

**A Longitudinal Study of the Effects of Seventh-Grade  
Ability Grouping in Mathematics**

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Paper presented at the annual meeting of the American Educational Research Association, Boston, April, 1990.

This research was made possible by grants from the Spencer Foundation (to Jacquelynn S. Eccles), and the Office of the Vice President for Research, University of Michigan (to Mary Corcoran, Paul Courant, and Jacquelynn S. Eccles).

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## **Introduction**

Academic tracking, one of the oldest and most contentious issues in American education, has recently re-emerged as a focal point in the debate over school reform. In their recent publication Turning Points: Preparing American Youth for the 21st Century (1989), the Carnegie Council on Adolescent Development placed the elimination of ability grouping as the cornerstone of their recommendations for American middle-school reform. Those that support the Council's recommendation suggest academic tracking is an archaic educational practice. They argue the custom denies low tracked students a challenging education, damages them psychologically, and channels them at an early age away from an equal opportunity in later education and employment. On the other hand, proponents of ability grouping believe it is the best way to meet the individual needs of all students. They assert that tracking allows those with high ability to be sufficiently challenged, and those with lower ability to get the attention and work pace they require.

Much of the heat in arguments over ability grouping comes from great gulfs between opposing beliefs regarding the purpose of public education. But the lack of conclusive research findings about the effects of tracking on children adds to the confusion (for reviews see Kulik and Kulik, 1982; Slavin, 1987). Although ability grouping has generated a plethora of research, most investigations have only been able to examine tracking and its effects over a short period of time. Some evidence suggests that while ability grouping may have immediate positive effects on self-concept and motivation, the effects may diminish over time (Oakes, 1985; Reuman, MacIver, Eccles, and Wigfield,

1987). Therefore, to more adequately address the issue, research on ability grouping must look at its long term effects.

This study moves in that direction, and presents the initial findings of a larger, more systematic investigation of the long-term effects of between-classroom ability grouping, or tracking, in math in junior high high school.

## **Sample**

The sample consisted of students who have participated in a longitudinal study designed to investigate issues of achievement, and to assess the effects of transitions on adolescent development. It includes 860 students from whom data were collected during sixth grade in 1983-1984, seventh grade in 1984-1985, and tenth grade in 1987-1988. These students were from 6 predominantly white, middle to lower-middle income school districts in southeastern Michigan.

## **Measures**

### Predictors

The two predictors used were ability level in mathematics at sixth grade, and ability grouping, or tracking, in mathematics at seventh grade.

Ability level in mathematics at 6th grade was a composite score composed of teacher's ratings of math talent and performance, students' year-end grade in mathematics, and their score on a statewide, criterion-referenced test in mathematics that was taken in the first month of the seventh grade. This last item was included as an objective measure of math ability, and the students took the test early enough in the seventh grade (mid-September) so that their performance was not influenced by their classroom experiences that year. A student's math ability score was computed by taking the mean of their

standardized scores on each item. The composite scores were then broken down by thirds to create three ability levels: low, medium, and high.

Ability grouping, or tracking, in mathematics at seventh grade was determined from the teacher's report of whether the student's math class was grouped by ability between classrooms, and if so, the ability level of the math class: low, medium, or high. In addition, based on reports of the students' teachers in sixth grade, only students who were not tracked by ability between classrooms in sixth grade were included in these analyses. Therefore, we believe we are examining the effects of students first experience with between-class ability grouping in mathematics.

Figure 1 shows you the final groupings of students based on ability level and ability grouping. Notice there were no low ability students who were placed in a high track classroom; and that no medium or high ability students were placed in a low track classroom. However, some low ability students were placed in a medium track classroom, allowing us to do some interesting comparisons.

### Outcomes

Four groups of 10th grade outcomes were examined: (1) mathematics achievement, (2) self-concept and future expectations, (3) deviant behavior, and (4) peer association.

Mathematics achievement in tenth grade was determined by taking students' scores on a statewide, criterion-referenced test in math. Students' ratings of their ability in mathematics were also included, as well as the value they placed upon mathematics. However, math grade was not used due to the incompatibility of the same letter grade across different high school mathematics classes.

Self-concept, future expectations, deviancy, and peer association were determined from students' self-report on a questionnaire administered during school hours.

For self-concept, students were presented with a list of achievement-related skills and abilities, and were asked to indicate how good they were at each. Figure 2 shows a few of these. For future expectations, students were presented with a list of life events and were asked to indicate how likely they thought each would be in their future (see Figure 3).

For deviancy, students were presented with list of deviant behaviors and were asked to indicated how often they engaged in these behaviors in the last six months. These behaviors included, among others, skipping class, punching or pushing other students in school, and bringing alcohol or drugs to school. For peer association, students were asked to indicate what percentage of their friends were very ambitious, planned to go to college, regularly drank alcohol, and other items describing the nature of their peer group.

Analyses of variance were used to analyze the data. In the case of mathematics achievement we were able to use analyses of covariance to control for the earlier, pre-tracking level of the outcome variable. As you would expect, there were many main effects of both ability level and ability group. But there were also many ability level by ability group interactions, so this paper will concentrate on the effects of ability grouping, or tracking, within each ability level.

## **Results**

Results indicate the long term impact of seventh grade ability grouping in mathematics on tenth grader's achievement and other outcomes depended upon the students ability level and the ability group into which they were placed.

