Finally, measures of mathematics SC included the SDQ III Mathematics subscale, the API Mathematics Perceptions subscale, and the SCA Form C (items specific to mathematics ability). The instruments were selected because they purported to measure (with some empirical justification) the SC facets in the theory to be tested.

The SDQ III is structured on an 8-point likert-type scale with responses ranging from "1-Definitely False" to "8-Definitely True". The General-Self subscale contains twelve items, the other three subscales, ten items. Marsh and O'Neill (1984) have reported internal consistency reliability coefficients ranging from .86 to .93 (Md α = .90) for the SDQ III general SC and each of the academic SC subscales, and strong support for their construct validity based on interpretations consistent with the Shavelson et al., (1976) model of SC.

The API was developed as a semantic differential with a forced-choice format containing four categories spread along a continuum between two dichotomous terms (e.g., "happy", "unhappy"). Internal consistency coefficients ranging from .79 to .94 (Md α = .85) have been reported for the subscale measures of general SC, academic SC, and the subject-specific SCs (Soares & Soares, 1980). Convergent validity coefficients ranged from .49 to .55 (Md r = .50) with peer ratings, and from .37 to .74 (Md r = 48.5) with teacher ratings for the same subscales. Soares and Soares (1980) also presented evidence of discriminant validity. The number of items comprising each of the API subscales is as follows: Self Concept--25; Student Self--25; English Perceptions--22; Mathematics Perceptions--17.

The SES is a 10-item Guttman scale based on a 4-point likert-type format ranging from "strongly agree" to "strongly disagree". The 8-item SCA, also intended to be a Guttman scale, has a response format based on a 5-point likert-type scale. Respondents are asked to rank their ability in comparison with others, on a scale from 1-"I am the poorest" to 5-"I am the best". Satisfactory reliability and validity data have been reported for both of these instruments (see Byrne, 1983 for a more extensive discussion).

Analysis of the Data

The data were analyzed using a variety of methodological procedures. Analyses related to the structure of SC examined covariance structures and zero-order correlations. Multivariate analysis of variance procedures were used to explore gender differences among SC dimensions and academic grades. Responses to negatively worded items were reversed so that for all instruments, the highest response code was indicative of a positive rating of SC. Additionally, the first item on the API Self Concept subscale was recoded, contingent on the sex of the respondent.[1] In an earlier study of these data (Byrne & Shavelson, in press), we factor analyzed the SDQ III, API and SCA. Based on these findings, the API Student Self Subscale was deleted as a measure of academic SC.[2]

Structure of self-concept. Analysis of the covariance structure of the data (LISREL V, Joreskog & Sorbom, 1981) was used to test the invariance of the multidimensional and hierarchial structure of SC across sex. To test the hypothesis that SC is a multidimensional, hierarchial structure, a series of competing models were compared separately for males and females, with respect to their goodness-of-fit. For example, a 1-factor model hypothesizing a general SC with all SC measures loading on it was tested against a 4-factor model positing (a) a general SC with the general SC measures from the SDQ III, API, and SES loading on it; (b) an academic SC with the academic SC measures from the SDQ III, API, and SCA loading on it; (c) an English SC with English SC measures from the SDQ III, API, and SCA loading on it; and (d) a mathematics SC with mathematics SC measures from the SDQ III, API, and SCA loading on it. Evaluation of this nested set of models involved their comparison with a null model. As such, a model positing complete independence of all observed measurement provided a measure of the total covariation in the data. Finally, the hypothesis that academic SC is discriminable from academic grades was tested by examining zero-order correlations.[3]

Although covariance structure analysis has traditionally relied on the chi-square (χ^2) significance test to determine the degree to which a proposed model fits the observed data, several researchers (e.g. Bearden, Sharma, & Teel, 1982; Bentler & Bonett, 1980; Schmitt, 1978) have noted the inadequacy of this test statistic in evaluating structural models. Given its dependency on sample size, a more reasonable measure of fit is expressed as a ratio of chi-square to degrees of freedom (χ^2/df) (Schmitt, 1978). While a χ^2/df ratio greater than 10.00 indicates inadequate fit, and less than 1.00 signals overfit, a ratio between 1.00 and 5.00 is considered an acceptable fit between the hypothesized and observed covariance matrices; the lower the ratio, the better the fit. Bentler and Bonett (1980) proposed an incremental fit index (d; coefficient delta) that is particularly applicable to large samples. Bearden et al. (1982) note that for samples larger than 100, a coefficient d less than .95 signals an inadequate fit. In the present study, the evaluation of competing models was based on the χ^2/df ratio and the d index.

