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ABSTRACT

Examined was whether within-class social comparison processes mediate the effects of ability grouping in mathematics on self-concept. The sample was 149 students in seventh-grade classrooms in two schools, one practicing within-classroom grouping and the other using between-classroom grouping. It was predicted that, among students who frequently use social comparison information to evaluate their ability, self-concept of mathematics ability ought to be more strongly related to the level of one's group if one is in a school that practices within-classroom grouping by ability. Among students who do not use social comparison information often, self-concept of mathematics ability should be equally related to the level of one's group, whether within-or between-classroom grouping practices are used. These predictions were partially confirmed, although complicated by interaction effects involving gender. The importance of these findings for the literature on social comparison of ability and on ability grouping in schools is discussed. (Author/MNS)

# SOCIAL COMPARISON AND ABILITY-GROUPING EFFECTS ON ABILITY EVALUATIONS IN MATHEMATICS

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## Abstract

The hypothesis that within-classroom social comparison processes mediate the effects of ability grouping in math on self-concept of math ability is examined in a sample of 149 seventh-grade math students in schools that practice either within-classroom or between-classroom grouping. Among students who frequently use social comparison information to evaluate their ability, self-concept of math ability ought to be more strongly positively related to the level of one's group if one is in a school that practices within-classroom as opposed to between-classroom grouping by ability. Among students who do not use social comparison information often, self-concept of math ability should be equally positively related to the level of one's group, whether within-classroom or between-classroom grouping practices are used. Predictions are partially confirmed, but they are complicated by interaction effects involving gender. The importance of these findings for the literature on social comparison of ability and ability grouping in schools is discussed.

Social Comparison and Ability-Grouping Effects on Ability Evaluations in Mathematics

Festinger's theory of social comparison processes (1954) assumes that there exists a human drive to evaluate one's abilities. To the extent that objective standards for evaluation are absent, people will evaluate their abilities by comparison with similar others. Other motivational theorists (Meyer, Folkes, and Weiner, 1976; Suls and Sanders, 1982; Trope, 1975; Weiner and Kukla, 1970) have assumed that persons are motivated to obtain accurate information about their abilities, that this information is obtained through social comparison, and that individual differences in the strength of this motivation exist.

In addition to individual differences in motivation to evaluate one's abilities, the nature of the reference group used in this evaluation process will determine how favorable one's self-evaluation will be. Schools that practice within-classroom grouping by ability offer their students reference groups that differ systematically from the reference groups offered students in schools with between-classroom grouping. Specifically, schools that practice within-classroom grouping may encourage students to compare themselves with others who are more diverse in ability within their own classroom. High ability students may compare themselves with substantially less able students and exaggerate how capable they are; low ability students may compare themselves with substantially more able students and exaggerate how incapable they themselves are. In contrast to Festinger's suggestion that persons will primarily evaluate their abilities by (upward) comparison with similar others, we are suggesting that schools may constrain students to treat all their classmates as relevant comparison others.

Other researchers have assumed that social comparison processes within the classroom mediate the effects of group placement on self-concept of ability (Schwarzer, 1982; Strang, Smith, and Rogers, 1978), expectancies for success and failure in day-to-day schoolwork (O'Connor, Atkinson, and Horner, 19[illegible]), and performance on standardized tests (Beckerman and Good, 1981; Rogers, Smith, and Coleman, 1978). Whereas the mediating role of within-classroom comparison of abilities has been assumed in these field investigations, it has not been empirically assessed. We know of no other study in the literature on effects of ability grouping in schools that has directly assessed within-classroom social comparison of abilities. Esposito (1973) suggests that the generally inconsistent findings reported in the ability grouping literature are due to lack of explicit attention to mediational processes. Our study attempts to redress this deficiency in the literature.

We propose a model in which individual differences in social comparison of one's ability together with grouping practices in schools jointly influence self-concept of ability. Consider an individual who frequently uses social comparison information to evaluate her or his ability in mathematics. We hypothesize that under within-classroom ability grouping this individual's self-concept of math ability will be more strongly related to the level at which she or he is placed than if the individual is in a school with between-classroom ability grouping. For those individuals who do not frequently use social comparison luate their math ability, we predict that self-ncept of ability will be positively related to the level at which indi is placed. The strength of this relationship should not vary as co equence of within- versus between-classroom grouping . Since prior research suggests that gender is related to oc mparison orientations (Veroff, 1969, 1977; Battistich, nso, Mann, and Pearlmutter, 1982) and to self-concept of math y (Eccles, Adler, Futterman, Goff, Kaczala, Meece, and Midgley, 1983) we will also include gender as a predictor in our model.