First, the actual outcomes affected depended upon the ability level of the students. But secondly, for low math-ability students, there were no positive long term effects of being placed in a low track math classroom as opposed to a heterogenous classroom; in fact, in some instances it appeared they fared worse. However, there were some positive effects of being placed in a medium track classroom for these students. Likewise, track placement resulted in more positive outcomes than heterogenous class placement for medium and high ability students.

Although quite a few outcomes were examined, the number of significant findings did exceed what would be expected by chance. Even so, in a study such as this, non-significant findings are just as important as significant findings.

#### Mathematics Achievement

Figure 4 shows students' performance on a statewide criterion-referenced math test, after controlling for their performance on the test at seventh grade. Low ability students placed in a low track math classroom performed worse on the test than those in a heterogeneous and medium track classrooms. However, medium and high ability students who were tracked at seventh grade performed better than their untracked peers.

This is an especially alarming finding. This test is based on what mathematical knowledge the the state feels students should possess at 10th grade. It appears that low ability students placed in low ability classrooms have a more difficult time acquiring this knowledge than their low ability counterparts in heterogeneous and average classrooms.

Tracking, however, was not associated with differences in either self-concept or perceived value of math, except for high ability students placed in high track classrooms who felt math was more useful for their future than

those in heterogenous classrooms. In an earlier study of these same students, there was an initial increase in math self-concept within the first couple of months after being placed in a tracked class, even for low ability students placed in a low tracked class (Reuman, et. al., 1987). Judging from these new results, it appears these gains have attenuated by tenth grade.

#### Future Expectations

In terms of future expectations, tracking appears to have had an impact on later educational plans (see Figure 5). Although there were no differences between low ability students placed in low track classroom and those placed in a heterogeneous classroom, low ability students placed in a medium track classroom, were more likely to plan to attend college. For medium and high ability students, placement in academic tracks likewise had effects on immediate educational plans. Those placed in medium and high math track classrooms were more likely to plan to attend college for any of the students.

Tracking, however, did not seem to affect plans to get vocational training, to enter the military, or to attend a community college program.

#### Self-Concept

As for self-concept, ability grouping had more similar effects for average and high ability students than for low ability students. Figure 6 shows that low ability students placed in a low track class had a lower self-concept of leadership ability and the ability to supervise others. However, Figure 7 shows that medium ability students who were tracked rated themselves as better in public speaking and logical, analytic thinking than their peers in heterogenous classrooms did. In addition, they rated themselves higher in creativity and independence. As shown in Figure 8, high ability students who were tracked rated themselves higher in public speaking and logical thinking; they also rated themselves higher in intelligence.

It is interesting to note that, overall, the effects of tracking on self-concept seem to be in the leadership and intellectual domains. Ability grouping had no effect on other self-concept items such as computer skills, organizational ability, teaching and explaining to others, and creativity.

#### Deviant Behavior

In terms of deviant behavior, again there was variation in effects according to ability level. Low ability students who were tracked tended to have more aggressive encounters with their peers in school. Medium ability and high ability students who were tracked were less likely to skip a class than their peers in heterogeneous classrooms. Ability grouping was also associated with fewer aggressive encounters among medium ability students, and with less graffiti in high ability students. It is interesting to note that tracking did not have an effect on deviant activities outside of school, such as using alcohol or drugs or skipping a day of school.

#### Peer Association

The findings regarding deviancy may be partially explained by the effects of ability grouping on peer association. Figure 10 shows that low ability students who were placed in a low track at seventh grade seem to be involved in a more deviant peer group at 10th grade. They tended to have more friends who use alcohol and drugs; they also had fewer friends planning to go to college than those in a medium track. In this case, an almost "buffering" effect of being placed in a medium ability classroom seems to be taking place. Although low tracked students were not different from non-tracked students for these two outcomes, they were different from medium tracked students.

Tracking, however, seems to associate medium and high ability students with a more achievement-oriented peer group. Medium ability students who were tracked had more friends who were ambitious, hard-working, and



planning to attend college (see Figure 11). High ability students who were tracked likewise tended to have more friends planning to attend college (see Figure 12).

### **Conclusion**

Ability grouping in mathematics in seventh grade had a differential impact on later outcomes in tenth grade, based upon the ability level of the students and track into which they were placed. For medium and high ability students, it was associated with generally positive outcomes; for low ability students, however, placement in a low track was associated with no positive outcomes. In fact, ability grouping seems to have had deleterious impact on a few tenth grade outcomes. But placement in a medium track clearly had some positive effects.

Ability grouping had a strong impact on later mathematics achievement in tenth grade, as measured by a statewide test. It was associated with higher scores for medium and high ability students, and lower scores for low ability students placed in a low track. It also appears to have an impact on later educational plans, self-concept of leadership ability and intelligence, and deviant behavior.

Many of these non-achievement outcomes may be related to the impact of ability grouping on later peer association. Tracking seems to associate medium and high ability students with a more achievement-oriented peer group, while associating low ability students with a more deviant group. Kandel's (1972) work on the influence of peers on both educational attainment and deviant behavior highlights the importance of this finding.

From a policy point of view, studies of the long-term effects of ability grouping such as this are essential. This study suggests that the short-term

gains of ability grouping for low ability students may attenuate, and in some cases turn into deficits over time. This raises the possibility that academic tracking not only fails to meet the needs of low ability students, but also sets them even further behind their peers. However, there appears to be strong positive effects of ability grouping for medium and high ability students. This juxtaposition of effects, of course, creates great difficulty for policy makers.

