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Motivation and Mathematics Achievement: A Comparative Study of Asian-American, Caucasian-American, and East Asian High School Students

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CHEN, CHUANSHENG, and STEVENSON, HAROLD W. *Motivation and Mathematics Achievement: A Comparative Study of Asian-American, Caucasian-American, and East Asian High School Students*. CHILD DEVELOPMENT, 1995, 66, 1215–1234. This study examined the motivation and mathematics achievement of Asian-American, Caucasian-American, and East Asian students. Subjects were 304 Asian-American, 1,958 Caucasian-American, 1,475 Chinese (Taiwan), and 1,120 Japanese eleventh graders (mean age = 17.6 years). Students were given a curriculum-based mathematics test and a questionnaire. Mathematics scores of the Asian-American students were higher than those of Caucasian-American students but lower than those of Chinese and Japanese students. Factors associated with the achievement of Asian-American and East Asian students included having parents and peers who hold high standards, believing that the road to success is through effort, having positive attitudes about achievement, studying diligently, and facing less interference with their schoolwork from jobs and informal peer interactions. Contrary to the popular belief that Asian-American students' high achievement necessarily takes a psychological toll, they were found not to report a greater frequency of maladjustive symptoms than Caucasian-American students.

Asian Americans constitute only a small percentage of American students, but they are greatly overrepresented among those who are the most successful in their academic work. This is evident in their school grades, scores on achievement tests, rates of admission to the nation's best colleges and universities, rates of high school and college graduation, and success in competitions such as National Merit Scholarship program and the Westinghouse Science Talent Search (e.g., Caplan, Choy, & Whitmore, 1992; Hirschman & Wong, 1986; Hsia, 1988; Steinberg, Dornbusch, & Brown, 1992; Stevenson, Lee, Chen, Lummis, et al., 1990;

Sue & Okazaki, 1990). These remarkable accomplishments inevitably lead to questions about how they are attained.

Several possible reasons for the success of Asian-American students have been suggested. Some emphasize selective immigration and genetic factors (e.g., Hirschman & Wong, 1986; Lynn, 1977; Rushton, 1985); others stress the role of the family and peers (e.g., Caplan et al., 1992; Steinberg et al., 1992); and still others have discussed the importance of academic success for upward mobility (Sue & Okazaki, 1990). Logical arguments can be offered for each of these pro-

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posals, but the paucity of empirical data makes it impossible to evaluate their relevance.

Discussion of Asian-American students typically includes reference to students from East Asia, who also demonstrate remarkably high levels of academic achievement. Test scores of Chinese and Japanese students, especially in mathematics and science, typically surpass those of their American peers from kindergarten through high school (e.g., Garden, 1987; Lapointe, Mead, & Askew, 1992; Lapointe, Mead, & Phillips, 1989; Stevenson, Chen, & Lee, 1993). Explanations offered for the success of East Asian students have included the beliefs, attitudes, and practices of parents, teachers, and students. More specifically, East Asians have been found to place a high value on education, to emphasize the role of effort in academic achievement, to hold high standards and aspirations, to show more parental involvement in their children's learning, and to devote more time to academic work (e.g., Chen & Stevenson, 1989; Hess & Azuma, 1991; Rohlen, 1983; Stevenson et al., 1993; Stevenson, Lee, Chen, Lummis, et al., 1990; Stevenson, Lee, Chen, Stigler, et al., 1990; White, 1993). Factors such as these seem especially important to consider when discussing the achievement of Asian Americans, who share, to varying degrees, the cultural background of East Asian societies. Nevertheless, we know of no studies in which the level of achievement of Asian-American students has been directly compared with that of students in East Asia, nor of studies that provide information about whether the factors associated with academic achievement in East Asia are also useful in explaining why Asian-American students display such high levels of accomplishment.