Method

Sample

One hundred and forty-nine students in the seventh-grade math classrooms in two junior high schools volunteered for this study. School B groups seventh-grade math students according to ability between classrooms; school B separates students by ability into three levels, called "high", "regular", and "basic". School W groups seventh-grade math students according to ability within each classroom; each classroom in school W has two ability levels, called "high" and "regular". Both schools are located in adjoining neighborhoods in the same city in southeastern Michigan; the racial and income characteristics of the two neighborhoods are highly comparable, though there is substantial variation within each neighborhood. Students ~~are as~~signed to a junior high school in the city according to the location of their family residence.

Measures

Students completed a questionnaire in school during a math period near the end of the school year. The questionnaire included three indicators of self-concept of math ability and five indicators of social comparison in math (see Table 1). In addition to these self-report measures, math course grades from the previous semester were obtained from school records.

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Table 1 here

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Results

Construction of composite measures

A principal components analysis of these eight indicators yielded two characteristic roots greater than 2.0. The six remaining roots were less than 0.8, suggesting empirical differentiation of two sets of items. Inspection of rotated factor loadings in a subsequent common factor analysis justified forming one composite from the five indicators of within-classroom social comparison and a second composite from the three indicators of self-concept of math ability. Accordingly, a unit-weighted sum was computed for the five indicators of within-classroom social comparison in math (range = 5 to 34; mean = 19.5; standard deviation = 6.2). The items demonstrated satisfactory internal consistency reliability (Cronbach's alpha = .77). A unit-weighted sum was also computed for the three indicators of self-concept of math ability (range = 6 to 21; mean = 14.8; standard deviation = 3.4). Cronbach's alpha for this composite was .84.

<u>Effects of social comparison, grouping, and gender on self-concept of ability</u>

Using effect coding, one dummy variable was created for gender (G: coded 1 if female and -1 if male), and four dummy variables were created for the five categories of grouping (B1: coded 1 if a student is placed in the high classrooms in school B, -1 if placed in the regular groups in school W, and 0 otherwise; B2: coded 1 if placed in the regular classrooms in school B, -1 if placed in the regular groups at school W, and 0 otherwise; B3: coded 1 if placed in the basic classrooms in school B, -1 if placed in the regular groups in school W, and 0 otherwise; and W1, coded 1 if placed in the high groups in school W, -1 if placed in the regular groups in school W, and 0 otherwise). Social comparison (C) was treated as a continuous variable. Cross-products of these variables were computed to capture interaction effects.

Beginning with the saturated model that included all possible linear effects of social comparison, grouping, gender, and their cross-products on self-concept of ability, a stepwise multiple regression procedure with backward elimination of terms was performed. Non-significant terms ($p$ > .05) were trimmed from the model, with the constraint that any lower-order term nested in a significant higher-order term would be retained, regardless of its own $p$-value.

This procedure led to the following trimmed regression model:

Predicted values of self-concept of ability =

$$14.33 + .02\,C - 1.20\,G - 2.31^{*}\,B1 + 1.68^{***}\,W1$$
$$- 3.98^{***}\,GxB1 + .13^{*}\,CxB1 + .03\,CxG + .15^{**}\,CxGxB1. \quad (1)$$

The R-squared for this model is .281. (One-, two-, or three asterisks following a term denote $p$-values of .05, .01, and .001, respectively.)

Mean predicted scores based on this regression model are listed in Table 2 and displayed in Figure 1.