But well-informed policy needs more information than the present study provides. This study represents the initial findings of a more systematic assessment of the long term impact of ability grouping in seventh grade. It will look more closely at factors such as the environment and teacher expectancies in these classrooms, and the impact of ability grouping in junior high upon later high school course enrollment to better elucidate the mediators of the effects of ability grouping.

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**Ability Grouping**

<b><u>Ability Level</u></b>	<b>None</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Total</b>
<b>Low</b>	157	41	79	--	279
<b>Medium</b>	156	--	103	21	280
<b>High</b>	147	--	45	109	301
<hr/>					
<b>Total</b>	460	41	227	130	860

# Self-Concept

supervising others

computer skills

public speaking

being a leader

organizational ability

intelligence

listening to and understanding others

patience

creativity

independence

assertiveness

## **Future Expectations**

get technical or vocational training right after high school

go into the military right after high school

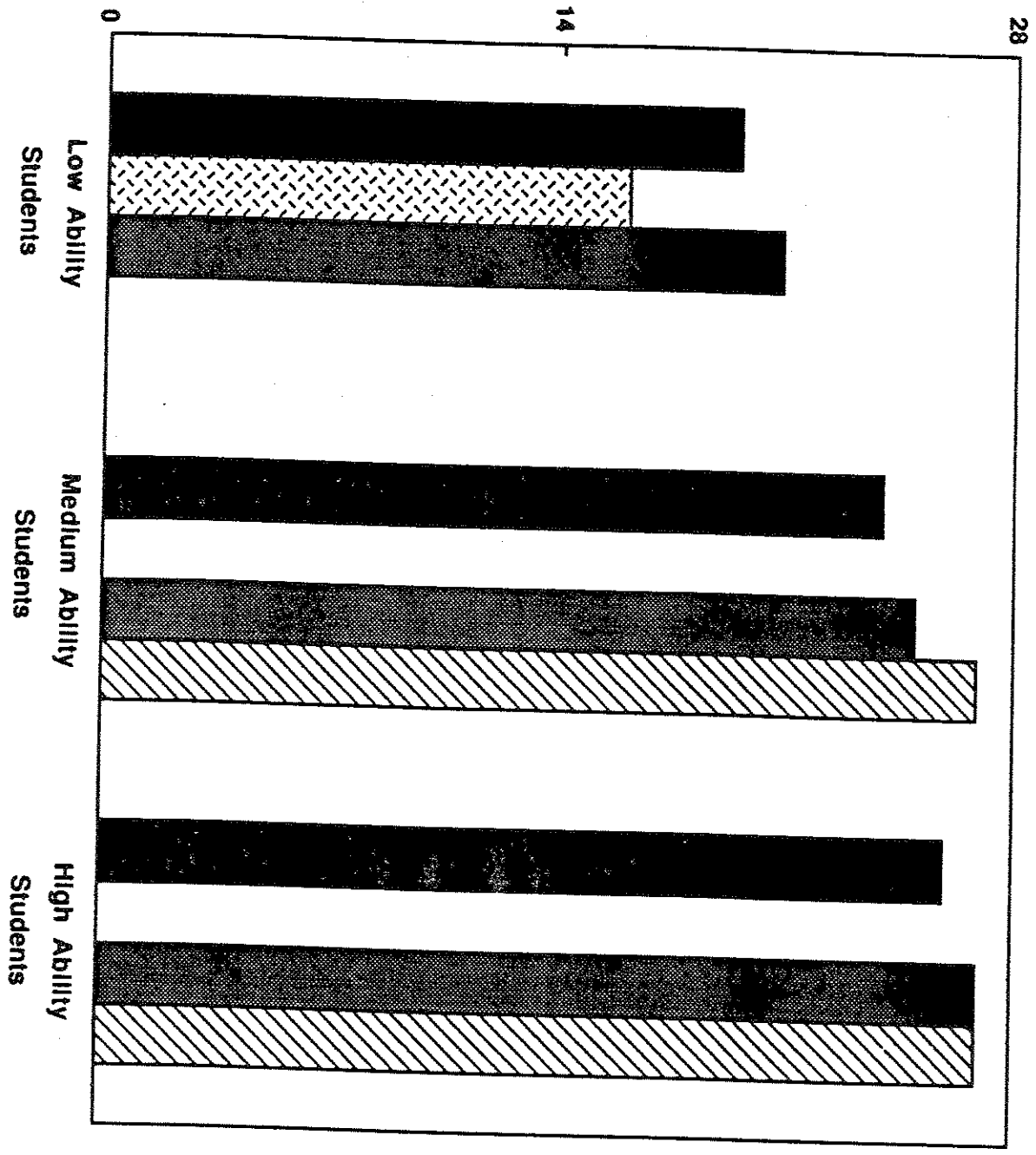
will graduate from a 2 year community college program

will graduate from college (4 year program)

