

Self-Concept and Academic Achievement: Investigating Their Importance as Discriminators of Academic Track Membership in High School*

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Several factors—general self-concept (SC), academic SC, or academic achievement (AA; academic grades)—may discriminate between low- and high-track students. Using linear discriminant function analysis, two independent samples of high school students ($N=929$; $N=968$) were tested on identical measures of these constructs. Although academic SC and AA both discriminated moderately between tracks, academic SC was the more effective discriminator. Further, low and high tracks could not be distinguished on the basis of general SC. We should distinguish between general SC and academic SC in the measurement of adolescent SC.

Plusieurs facteurs—concept de soi (CS), moi scolaire (MS) ou rendement scolaire (RS)—permettent de départager les élèves du groupe supérieur et les élèves du groupe inférieur. À l'aide d'une analyse fonctionnelle discriminante linéaire, deux échantillons distincts d'élèves du secondaire ($N=929$; $N=968$) ont été testés, les instruments de mesure de ces construits étant identiques. Le MS et le RS permettaient de départager assez bien le groupe supérieur et le groupe inférieur, le MS ayant toutefois le meilleur pouvoir de discrimination. En outre, les groupes supérieur et inférieur ne pouvaient pas être distingués en fonction du CS. Il faudrait donc distinguer entre le CS et le MS lorsqu'on mesure le CS des adolescents.

Educators, educational researchers, and school psychologists have long been interested in the extent to which a student's social environment influences his/her self-concept and academic achievement. The practice of ability grouping in high school, that is, the placement of high ability and low ability students in separate classrooms, is commonly known as "academic tracking." High-track courses typically stress conceptual understanding and are tailored to meet the requirements of university entrance; low-track courses emphasize practical skill and are designed for acceptance into community college or the work force.

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The advantages and disadvantages of academic tracking are extremely debatable (Kulik & Kulik, 1982). However, studies comparing low- and high-track students on affective and academic factors have yielded consistent results. Most research on this aspect of academic tracking has emphasized the socialization process rather than behavioural outcomes. Although sociological findings have implied tracking effects on individual student attitudes and social behaviours (Rosenbaum, 1976, 1980), educational and psychological literature on the question is scarce. I have chosen to investigate the impact of self-concept (SC) and academic achievement (AA) in discriminating between low- and high-track high school students.

The sociological literature shows tracking segregates students by defining an academic hierarchy through which certain rewards are allocated (Heyns, 1974; King & Hughes, 1985; Rosenbaum, 1980), thereby generating two separate societies in the school (Rosenbaum, 1976). Furthermore, segregation crystallizes as a function of the stereotyping and labelling that accompanies track membership. Studies of teacher and student attitudes (e.g., Addy, Henderson, & Knox, 1980; Finley, 1984; Rosenbaum, 1976) and student friendship patterns (Alexander & McDill, 1976; Cohen, 1977; Rosenbaum, 1976) have consistently demonstrated that high-track students see their low-track peers as "slow learners," while teachers see them as "frustrating to teach." In contrast, low-track students see high-track students as "brains," and teachers think of high-track students as "fun to teach." In fact, Rosenbaum (1976, p. 169) posits that "track membership provides a single, highly visible, unambiguous label that instantaneously communicates stigma."

Social comparison plays a vital role in SC development (Suls, 1977). In such achievement-oriented social environments as schools, such comparisons bear importantly on perceptions of academic ability (academic SC) (Coleman, 1983; Rogers, Smith, & Coleman, 1978; Strang, Smith, & Rogers 1978). Schools that practise ability grouping provide a fertile environment for the operation of social comparison. This is particularly so in high school, where students and teachers readily recognize characteristics unique to each track (see, for example, Addy et al., 1980; Finley, 1984; Rosenbaum, 1976). The visibility of these ability groups makes them highly effective social referents for high school adolescents in their perceptions of self (see Richer, 1976).

Social comparison theory, together with theoretical models that argue for a multidimensional SC structure (Shavelson, Hubner, & Stanton, 1976), suggest that low-track students, in comparing their academic ability with that of their high-track peers, will perceive themselves as less capable and thus exhibit lower levels of academic SC. The tracking literature is consistent in reporting lower levels of academic SC for low-track than for high-track students (Addy et al., 1980; Alexander & McDill, 1976; Byrne, 1988a; Porter,

Porter, & Blishen, 1982; Rosenbaum, 1976); low-track students also demonstrate lower levels of AA than their high-track peers (Addy et al., 1980; Alexander, Cook, & McDill, 1978; Alexander & McDill, 1976; Porter et al., 1982). To date, only one study (Byrne, 1988a) has reported findings from research bearing on general SC and showing no track differences.

Tracking research on relations between adolescent SC and AA is limited for at least two reasons. First, with one exception, studies have examined track differences in academic SC only, ignoring differences in general SC despite substantial evidence that general and academic SC are clearly distinguishable constructs (Byrne, 1986; Byrne & Shavelson, 1986; Harter, 1982; Marsh & Shavelson, 1985), can often generate psychometrically noninvariant measurements across groups (Byrne, 1988b; Byrne, 1988c; Byrne & Schneider, 1988; Byrne & Shavelson, 1987), and can be differentially affected by particular intervention programs (Marsh, Richards & Barnes, 1986). Second, although social comparison processes bear importantly on SC formation, the impact of general SC, academic SC and AA in discriminating between low- and high-track students has not been directly tested.