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Table 2 and Figure 1 here

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We will focus first on predicted self-concept of ability among students who are high on within-classroom social comparison. Mean predicted scores, inspected separately for girls and boys, are consistent with our hypotheses. For example, the mean predicted score for girls in high-ability groups at school W is 16.06, whereas the mean predicted score for girls in regular-ability groups in the same classrooms is 12.21. Mean predicted scores for girls in all classrooms at school B fall between these two values (see Figure 1). Similarly, the mean predicted score for boys in high-ability groups at school W is 16.98, whereas the mean predicted score for boys in regular-ability groups in the same classrooms is 12.53. Mean predicted scores for boys in all classrooms at school B fall between these two values (see Figure 1). Thus, relative to same-sex students, within-classroom grouping by ability accentuates the positive self-evaluation of students in high-ability groups and accentuates the negative self-evaluation of students in regular-ability groups, among those students who use and value social comparison standards.

If one considers simultaneously <u>all</u> students who are high on within-classroom social comparison, it is apparent that our hypotheses are confirmed with respect to students in regular-ability groups at school W. These students are consistently lower on self-concept of math ability than all other students who frequently use within-classroom social comparison. On the other hand, our hypotheses are not fully confirmed for girls in high-ability groups at school W. The mean predicted score for these girls (16.06) is slightly below the mean predicted score for boys in high-ability classrooms at school B (16.43).

Among students who do not use social comparison information to evaluate their math ability, the relationship between grouping and self-concept of ability does not fit our simple expectation that group level would be positively related to self-concept of ability, and equally related in both schools. As can be seen in Figure 1, group level and self-concept are inversely related for girls at school B who do not use within-classroom social comparison. The relationship between group level and self-concept is at least positive for low social-comparison boys in both schools, and for low social-comparison girls at school W; however, the magnitude of this positive relationship appears to be stronger for low social-comparison boys at school W.

The role of past performance in math

Students in these junior high schools were not randomly assigned to levels of the independent variables whose effects were assessed here. This implies that a potential for model misspecification exists (Cook and Campbell, 1979). If they are correlated with social comparison, ability grouping, or gender, causes of self-concept of math ability that were omitted from the regression model just described (see equation 1) could substantially change the coefficients in that model. It has been argued (e.g., Calsyn and Kenny, 1977) that past performance level is a cause of current self-concept of academic ability. If past performance in math is correlated with any of our independent variables--social comparison, ability grouping, or gender--it is possible that effects we have attributed to these independent variables are spurious.

Consequently, we have examined the role of past performance in math as a potential confound in our regression model.

We first examined whether first-semester math grades are related to social comparison, ability grouping, gender, or their cross-products. If we found no significant relationships, we could quickly rule out past performance as a threat to the validity of our previous conclusions. Using the same stepwise multiple regression procedure, now with first-semester math grades as the dependent variable (P: coded 15 if A+, 14 if A, etc.), we reach the following trimmed regression model:

Predicted values of math grades =

$$9.50 + 1.09^{***}\,B1 + 1.00^{***}\,W1. \quad (2)$$

The R-squared for this trimmed model is .236. The mean predicted scores generated by this model are 10.59 for all students in high-ability math classrooms in school B; 10.50 for all students in high-ability math groups in school W; 9.50 for all students in regular-ability and basic-ability math classrooms in school B; and 7.40 for all students in regular-ability math groups in school W. Several inferences may be drawn from this regression model. First, the math grades of girls in high-ability math classrooms at school B are as high as those of any group; if they were using this "objective" performance information to evaluate their ability in math, girls in high-ability classrooms at school B who do not use social comparison information would not have evaluated themselves so poorly. The causes of their low self-evaluation remain to be identified. Secondly, we note that students in the regular-ability math group at school W receive much lower grades than students in both regular-ability and basic-ability math classrooms at school B. Teachers at school W may be comparing the performance of students in the regular-ability math group in a classroom against the superior performance of students in the high-ability math group in that same classroom. In this normative context, teachers may be unduly accentuating a negative evaluation of students in regular-ability groups. Finally, the fact that first-semester math grades are significantly related to ability-group level means that our previous conclusions may be mistaken concerning effects of ability grouping on self-concept of math ability.