will attend graduate or professional school

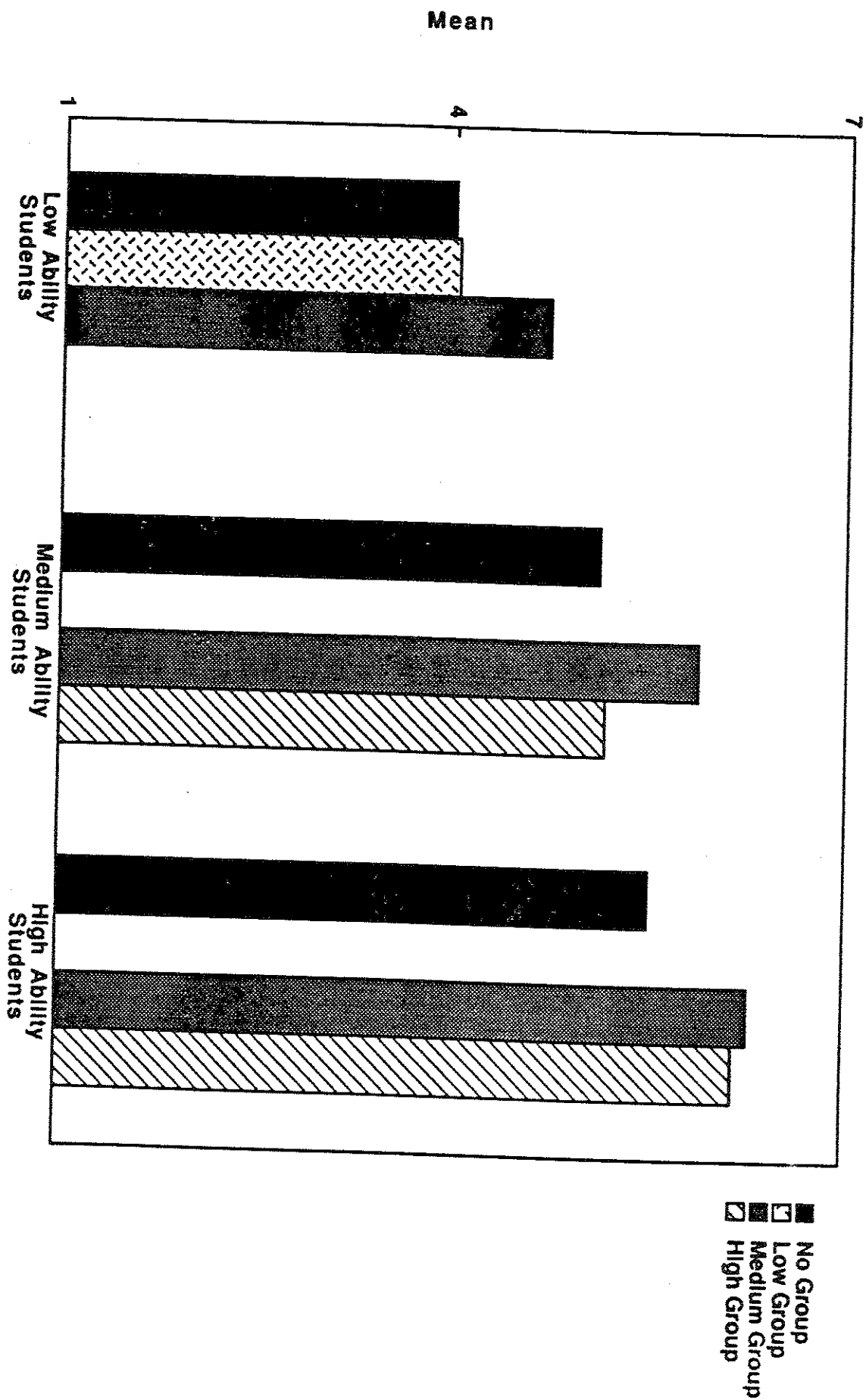
Figure 4  
Adjusted Mean

MEAP Score



■ No Group  
▨ Low Group  
▩ Medium Group  