Gender differences related to dimensions of self-concept. Multivariate analysis of variance procedures were used to test mean differences related to dimensions of SC, as well as grades.

Results and Discussion

Structure of Self-concept

Before testing the invariance of SC structure across sex, we first determined the best fitting model for each group separately. Thus, the measurement estimation and properties of the model were determined prior to the comparison of the structural parameters (see Wolfle, 1983). The model-fitting process involved a series of steps in which the parameters were respecified and the model reestimated; respecification was based on the modification indices. Theoretical as well as statistical considerations guided the model fitting process.

Gender differences in the multidimensional, hierarchical structure of self-concept. We tested three alternative models bearing on the multidimensional, hierarchical structure of SC for males and females independently. Model 3 hypothesized the SC structure shown in Figure 1 with four different, but correlated facets: general SC, academic SC, English SC, and mathematics SC. Models 1 and 2 represented alternatives that were more restrictive and less differentiated than Model 3. Model 1 posited a unidimensional general SC structure, measured by all of the indicator variables. Model 2 posited two correlated factors comprising general SC (measured by SDQ III, API, and SES general SC), and academic SC (measured by all the remaining indicator variables, except the API Student Self subscale). These results are presented in Table 1.

Insert Table 1 about here

These data indicate that for both males and females, Model 3 provided the best fit to the data (χ^2/df=3.22, d = .97; χ^2/df=2.54, d = .97 respectively). As noted in Table 1, to fit this model, it was necessary to allow the error/uniqueness terms to covary between specific subscales of the same measuring instrument. Covariation of error terms indicate that systematic error is introduced by a particular measurement method, and that the underlying constructs are unidimensional.

In testing for invariance of SC structure, the first step was to test the hypothesis (1) of overall invariance--is there, or is there not, a difference in the male and female covariance matrices? If there are differences, the next step is to test a sequence of additional hypotheses such that each is more restrictive than the preceding.[4] These hypotheses are: (2) the number of factors (i.e., latent constructs, SC dimensions) under study are invariant for males and females; (3) the pattern of loadings on each factor are invariant for males and females; (4) the measurement dependability is invariant for males and females; (5) relations among the factors are invariant for males and females. The proposed 4-factor model was thus fitted to the data from the two groups simultaneously, with the appropriate parameters made invariant across groups. These results are presented in Table 2.

Insert Table 2 about here

All but one hypothesis was rejected. By rejecting Hypothesis 1, we confirmed that the covariance matrices were significantly different for males and females. Hypotheses 2 and 3 must be considered together since they are both related to the factor structure. Although it would appear that Hypothesis 2 should be rejected, Hypothesis 3 is more restrictive, and therefore overrides the preceding hypothesis (see Joreskog, 1979). The acceptance of Hypothesis 3 is interpreted as indicating that the latent constructs (i.e., SC dimensions), as measured in this study, are invariant across sex. For Hypotheses 3 through 5, the level of significance was based on the difference in χ^2 ($\Delta\chi^2$), as well as degrees of freedom between each successive test; this difference being χ^2-distributed. Rejection of Hypotheses 4 and 5 indicate that the two groups differ with respect to measurement error (random and systematic), as well as relations among the SC dimensions.

Correlations among the latent SC constructs and subject grades bear on the hierarchical structure hypothesis. In particular, an hierarchical structure should yield a pattern of correlations such that general SC correlates highest with academic SC, next with subject-specific SCs, and least with grades; academic SC should correlate higher with subject-specific SCs than with subject grades; and subject-specific SCs should correlate higher with their corresponding grades, than with grades in different subjects. More generally, correlations between adjacent levels of the hierarchy should be higher than correlations between nonadjacent levels.