The purpose of the present study was to test directly the impact of general SC, academic SC, and AA in discriminating between low- and high-track high school students. I replicated the findings by conducting the same analyses on the same measures for two independent high school samples.

METHOD

Samples and Procedures

The data for the present study came from two larger studies each originally designed to validate the structure of adolescent SC (Byrne, 1986 [Sample 1]; Byrne & Shavelson, 1986 [Sample 2]). Respondents from four suburban, upper-middle class secondary schools in Ottawa provided the data base. Subjects in Sample 1 (low track, $N=180$; high track, $N=749$) were grades 9–12 students selected through a random proportional sampling of low- and high-track classes. Sample 2 (low track, $N=314$; high track, $N=654$) consisted of grades 11 and 12 mathematics classes. I tested all low- and high-track classes. For practical reasons of data collection, both samples comprised a non-equivalent number of students from each grade.

In Ontario, two courses are offered for each academic subject (e.g., mathematics, science, history, geography, English, French). One is designed to meet the needs of the high-track student (advanced level courses) and the other, the low-track student (general level courses). Typically, about one-third of all high school students register in the low-track (King & Hughes,

1985). Although the Ontario Ministry of Education has not formalized selection criteria for high and low academic tracks, most Ontario secondary schools (King & Hughes, 1985), and the participating schools in the present study, classify low-track students as those taking two or more of their mathematics, English and science courses in a given year at the general level. All other students are considered high-track. Although low-track students are typically of low ability, educational policy precluded access to this information. I therefore do not report the IQ range for each track.

For both samples, I administered the SC instruments to intact classroom groups in a single class period. The testing was complete about 2 weeks after issuance of April report cards. The students thus could know their AA prior to completing tests for the study. This factor was important in measuring academic SC.

Instrumentation

The Self-Esteem Scale (SES; Rosenberg, 1965) and the Self-Concept of Ability Scale (SCA; Brookover, 1962) were used to measure general SC and academic SC, respectively. Both instruments have a self-report rating scale format and are popular measures of adolescent SC (see Byrne, 1983, 1984; Shavelson et al., 1976).

The SES is a 10-item scale based on a 4-point Likert-type format ranging from "strongly agree" to "strongly disagree." A test-retest reliability of .62 and convergent validity coefficients ranging from .56 to .79 have been reported (Byrne, 1983; Byrne & Shavelson, 1986). The 8-item SCA 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"). Test-retest and internal consistency reliability coefficients, and convergent validity coefficients range from .69 to .72, .77 to .87, and .56 to .68, respectively (Byrne, 1983; Byrne & Shavelson, 1986). For both instruments, responses were reflected such that low subscale scores represented low SC¹.

The measure of AA was based on the mean final grade for all core subjects. Some researchers (e.g., Maruyama, Rubin, & Kingsbury, 1981) have argued that for students, school grades, rather than other types of achievement measures, are valuable indicators of school performance since they provide a more salient and immediate source of feedback. From a research perspective, school grades have been shown to be problematic as measures of academic achievement. Nonetheless, students rely heavily upon school grades—their own as well as those of their fellow students—as a basis for their formation of academic SC.

TABLE 1
Means and Standard Deviations for Self-Concept and Academic Achievement Measures

	<i>Low Track</i>		<i>High Track</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Sample 1 (N=929)</i>				
GSC ^a	30.66	4.73	32.00	4.98
ASC	25.28	4.89	29.26	4.96
AA	61.25	9.73	68.58	10.78
<i>Sample 2 (N=968)</i>				
GSC	31.10	4.71	31.43	5.05
ASC	25.03	4.38	30.20	4.88
AA	60.59	8.71	70.31	10.07

^aGSC=general self-concept; ASC=academic self-concept; AA=academic achievement

Analysis of the Data

For each sample, direct linear discriminant function analyses determined which factor—general SC, academic SC, or AA—had greatest impact in discriminating between low- and high-track students.

RESULTS

Means and standard deviations for general SC, academic SC and AA by track appear in Table 1. Overall, high-track students in both samples demonstrated higher levels of academic SC and AA than their low-track peers. The general SC results were minimally different in the two samples. The practical significance of these comparisons, however, is best judged by examining the standardized score differences (i.e., effect sizes) rather than the raw score differences. As such, the largest effect size (ES) was associated with academic SC (Sample 1=.40; Sample 2=.56), followed by AA (Sample 1=.36; Sample 2=.52), and general SC (Sample 1=.14; Sample 2=.03), respectively.