In order to control for past performance in math, we regressed self-concept of math ability on first-semester math grades, social comparison, grouping, gender, and all cross-products except those involving grades. Stepwise multiple regression, using backward elimination criteria as before, led to the following trimmed regression model:

Predicted values of self-concept of ability =

$$6.55 + .05\ C + .46\ G - 2.62^{*}\ B1 + 2.96\ B3 - 4.86^{***}\ GxB1 + 4.77^{**}\ GxB3 + .08\ CxB1 - .06\ CxB3 - .04\ GxC + .20^{**}\ GxCxB1 - .21^{**}\ GxCxB3 + .80^{***}\ P, \quad (3)$$

The R-squared for this trimmed model is .557. The increment in explained variance, over and above the effect of first-semester math grades, is .137. This increment is highly significant ($F(11, 124) = 3.48$; $p = .0003$). Mean self-concept of math ability as predicted by this model is shown in Table 3 and Figure 2. This analysis demonstrates that the effects of ability grouping on self-concept of math ability are mediated by social comparison processes, even when self-concept is also dependent upon past performance in math.

Table 3 and Figure 2 here

Restricting our attention first to those who frequently use social comparison information to evaluate their ability in math, we note that students in basic-ability classrooms at school B (i.e., B3 groups) show higher predicted self-concepts than other same-sex students who use social comparison information frequently. The elevated self-concepts of these students in basic-ability math classrooms may be the result of the teacher-contact that was more personalized in their classrooms, compared to all other classrooms in the sample. Since systematic observational measures of teacher-student interactions were not obtained, our understanding of the elevated self-concepts of students in basic-ability math classrooms must remain speculative. Differential participation rates could also account for the elevated self-concepts of these students. B3 students were somewhat less likely to volunteer to participate in the study, compared to other seventh-graders in the sample.

Otherwise, high social-comparison students rank with respect to self-concept much as they did before, when grade effects were not partialled out. For instance, among girls who use social comparison frequently, girls in a high-ability group (W1) have higher self-concepts--and girls in a regular-ability group (W2) have lower self-concepts--than girls in high-ability or regular-ability classrooms (B1 or B2). The same pattern holds for high social-comparison boys.

Among those students who do not use social comparison information frequently, we note that group level is positively related to self-concept of math ability at school W, as expected. Once again, the pattern at school B does not confirm our initial expectations. Among girls at school B who do not use social comparison information frequently, self-concept of math ability is <u>inversely</u> related to the level of one's classroom assignment. Among boys at school B who do not use social comparison information frequently, the relationship between self-concept of math ability and classroom ability level is non-monotonic.

## Conclusions

Social comparison processes are an important mediator of the relationship between ability-grouping practices in seventh grade mathematics classrooms and self-concept of math ability. Whereas many researchers have assumed the operation of this mediating process, our study is the first to test it directly and confirm it. Our model and results call into question one of the conclusions reached by Kulik and Kulik (1982) in their meta-analysis of the literature on ability grouping; namely, their conclusion that ability grouping is unrelated to self-concept. If one aggregates over ability group level and over the extent to which students use social comparison information, as Kulik and Kulik did, meaningful relationships between grouping and self-concept of ability will be missed.

In focusing on social comparison processes in the classroom, we are emphasizing an active process by which students evaluate themselves (Levine, 1983). Students' social comparison behavior is an important influence on their eventual self-concept of math ability. By comparing themselves against others in a high-ability math group in their classroom, students in a regular-ability group are exaggerating how incapable they themselves are. By their own activity, they may be ruling themselves out of further participation in math classes, rather than attempting to improve. By not using social comparison information, on the other hand, girls in a high-ability classroom may be ignoring information that would encourage them to persist in math.

This field investigation suggests several considerations for theory and research on social comparison processes. First, the nature of the interaction effects reported here prompts us to ask how low, social-comparison persons should be regarded by social comparison theorists. On the one hand, the behavior of such persons, who say they do not use social comparison information or who say it is not important information in self-evaluations of ability, is clearly relevant to the theory that explains the behavior of persons who say they do use and value social comparison standards. If ability-grouping practices and gender were to affect self-concept of ability, irrespective of social comparison level, the theorist would have to question (a) the adequacy of the measures of social comparison that were used, or (b) the applicability of a social comparison model to the domain under investigation. By showing interactions involving level of social comparison, the utility of a social comparison model can be asserted. On the other hand, the behavior of such persons, who say they do not use or value social comparison information, demands explanation in its own right. If some students do not use social comparison standards to evaluate their abilities, what standards (if any) do they use? Social comparison theory ought to be developed in this broader context. Minimally, predictions derived from social comparison theory might be more unambiguously confirmed in field investigations, if respondents could be separated into groups who only use social comparison standards for self-evaluation of abilities, groups who only use some other standard for self-evaluation (such as comparison with one's own past performance level), and groups who interchangeably use a variety of standards for self-evaluation.