Insert Table 3 about here

For both sexes, the results in Table 3 supported the hypothesis with respect to general SC and academic SC. However, conditions related to the subject-specific SCs varied for males and females. As predicted, the correlation between general SC and academic SC (r_M =.46; r_F =.39)[5] was highest; between general SC and subject-specific SCs ($\bar{r}_M$ =.32; $\bar{r}_F$ =.24) the next highest; and, between general SC and grades ($\bar{r}_M$ =.05; $\bar{r}_F$ =.02), the lowest. Similarly, the correlations between academic SC and subject-specific SCs ($\bar{r}_M$ =.66; $\bar{r}_F$=.59) were higher than they were with grades ($\bar{r}_M$ =.54; $\bar{r}_F$ =.52). For females, English and mathematics SCs correlated higher with their corresponding grades (r =.50; r =.64, respectively), than with grades in the other subject (r =.01; r =.27, respectively). For males, however, this pattern did not hold. While grades in mathematics correlated higher with mathematics SC (r =.68), than with English SC (r =.13), grades in English correlated to the same degree with mathematics SC as with English SC (r =.32). Finally, although for both sexes, the correlation between mathematics SC and mathematics grades (r_M =.68; r_F =.64) was higher than the correlation between academic SC and mathematics grades (r_M =.55; r_F =.42), the same pattern did not hold for English. As such, the correlation between English grades and English SC (r_M =.32; r_F =.50) was lower than the correlation between English grades and academic SC (r_M =.52; r_F =.61). This discrepancy was much more dramatic for males than for females. One other interesting gender difference related to correlations between academic and subject-specific SCs is worthy of note. Whereas for females, English SC correlated higher with academic SC (r =.65), than did mathematics SC (r =.52), the reverse was true for males; mathematics SC correlated higher with academic SC (r =.76), than did English SC (r =.55).

Gender differences in the discriminability of self-concept from academic grades. Demonstrating that a SC structure is consistent with theory is a necessary, but not sufficient condition in the validation of construct interpretations. It must be further shown that measures of the proposed construct can be discriminated from other constructs (c.f. Shavelson et al., 1976). This is particularly true for constructs such as academic SC and subject-specific SCs, since they are linked so closely with academic achievement. A counter-interpretation to the proposed interpretation of academic SC measures, then, is that academic SC is merely a student's report of his/her general achievement, subject grades, or some combination of both.

Zero-order correlations were examined to determine the discriminability of academic SC from academic grades. In creating the table, the correlations among multiple indicators of a construct were averaged by transforming all correlations to Fisher's Z's, averaging the Z's, and then transforming the average Z to a correlation. These results are presented in Table 4.

Insert Table 4 about here

Values on the main diagonals represent convergent validity coefficients. Discriminant validity is ascertained by comparing the convergent validity coefficients, with correlations in the corresponding rows and columns. Of specific importance, is the comparison of the correlations on the main diagonal, with those for grades in rows 5 and 6. In particular, attention focuses on the comparison of the convergent validities for English SC (r_M =.62; r_F =.63) and mathematics SC (r_M =.84; r_F = 83), and the corresponding correlations for grades in English (r_M =.29; r_F =.36) and grades in mathematics (r_M =.61; r_F =.56). For both males and females, the convergent validities for the subject-specific SCs, as well as for academic SC and general SC, were higher than other correlations in corresponding rows and columns, thus providing evidence of discriminant validity.

Gender Differences in Dimensions of Self-concept

A one-way (gender) multivariate analysis of variance of the 12 measures of SC facets was highly significant (Wilks lambda = .723; F (14,817) = 22 38 p<.001). Univariate F-tests, as well as cell means and standard deviations are summarized in Table 5. Using the Bonferroni procedure, the significance level was adjusted (α =.05/12 = .004) to minimize the possibility of Type I error. Results for general and academic SC were inconsistent. Although no significant gender differences were found on general SC as measured by the SDQ III, results on the API and SES found that males exhibited significantly higher general SC than females. Academic SC as measured by the SDQ III, was significantly higher for females, while results based on the SCA revealad no significant differences. These inconsistent findings regarding general and academic SC support other studies that have found gender differences contingent on the particular measure used (e.g., Smith, 1978). Findings related to the subject-specific SCs on the other hand, were quite consistent. Girls exhibited significantly higher English SC; boys demonstrated significantly higher mathematics SC. With respect to academic performance, females had significantly higher grades in both English and mathematics.