▧ High Group

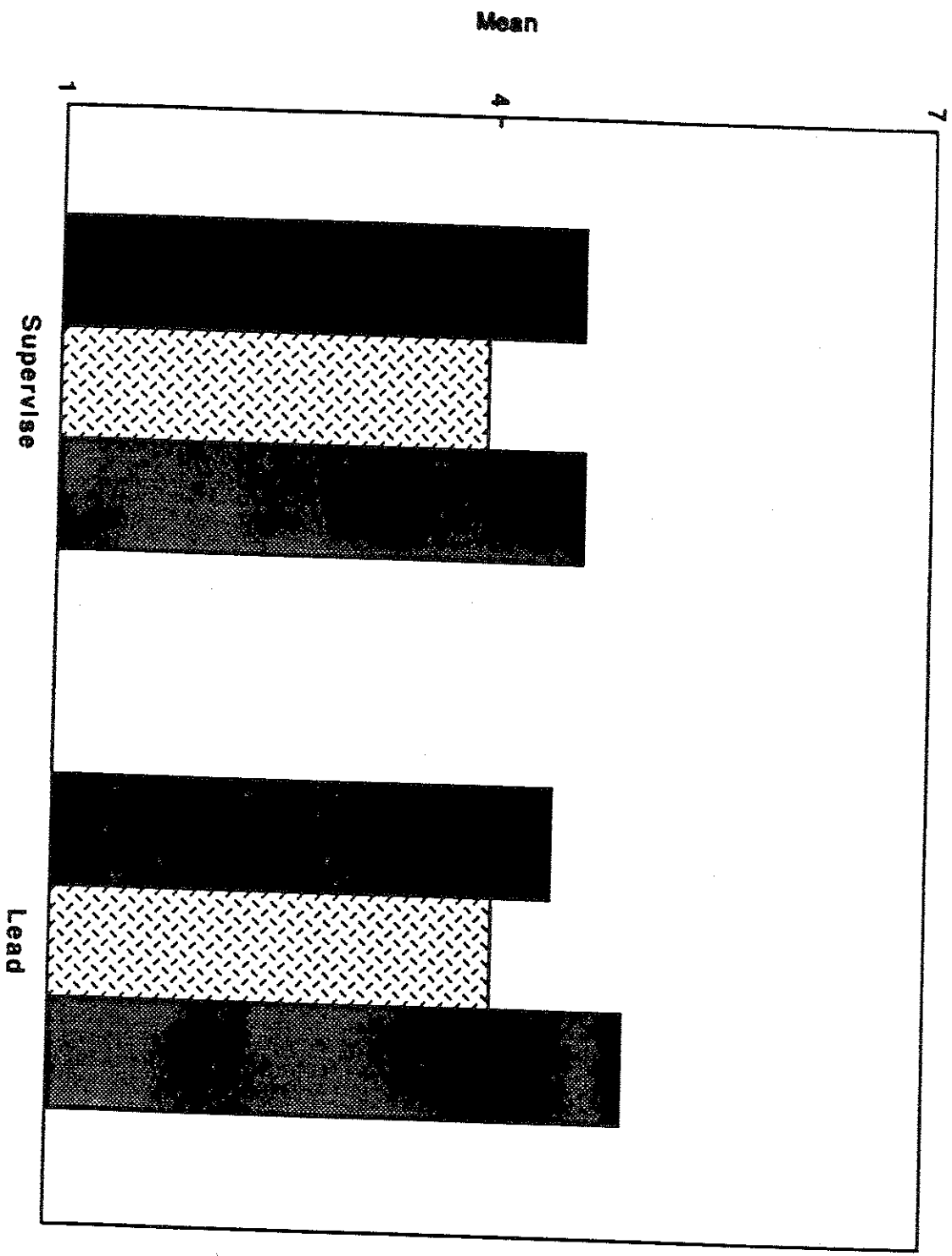
Figure 5





# Self-Concept: Low Ability Students

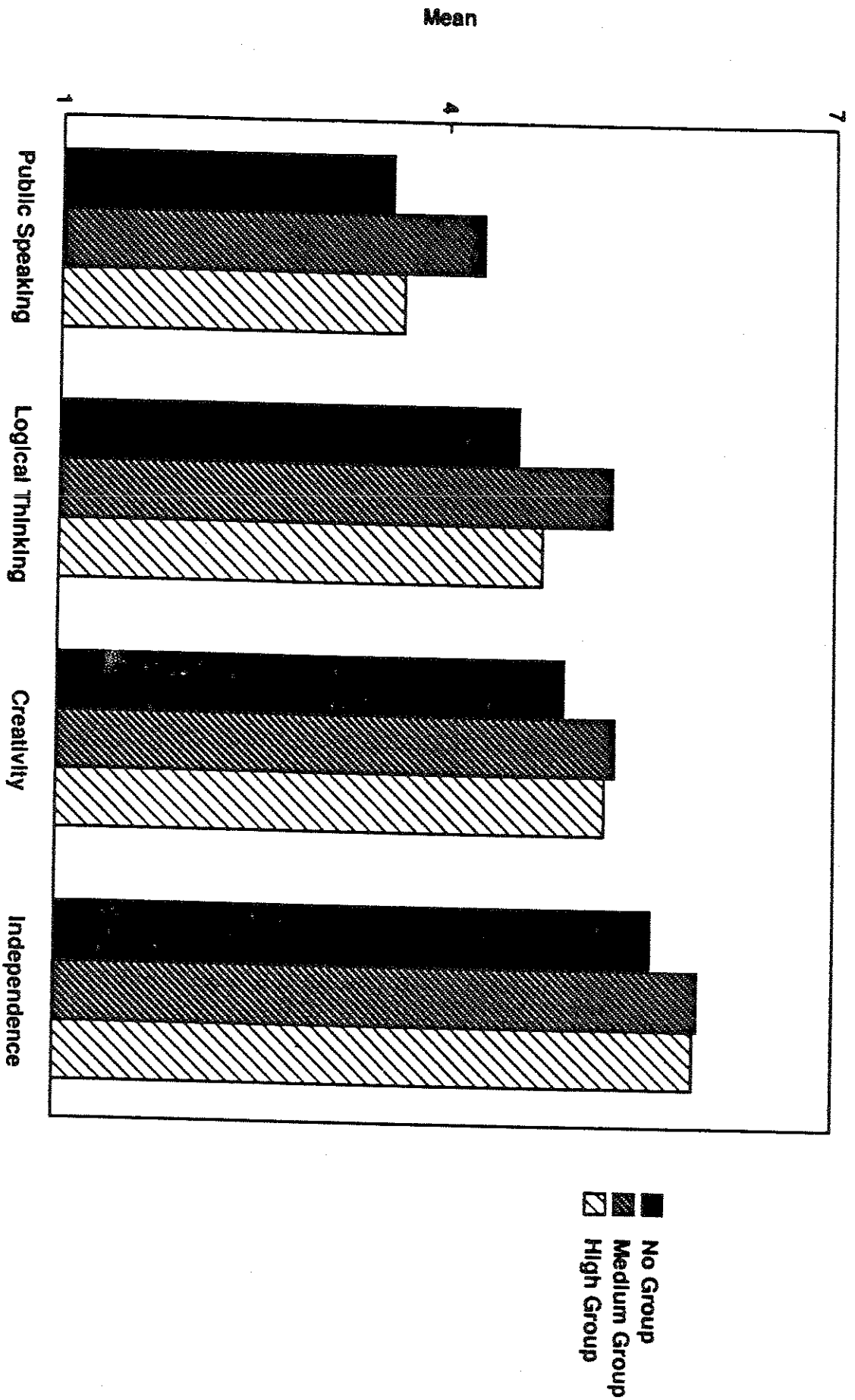
Figure 6



■ No Group  