Moreover, few studies have included the groups necessary to evaluate the degree to which the acculturation of Asian-American students to mainstream American society might have altered the role of these factors. An ideal design would require the inclusion of Asian-American, Caucasian-American, and East Asian students in the same study. Responses of these three groups would then provide a context for determining the areas and degrees of their similarity and difference. So far, to our knowledge, only two studies (Hess, Chang, & McDevitt, 1987; Lin & Fu, 1990) have attempted to compare beliefs and attitudes of Chinese-American students and parents with those

of their Caucasian-American and Chinese counterparts. Neither study used an achievement test, thus it was not possible to examine whether those values actually were related to the group differences in achievement. Further, studies so far have usually focused on only one or two types of belief. To better understand the role of culture in achievement, it is necessary not only to undertake a more comprehensive examination of each group's cultural values and beliefs, but also to consider more proximal factors such as daily behaviors that might lead to high achievement.

For the present study, we have included representative samples of four groups of eleventh-grade students. To represent East Asian students, we chose Chinese and Japanese students attending schools in Taiwan and Japan. American students were represented by Asian-American and Caucasian-American students attending the same schools in two regions of the United States. We compare these four groups in their values regarding education, belief in the importance of effort in achievement, standards and aspirations, achievement attitudes, and achievement behavior.

We assume that the role of culture in students' academic achievement is realized through the social contexts of family, school, and peers. Each of these social contexts can exert a direct effect on achievement or an indirect effect through another context. This study examines several of these possibilities. For example, we assume that parents influence students' achievement motivation and behavior directly by setting standards and indirectly by enrolling students in particular schools. We further assume that effects such as these differ for different cultural groups. Asian Americans should share some of the cultural values with East Asians, such as emphasizing the role of effort, but they have also adapted to particular aspects of American society, which may differentiate them from East Asians. As a consequence, students from different cultural groups are hypothesized to have distinctive sets of beliefs, values, and attitudes toward education in general and mathematics in particular, with resulting effects on achievement-related behavior and academic achievement. This study should add to our understanding of the bases of the Asian-American and East Asian success and should also offer clues about how the academic achievement of other American students might be improved.

In addition to the examination of achievement and motivation, this study also

addresses the issue of whether a high level of achievement comes with a psychological toll for groups such as Asian Americans and East Asians. To evaluate this possibility, we compare the four groups of students in their self-reported level of depression, stress, academic anxiety, aggressive feelings, and psychosomatic symptoms.

Method

Subjects

Data for this study were collected as part of a large-scale, cross-cultural project on the achievement and motivation of eleventh-grade students. The students in the American sample attended five public schools in Fairfax County, Virginia, a metropolitan area adjacent to Washington, DC, and nine schools in the Minneapolis metropolitan area. The 14 schools were chosen in consultation with local colleagues and educational authorities to constitute a representative sample of schools in each metropolitan area. The sample included 304 Asian Americans and 1,958 Caucasian Americans. Of the Asian-American sample, 74% came from Fairfax County; the corresponding percentage for the Caucasian-American sample was 59%. We did not request information about the students' ancestry, but according to school authorities, the Asian-American sample consisted of students of primarily Chinese, Japanese, Vietnamese, and Korean backgrounds, and most were born in the United States. Omitted from our analyses were 737 students in these schools who were either from other ethnic groups or who did not provide identifying information. In addition, 1,475 Chinese students from Taipei, Taiwan, and 1,120 Japanese students from Sendai, Japan, were included in the study. The percentages of girls were 53%, 51%, 58%, and 43% in the Asian-American, Caucasian-American, Chinese, and Japanese samples, respectively. In Taipei and Sendai, where high schools form a hierarchy defined by scores on entrance examinations, we visited schools with stringent, average, and lax entrance requirements to create representative samples of schools in each city. As a result, we included both regular academic high schools and vocational high schools in our samples. Schools in Taiwan and Japan, like the majority of schools in the United States, follow a 6-3-3 pattern for the years of elementary, junior high, and high school, respectively. The school year differs, however, among the three locations. Depending on how days involving special events, such

as field trips and sports days, are counted, the East Asian school year is roughly 30 days longer than the American school year: 210 versus 180 days.