Insert Table 5 about here

Conclusions

The purposes of the study were to: (a) test the invariance of a multifaceted, hierarchical structure of SC for males and females; (b) test the invariance of the discriminability of SC from academic grades; and, (c) explore sex differences related to general SC, academic SC English SC, mathematics SC, and grades in English and mathematics. We first fitted the hypothesized 4-factor model (Figure 1) separately for males and females. We then compared the goodness-of-fit of this model with alternative 2-factor (general SC and academic SC) and 1-factor (general SC) models. Using Model 3 as our baseline model, our next step was to test the assumed independent covariance structures for males and females. We confirmed that our data represented two independent groups and therefore proceeded next to test further assumptions underlying the invariance of SC structure for males and females. Based on a series of increasingly restrictive models, we determined that although the number of factors and their pattern of factor loadings was invariant across sex, relations among the factors (i.e., SC dimensions) and the measurement dependabilities, differed for males and females.

With respect to structure, the multidimensionality of SC, as well as its discriminability from grades were found to be invariant across sex. General SC can be interpreted as distinct from, but correlated with academic SC. The subject-specific facets of English SC and mathematics SC can be distinguished from (but are correlated with) academic SC and general SC. As Marsh and associates have found, English and mathematics SCs are uncorrelated with each other. Of particular importance with respect to the discriminability of academic SC from grades, was the finding that English and mathematics SCs can be distinguished from grades in English and mathematics.

Contrary to Marsh and Shavelson's findings (Figure 2), however, a single academic facet was identified, and the English and mathematics facets were highly correlated with it ($r_M = .55$, $r_F = .65$ and $r_M = .76$; $r_F = .52$, respectively). This finding supports the model in Figure 1 and is not specific to a particular SC instrument. In general, our analyses suggest that for both sexes, SC is an hierarchical construct with general SC at the apex, descending to academic SC, then to subject-specific SCs. In particular, the hierarchy varies between males and females with respect to relations involving the subject-specific SCs, academic SC, and grades. Our findings showed that for both sexes, English grades correlated higher with academic SC than with English SC. However, for females, academic SC correlated higher with English SC than with mathematics SC; for males, the reverse was true. It appears, then, that consistent with stereotypic expectations, high school girls perceive their overall academic ability in terms of their grades in English, whereas for boys, this perception derives from their performance in mathematics. We are unable to interpret the finding that for males, English grades correlated higher with mathematics SC than with English SC, but suspect that this effect will disappear upon replication.

Substantively, findings related to the specific facets of SC were the most consistent. Our results showed that despite significantly better academic performance in English and mathematics, females exhibited significantly lower levels of mathematics SC, albeit higher levels of English SC. These results support earlier research and seem to reflect school expectations, as well as the course-taking behavior of males and females in high school. Findings related to general SC and academic SC were inconsistent; this ambiguity, nonetheless, being consistent with the literature.

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Footnotes

1. The item was "I am masculine-------I am feminine".
2. The 4-factor solution was not clear for the API. For both sexes, only 10/25 items designed to measure academic SC loaded on that factor; of the remaining items, 10 loaded on general SC, 4 on mathematics SC, and 1 on English SC. A subsequent 3-factor solution yielded three clearly defined factors for each sex.
3. We originally intended to use covariance structure analysis in examining the discriminability of SC from academic grades. Three alternative models were proposed: (a) a 1-factor model hypothesizing that SC and academic grades form a unidimensional construct; (b) a 2-factor model comprising a SC factor (English SC and mathematics SC combined) and an academic achievement factor (English and mathematics grades combined) and, (c) a 4-factor model postulating that English, mathematics, English grades, and mathematics grades are separate constructs. In order to adequately fit the 4-factor model, it was necessary to allow English grades to correlate with the English SC subscale of the SCA. However, since English grades was a single indicator, this correlation resulted in an unidentified model.