▨ Low Group  
▩ Medium Group

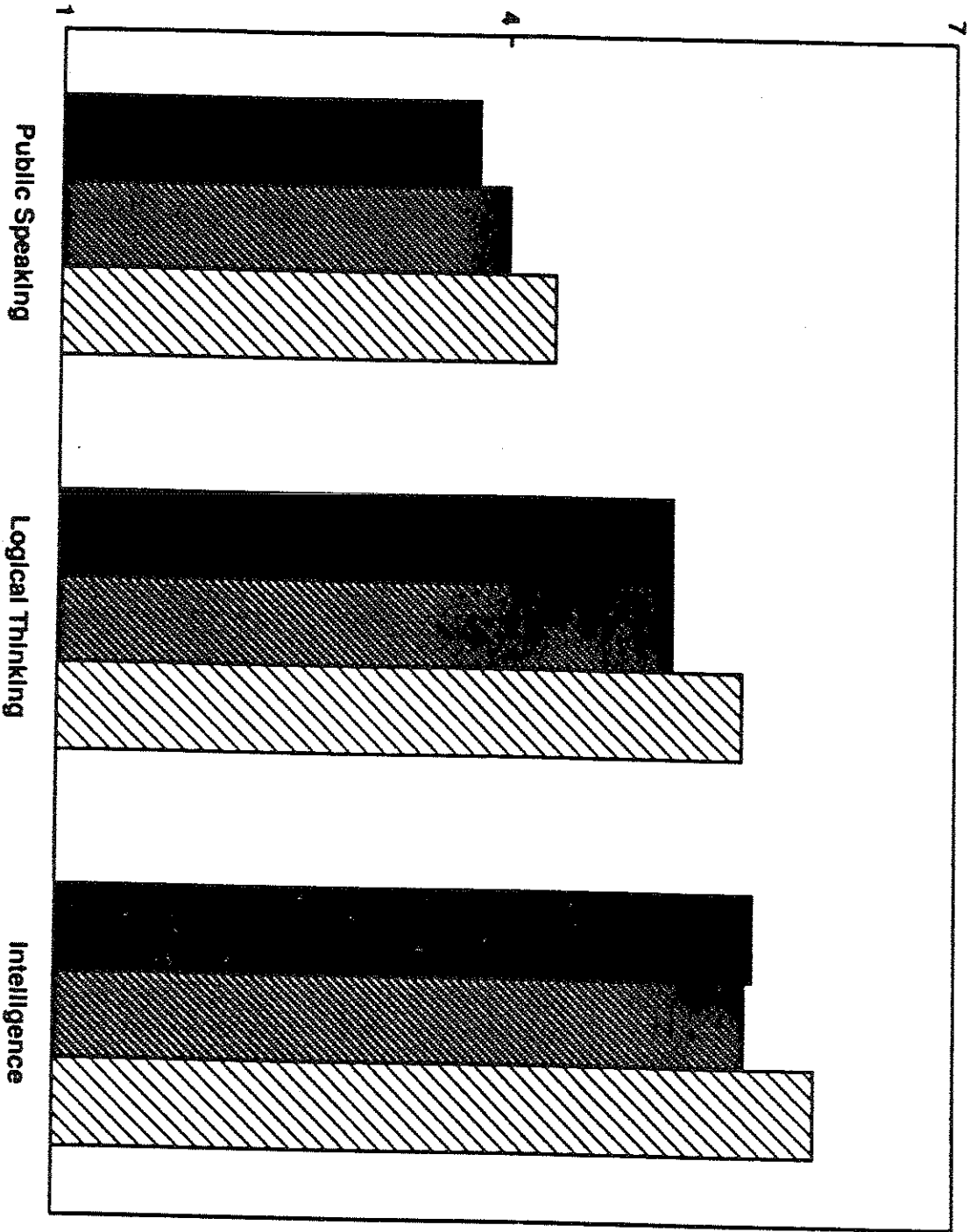
# Self-Concept: Medium Ability Students

Figure 7



# Self-Concept: High Ability Students

Figure 8  