Finally, in our attempt to investigate social comparison processes in a field setting, we are impressed with the difficulty of knowing just when there is an "absence of objective standards for self-evaluation", that Festinger (1954) counts as a pre-condition for expecting social comparison processes to affect self-evaluation of abilities. One might suppose that after taking a math test and before receiving any outcome information from the teacher, some students will be prompted to compare with their classmates, that is, there is not yet any "objective" standard on which to evaluate oneself. Yet common observation suggests that social comparison in seventh-grade classrooms is particularly intense immediately following the teacher's distribution of graded tests. It would appear that, for many students, grades only acquire meaning when they are placed in a social comparative context, and that grade information does not constitute "objective performance information" in itself. This conclusion is somewhat at odds with the common sense notion that grades are objective precisely because they are publicly sharable. It is possible that Festinger's hypothesized pre-condition for expecting effects of social comparison processes (i.e., the absence of objective performance standards) should be re-evaluated.

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Table 1

Indicators of Math Self-Concept

and Within-Classroom Social Comparison

| | Response Format |
|---|---|
| **Math Self-Concept Indicators** | |
| How good at math are you? | 1=Not at all good<br>7=Very good |
| If you were to rank order all the students in your math class from the worst to the best in math, where would you put yourself? | 1=The worst<br>7=The best |
| How have you been doing in math this year? | 1=Very poorly<br>7=Very well |
| **Social Comparison Indicators** | |
| I compare my math ability to other students in my math class. | 1=Never<br>7=Very often |
| I like to know how my math ability compares to other students in my math class. | 1=Not at all true for me<br>7=Very true for me |
| Doing better in math than other students in my classroom is important. | 1=Strongly disagree<br>7=Strongly agree |
| I compare how hard I try in math to how hard other students try in my classroom. | 1=Never<br>7=Very often |
| Trying harder in math than other students in my classroom is important to me. | 1=Strongly disagree<br>7=Strongly agree |

Table 2

Self-Concept of Math Ability Predicted by

Ability Grouping, Gender, and Social Comparison

| | Ability Group | | | | |
|---|---|---|---|---|---|
| | B1 | B2 | B3 | W1 | W2 |
| Boys | | | | | |
| High Social Comparison | 16.43 | 15.32 | 15.30 | 16.98 | 12.53 |
| | (7) | (5) | (2) | (13) | (12) |
| Low Social Comparison | 16.79 | 15.44 | 15.39 | 17.05 | 12.36 |
| | (9) | (4) | (3) | (2) | (9) |
| Girls | | | | | |
| High Social Comparison | 14.99 | 14.36 | 14.44 | 16.06 | 12.21 |
| | (9) | (6) | (3) | (12) | (8) |
| Low Social Comparison | 11.82 | 13.85 | 13.91 | 15.65 | 14.21 |
| | (8) | (7) | (3) | (11) | (8) |

Note. Social comparison is represented as a dichotomous variable for ease of presentation; it was included in the regression analysis as a continuous variable. N's are shown in parentheses.

Table 3

Self-Concept of Math Ability Predicted by

Grades, Ability Grouping, Gender, and Social Comparison

| | Ability Group | | | | |
|---|---|---|---|---|---|
| | B1 | B2 | B3 | W1 | W2 |
| Boys | | | | | |
| High Social Comparison | 16.52 | 14.36 | 17.62 | 16.73 | 12.42 |
| | (7) | (5) | (2) | (13) | (11) |
| Low Social Comparison | 17.31 | 14.16 | 14.72 | 15.09 | 12.68 |
| | (9) | (4) | (3) | (2) | (9) |
| Girls | | | | | |
| High Social Comparison | 15.16 | 13.68 | 16.65 | 15.66 | 13.13 |
| | (9) | (6) | (3) | (12) | (8) |
| Low Social Comparison | 11.18 | 14.06 | 17.29 | 15.47 | 13.05 |
| | (8) | (7) | (3) | (11) | (8) |

Note. Social comparison is represented as a dichotomous variable for ease of presentation; it was included in the regression analysis as a continuous variable. N's are shown in parentheses.