4. Stated in LISREL terminology, the hypotheses were:

(1) $H_{\Sigma} : \Sigma_M = \Sigma_F$

(2) $H\ \Lambda_X : \Lambda_X = \begin{matrix} X & 0 & 0 & 0 \\ X & 0 & 0 & 0 \\ X & 0 & 0 & 0 \\ 0 & X & 0 & 0 \\ 0 & X & 0 & 0 \\ 0 & 0 & X & 0 \\ 0 & 0 & X & 0 \\ 0 & 0 & X & 0 \\ 0 & 0 & 0 & X \\ 0 & 0 & 0 & X \\ 0 & 0 & 0 & X \end{matrix}$ LX = SP

(3) $H_{\Lambda} : \Lambda_M = \Lambda_F$ LX=IN

(4) $H_{\Lambda\Theta\phi} : \Theta_{\delta F} = \Theta_{\delta F}$ LX=IN; TD=IN

(5) $H_{\Lambda\Theta\phi} : \Theta_{\delta}\phi_M = \Theta_{\delta}\phi_F$ LX=IN; TD=IN; PH=IN

5. r_M = correlation for males

r_F = correlation for females

Table 1

Test of the Multidimensional Hierarchical Structure of Self-Concept by Sex[a]

	Males				Females			
Competing Models	χ^2	df	χ^2/df	d	χ^2	df	χ^2/df	d
0 Null Model	3258.48	55	--	--	3206.94	55	--	--
1 General SC (1-factor model)	1334.01	41	32.54	.59	1868.62	41	45.58	.42
2 General and academic SC (2-factor model)	806.55	40	20.16	.75	876.22	40	21.91	.73
3 General, academic, and subject-specific SC (4-factor model)	112.54	35	3.22	.97	88.73	35	2.54	.97

[a]For both sexes, the error/uniqueness terms in models 1 to 3 were allowed to correlate between:

(a) the SCA academic SC and English SC subscales;

(b) the SCA academic SC and mathematics SC subscales;

(c) the API English SC and mathematics SC subscales.

Table 2

Simultaneous Tests of Invariance Across Sex

Hypotheses	χ^2	df	χ^2/df	$\Delta\chi^2$	df	$p(\Delta\chi^2)$	d
Invariance of:							
1. Covariance matrices	138.80	66	2.10	--	--	0.0	
2. Number of factors	201.28	70	2.88	--	--	0.0	.97
3. a) Number of factors; b) Pattern of factor loadings	210.68	77	2.74	9.40	7	.23	.97
4. a) Number of factors b) Pattern of factor loadings; c) Error/ uniquenesses	259.31	91	2.85	58.03	14	0.0	.96
5. a) Number of factors; b) Pattern of factor loadings; c) Error/uniquenesses d) Latent construct relations	308.79	101	3.06	49.48	10	0.0	.95

Table 3

Correlations Among Latent Constructs by Sex[a,b]

	GSC	ASC	ESC	MSC	ENG	MATH
GSC	1.00	.39	.30	.18	.07	-.03
ASC	.46	1.00	.65	.52	.61	.42
ESC	.29	.55	1.00	-.01	.50	.01
MSC	.34	.76	.21	1.00	.27	.64
ENG	.02	.52	.32	.32	1.00	.46
MATH	.07	.55	.13	.68	.59	1.00

[a]Correlations for boys are below the main diagonal; those for girls are above the main diagonal.