Mean



- No Group
- ▒ Medium Group
- ▨ High Group

# Deviancy

Figure 9

# of times

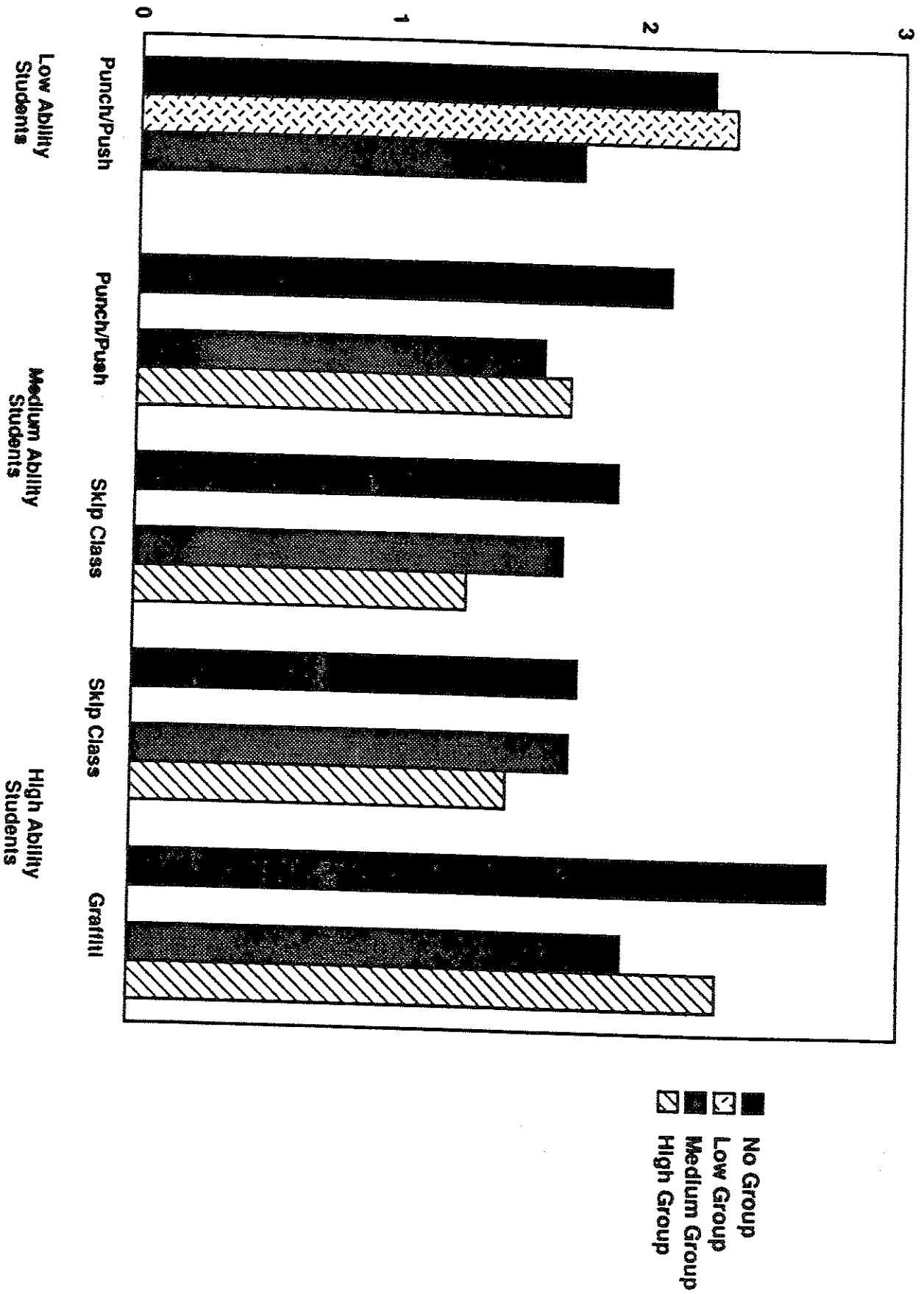
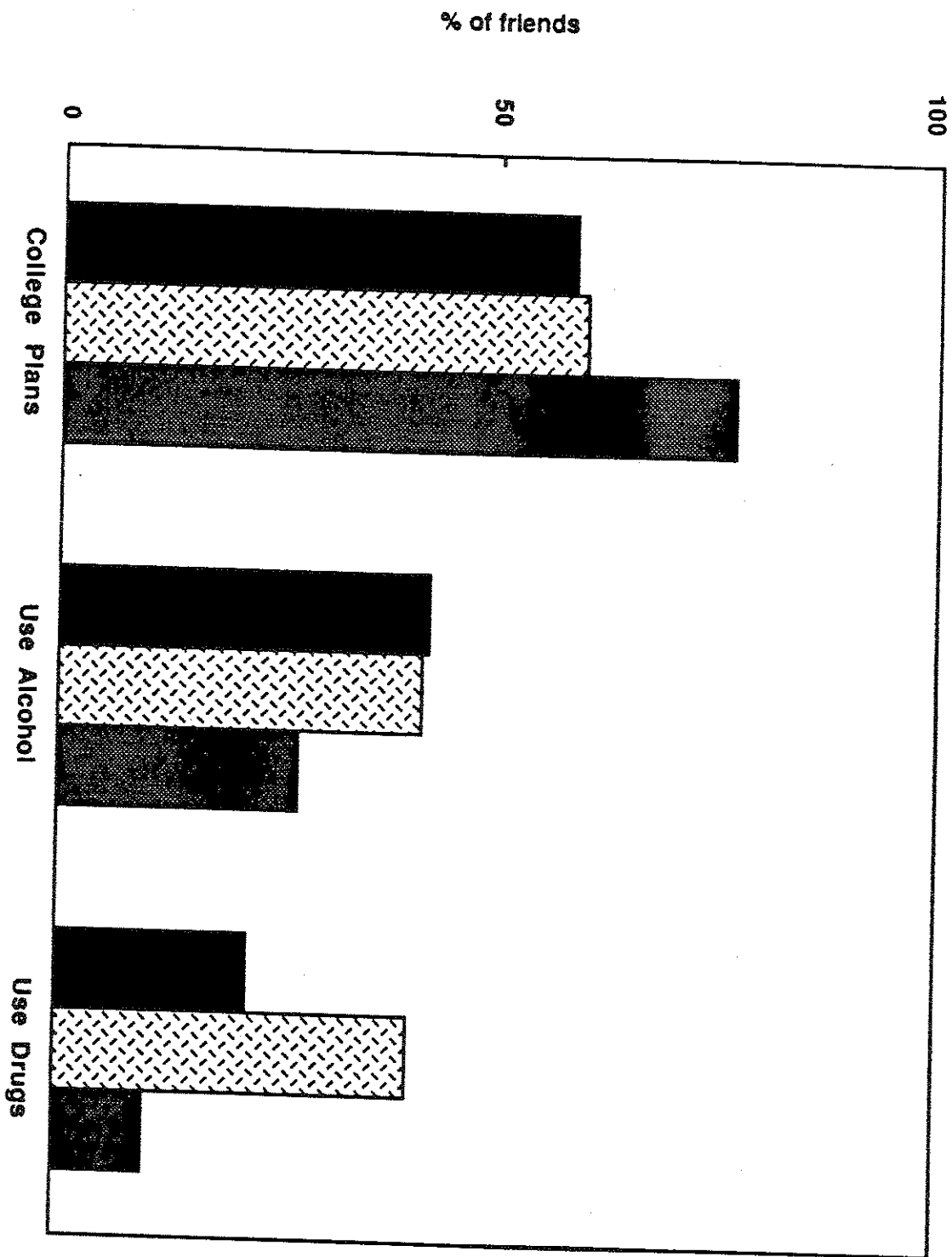