Schools in Minneapolis and Fairfax County permitted students themselves to decide whether or not they wished to participate in the study. Few students refused. In Taiwan and Japan, permission for participation in research is vested in the school authorities. Participation was nearly universal.

Table 1 presents demographic data concerning the students' families. The number of years of education and the occupational status of the two groups of American fathers were similar. Compared to Caucasian-American mothers, Asian-American mothers had somewhat fewer months of education and fewer Asian-American mothers were employed. The educational and occupational status of the Chinese and Japanese parents was lower than that of the American parents, partly reflecting differences in the percentage of each population who attend institutions of higher education. The percentage of intact families was higher for the Asian-American than for the Caucasian-American group, but in both groups it was lower than for the Chinese and Japanese families.

Mathematics Test

A 46-item mathematics test was constructed on the basis of analyses of the textbooks used in the high schools in each location. The difficulty of the items increased rapidly, and even the best students found the test challenging. All items were open-ended. Early items tapped knowledge of fractions, percentages, and decimals, and the later items required the solution of problems of limits, addition of tangents and secants, and finding the intersection of two- and three-dimensional figures. The reliability of the test was high: Cronbach alpha values were above .90 for all groups.

Questionnaire

We rejected the alternative of adapting standard Western questionnaires for the study because of the possibility that the items would not be applicable to Asian-American or East Asian high school students. Instead, members of our research group, which included both Americans and East Asians, constructed the questionnaire simultaneously in English, Chinese, and Japanese to ensure comparability and cultural appropriateness. Meetings attended by representatives of each culture considered

TABLE 1

FAMILY DEMOGRAPHIC CHARACTERISTICS

	Asian-American	Caucasian-American	Chinese	Japanese
Parental education (mean years; SD):				
Mothers	14.4 (3.1)	14.9 (2.2)	8.9 (3.7)	12.4 (1.8)
Fathers	15.6 (2.8)	15.8 (2.3)	10.6 (4.2)	13.2 (2.5)
Working mothers (% yes)	72.2	79.5	47.9	60.7
Parental occupational status (% semi-professionals or professionals):				
Mothers	60.4	58.6	27.0	11.3
Fathers	75.4	78.2	28.1	33.8
Intact family (%)	80.9	75.1	88.4	87.2
Ns	304	1,958	1,475	1,120

NOTE.—Occupational status included five categories: laborers, semi-skilled workers, skilled workers, semi-professionals, and professionals.

the relevance of each item that was suggested as well as the degree to which words equivalent in nuance and meaning could be found for expressing the content of the item. By following this procedure, we avoided (a) many of the problems encountered in finding comparable words and sentence structures when questionnaires are initially constructed in one language and then translated into other languages and (b) the inclusion of items that were irrelevant for the cultures involved in the study.

The portions of the questionnaire to be discussed in this report included basic demographic information about the family, reasons for studying hard, beliefs about the importance of effort in achievement, attitudes toward mathematics, daily use of time, beliefs about peer norms, and self-reports of psychological well-being. Because of limitations in the amount of time available at the schools, the questionnaire was divided into two parts. All students responded to the first part; the second part was divided into two sections, each of which was administered to half of the students in each school. All tests and questionnaires were administered by research assistants who were familiar with the materials and had been trained in their administration.

Results

Mathematics Achievement

A 4 (culture) \times 2 (gender) analysis of variance of scores on the mathematics test revealed a significant difference among cultures, $F(3, 4590) = 179.25, p < .001$. Asian-American students received higher average

scores on the mathematics test than did Caucasian-American students (20.9 vs. 17.3), but their scores were lower than those of Chinese (24.1) and Japanese students (21.7). The respective standard deviations were 9.0, 8.5, 9.5, and 6.6. Scheffé contrasts between all pairs were significant at .001 level, with the exception of a nonsignificant difference between Asian-American and Japanese students.