[b]GSC = general SC

ASC = academic SC

ESC = English SC

MSC = mathematics SC

ENG = English grades

MATH = mathematics grades

Table 4

Zero-order Correlations Between Self-concept and Academic Grades[a]

	Males						Females					
	GSC	ASC	ESC	MSC	ENG	MATH	GSC	ASC	ESC	MSC	ENG	MATH
GSC	.67						.72					
ASC	.32	.70					.25	.66				
ESC	.22	.41	.62				.21	.44	.63			
MSC	.26	.60	.18	.84			.13	.41	.03	.83		
ENG	.02	.46	.29	.28	1.00		.05	.50	.36	.23	1.00	
MATH	.06	.45	.10	.61	.53	1.00	-.03	.36	.01	.56	.43	1.00

[a]GSC = general SC

ASC = academic SC

ESC = English SC

MSC = mathematics SC

ENG = English grades

MATH = mathematics grades

Table 5

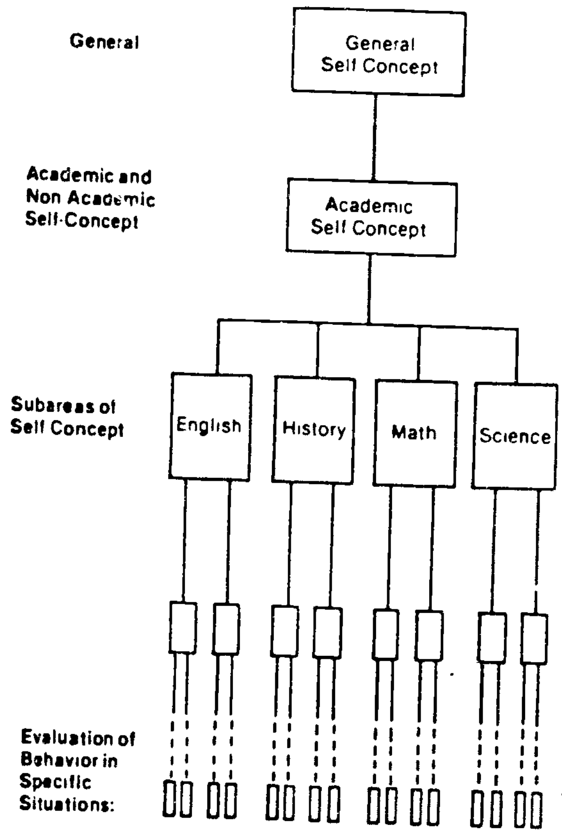
Cell Means, Standard Deviations and Univariate F-tests for Self-concept Measures and Academic Grades

Measure	Males M	Males SD	Females M	Females SD	Univariate F-test	p
SDQ III						
general SC	76.21	13.58	75.26	14.53	1.15	.283
academic SC	52.62	13.14	57.24	11.05	29.91	.000
English SC	50.71	9.96	53.06	9.68	11.67	.001
mathematics SC	48.96	15.74	44.15	16.28	18.35	.000
API						
general SC	78.36	9.34	75.23	8.94	20.68	.000
academic SC	70.98	9.86	74.03	8.71	21.08	.000
English SC	57.61	11.12	62.87	10.83	48.24	.000
mathematics SC	47.40	11.69	43.69	11.19	21.03	.000
SES						
general SC	31.91	4.89	30.69	4.98	14.11	.000
SCA						
academic SC	28.27	5.73	28.73	4.87	1.96	.162
English SC	26.49	5.87	28.68	5.41	27.48	.000
mathematics SC	26.14	7.71	24.07	7.13	14.84	.000
Grades						
English	62.19	12.76	68.65	11.86	58.46	.000
mathematics	59.50	16.71	62.95	14.89	10.08	.002

Figure Captions

Figure 1. Structure of Academic Self-Concept. (Adapted from "Self-Concept: Validation of Construct Interpretations" by R. J. Shavelson, J. J. Hubner, and J. C. Stanton, Review of Educational Research, 1976, 46, 407-441.)

Figure 2. Structure of Self-Concept. (Adapted from "Self-Concept: Its Multifaceted, Hierarchical Structure" by H. W. Marsh and R. J. Shavelson, Educational Psychologist, 1985, 20, 107-125.