Figure 10

# Peer Association: Low Ability Students



■ No Group  
▨ Low Group  
■ Medium Group

# Peer Association: Medium Ability Students

Figure 11  
% of friends

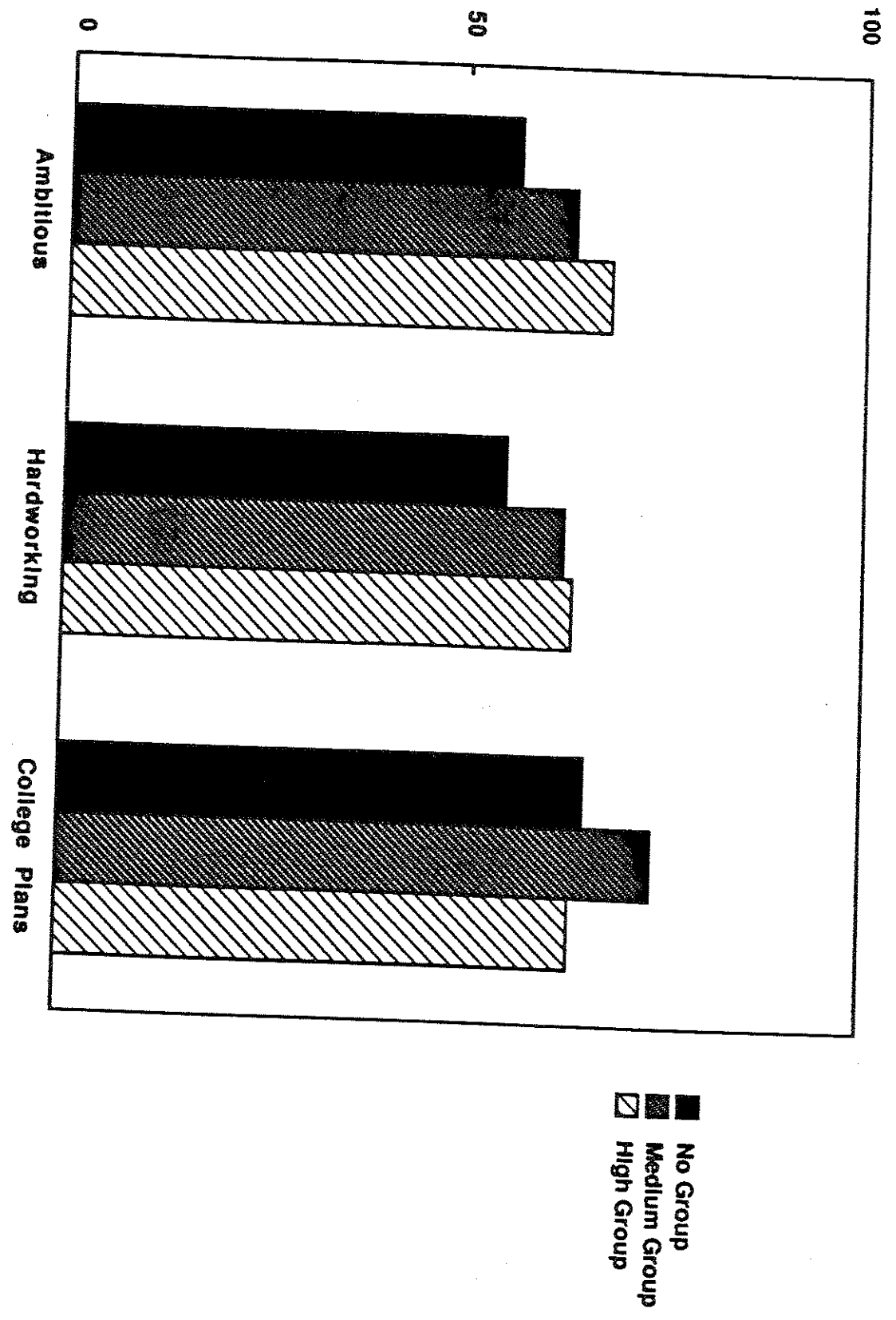


Figure 12

# Peer Association: High Ability Students