As Figure 1 shows, differences in level of achievement were pervasive across all types of problems included in the mathematics tests, $F_s(3, 4590) = 140.90\text{--}307.20, p_s < .001$. Differences between Asian-American students and Caucasian-American and Chinese students were consistent, whether the items tapped knowledge of arithmetic or advanced mathematics. Scores of the Asian-American students were also below those of the Japanese students with two exceptions: the two groups received the same scores on algebra and advanced mathematics.

Overall, males scored significantly higher than females, $F(1, 4569) = 232.78, p < .001$. However, there was a significant interaction between gender and culture, $F(3, 4569) = 8.33, p < .001$, such that gender differences were smaller for the American than for the Asian students. The magnitude of the gender differences for the scores of Asian-American and Caucasian-American students were 2.5 and 2.4 points, respectively. Both differed markedly from the gender differences for the Chinese (4.2 points) and Japanese students (5.4 points).

A sufficient number of regular ($n = 9$) and vocational high schools ($n = 9$) were

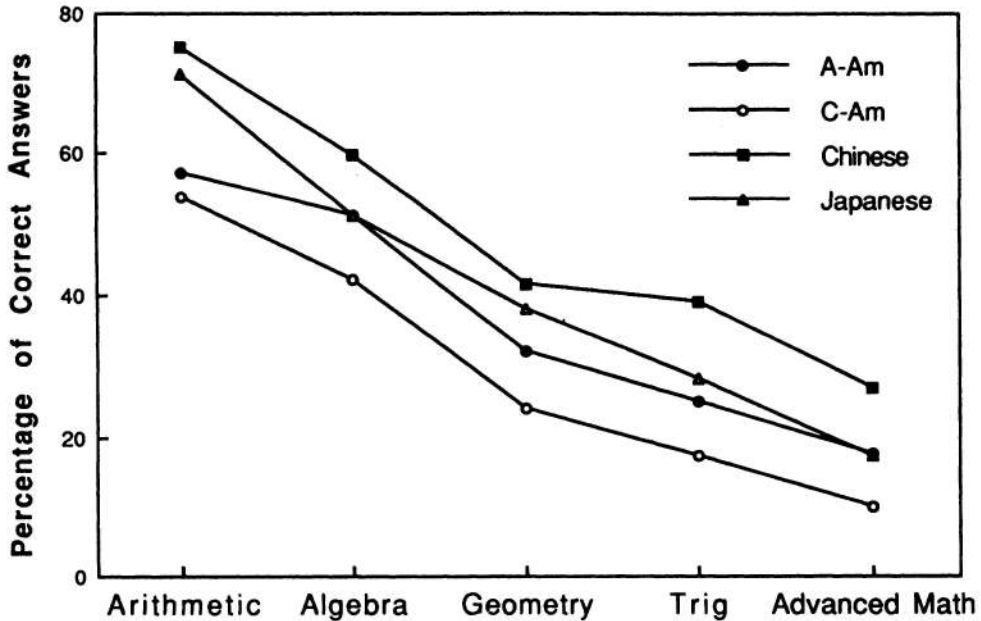


FIG. 1.—Students' scores on the five types of mathematics problems

included in the Taipei sample to allow a meaningful comparison of the performance of these groups with that of the Asian-American and Caucasian-American samples. The performance of the American students, whether Asian-American (mean = 20.9) or Caucasian-American (mean = 17.3), was similar to that of the 787 Taipei vocational school students (mean = 18.3) but much lower than that of the 688 college-bound students in Taipei's regular academic high schools (mean = 30.7).

Socioeconomic status and mathematics achievement.—Correlations between each of four indices of socioeconomic status (mothers' and fathers' years of education and occupational status) and students' scores on the mathematics test ranged from .14 to .35, $ps < .001$. The highest correlations were between students' mathematics scores and their fathers' years of education among Asian-American (.34) and Caucasian-American students (.35). The remaining correlations followed no clear pattern of cross-cultural differences.