The results in Table 2 demonstrate that for both samples, only academic SC and AA were important in distinguishing between academic tracks. Examination of correlations between the predictor variables and the discriminant function (i.e., the discriminant structure coefficients) reveals academic SC to be the primary variable discriminating between low- and high-track students (Sample 1=.97; Sample 2=.92). General SC was ineffective in discriminating between tracks.² For both samples, the linear discrimi-

TABLE 2
Summary of Discriminant Function Analysis by Track

Predictor variables	Correlation A ^b	Wilk's	Univariate ^a	Correlations B ^b	
		Lambda U		F	ASC ^c

Sample 1 (N=929)					
GSC ^c	.29	.99	8.36 **	.36	.15
ASC	.97	.91	92.93 ***		.59
AA	.78	.94	60.58 ***		
Canonical R	.32				
Sample 2 (N=968)					
GSC	.06	.99	1.06	.30	.06
ASC	.92	.80	248.50 ***		.59
AA	.82	.83	194.10 ***		
Canonical R	.48				

** $p < .01$

*** $p < .001$

^a Degrees of freedom were: Sample 1 (1,927); Sample 2 (1,966)

^b Correlation A: Correlation between predictor variables and discriminant function; Correlations B: Pooled within-group correlations among predictor variables

^c GSC=general self-concept; ASC=academic self-concept; AA=academic achievement

nant function was statistically significant (Sample 1, $X^2(3) = 94.56$, $p < .001$; Sample 2, $X^2(3) = 254.06$, $p < .001$).

DISCUSSION

The findings that academic performance and academic SC differentiated between low- and high-track students, albeit only moderately so (see Cohen, 1969, p. 22–25), was not unexpected. However, the fact that academic SC was more effective than AA in this differentiation, was surprising. Furthermore, these results replicated in a second sample. Clearly, low-track students, cognizant of the discrepancy between their school marks and those of their high-track peers, perceive themselves as academically less capable.

It could be argued, of course, that their history of poor academic performance leads low-track students to enter high school with academic SCs already lower than those of their high-track peers; the tracking process therefore has little impact on their academic SCs. While these initial differences are highly probable, the point is that by separating students into two visibly different academic streams, tracking reinforces these differences, thereby further widening the academic SC differential between low- and high-track students.

Perhaps a more important finding was that the track membership of students could not be distinguished on the basis of general SC. This result is consistent with both the theoretical and substantive literatures regarding SC/AA relations. Theoretically, it supports the hierarchical structure of SC (Byrne & Shavelson, 1986; Shavelson et al., 1976) which posits that AA should correlate highest with subject matter SCs, next highest with academic SC, and least with general SC. Typically, AA scores correlate .6, .4, and .2 with these SC facets, respectively (Byrne & Shavelson, 1986; Hansford & Hattie, 1982; see also the pooled within-group correlations among the predictor variables in Table 2). Although the present study did not measure subject matter SCs, students' academic performance had little bearing on their general SC.

Substantially, this finding suggests that although low-track students may know of their inferior academic ability (as shown in their low academic SCs), they may place little value on academic attainment (see Rosenberg, 1968); their low AA therefore has little bearing on their overall concept of self. Likely other factors (for example, popularity within friendship cliques) are perceived as more worthwhile (see, for instance, Addy et al., 1980). The general SC results should interest educators, politicians, and researchers anxious about the well-being of low-ability students (see Kulik & Kulik, 1982). Although tracking may have a negative impact on low-track students' academic SC, that may not be so on nonacademic SC facets (for example, social, physical). Social comparison research on various categories of exceptional children (e.g. Ross & Parker, 1980; Winne, Woodlands, & Wong, 1982) has found a compensatory pattern among SC facets; students exhibiting low levels of academic SC often have high levels of social and/or physical SC, and vice versa. This may also be true of students tracked according to academic ability, and future research could answer this question.

Two limitations bear discussion here, and each suggests lines of future research. First, although its findings show the effects of social comparison, that conclusion is nonetheless speculative and based on secondary analyses. The next step logically is to test directly the impact of particular reference groups on SC. Second, it may be that AA as measured by teacher grades does not accurately show track since students are graded relative to classroom peers. Teacher grades may thus be ineffective in discriminating between low- and high-track students. Future research should include both standardized test scores and academic grades as measures of AA.

One methodological finding of my study has important implications for assessment of adolescent SC. The fact that general SC and academic SC could be measured as separate constructs supports the growing body of argument for the multidimensionality of SC (see e.g., Byrne, 1984, 1986; Byrne & Schneider, 1988; Byrne & Shavelson, 1986; Marsh & Shavelson,

1985). Assessments of general SC ought certainly to be distinguished from those of academic SC. For example, in tracked high schools, low-ability students' academic SC is ordinarily assessed before and after the implementation of an intervention program such as remedial mathematics or reading. Clearly an instrument designed to measure general SC would not only be inappropriate, but would lead to misleading and erroneous results. I urge researchers and evaluators who assess adolescent SC to select instruments that are psychometrically sound for the particular SC facet under study.

NOTES

¹ Although general SC was found to be statistically significant in Sample 1, its practical significance was considered minimal since correlations between predictor variables and the discriminant function cannot be meaningfully interpreted (Tabachnick & Fidell, 1985).

² The absence of normative data precluded any comparison with a norm group.

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