Figure 1

Self-Concept of Math Ability Predicted by

Ability Grouping, Gender, and Social Comparison

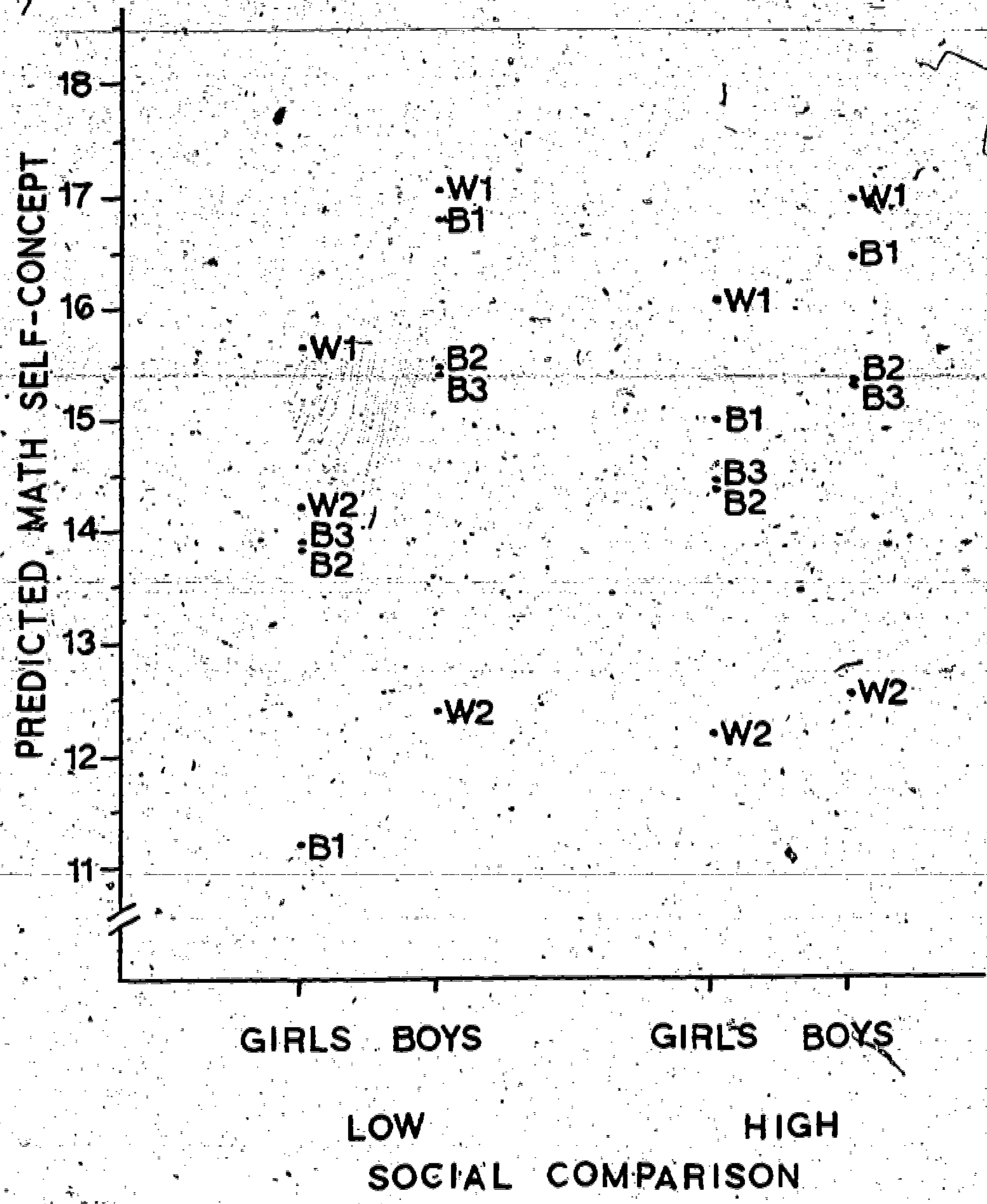

Figure 2

Self-Concept of Math Ability Predicted by

Grades, Ability Grouping, Gender, and Social Comparison