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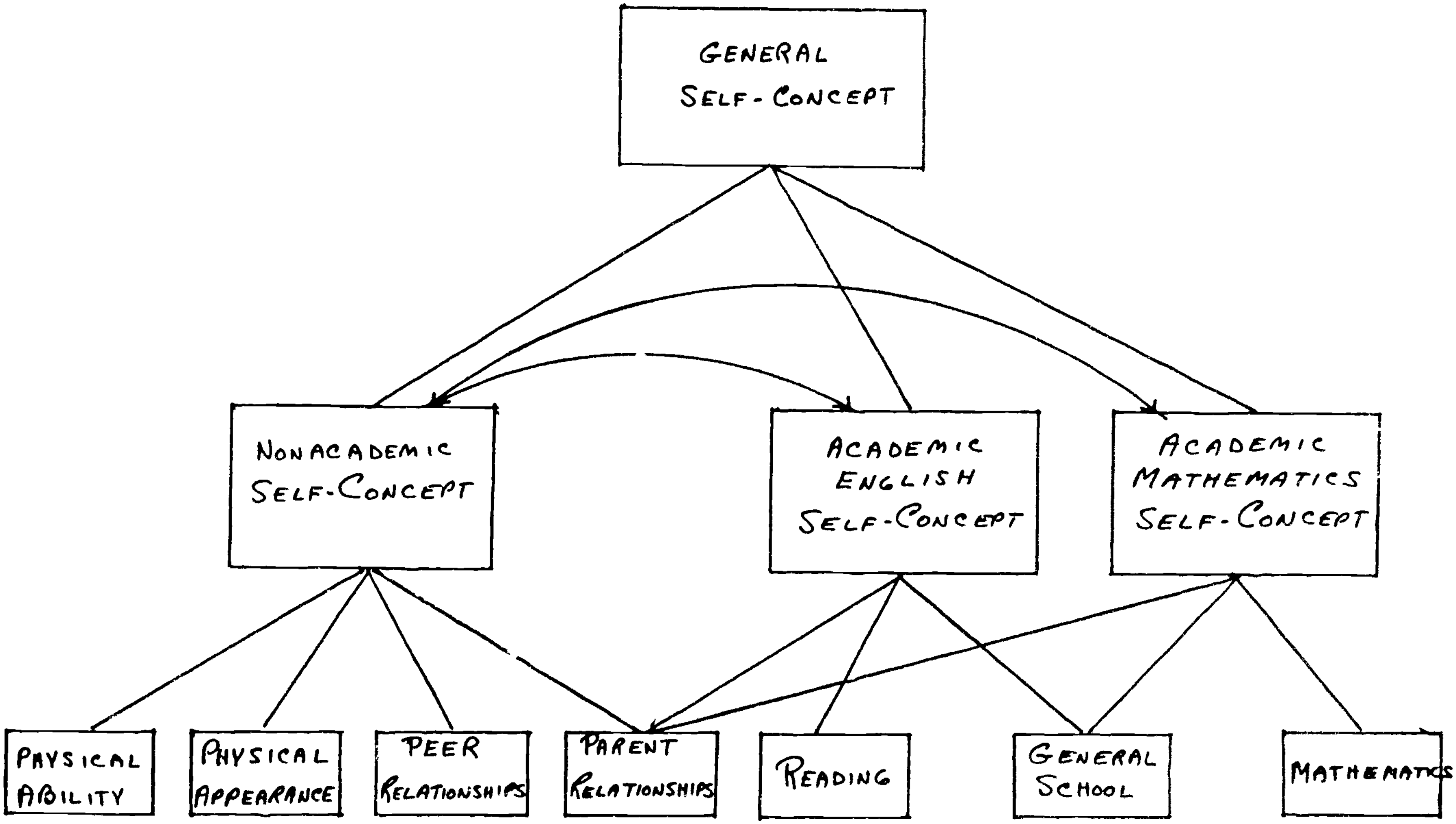
GENERAL SELF-CONCEPT
NONACADEMIC SELF-CONCEPT
ACADEMIC ENGLISH SELF-CONCEPT
ACADEMIC MATHEMATICS SELF-CONCEPT
PHYSICAL ABILITY
PHYSICAL APPEARANCE
PEER RELATIONSHIPS
PARENT RELATIONSHIPS
READING
GENERAL SCHOOL
MATHEMATICS