A clear illustration of the positive relations found between socioeconomic indices and students' mathematics achievement is presented in Figure 2. In each location, students whose fathers had postgraduate education scored about 10 points higher than students whose fathers had junior high school

education or less. Within each level of education, the rank order of mathematics scores remained constant: Chinese, Japanese, Asian-American, and Caucasian-American.

Although socioeconomic status was positively related to level of achievement within each location, it did not parallel group differences in level of achievement. For example, Asian-American and Caucasian-American families had about the same level of socioeconomic status (see Table 1), yet their children received significantly different achievement scores. Conversely, the families of the Caucasian-American students had the highest level of socioeconomic status, but the students received the lowest scores.

School attended.—The schools students attend may provide one basis for their level of academic achievement. We controlled for school attendance in part by sampling Asian-American and Caucasian-American students from the same schools; however, we did not control for the percentage of Asian-American students who attended each school. It turned out that Asian-American students were more likely to attend schools with the highest levels of achievement as determined by the mathematics scores of the Caucasian-American students. In fact, 32% of our Fairfax County sample of Asian-American students were enrolled in the school with the

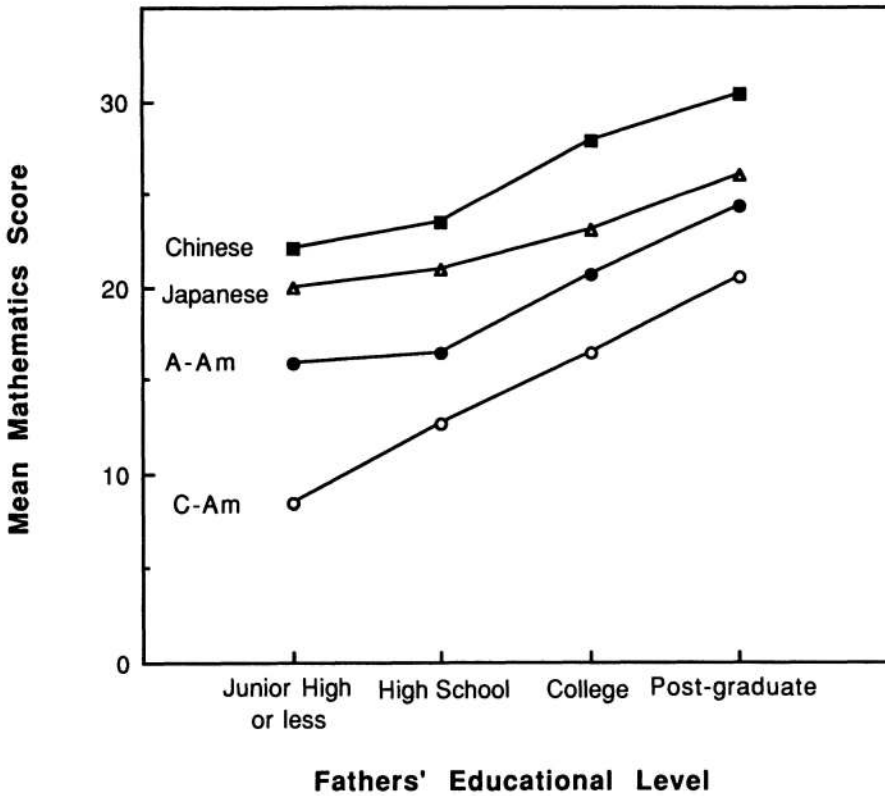


FIG. 2.—Students' mathematics scores as a function of their fathers' educational level

highest mathematics scores attained by both the Asian-American and Caucasian-American samples. The eleventh grade Asian-American enrollment in this school was 73 and the Caucasian-American enrollment was 239 (21% of our Fairfax County sample of Caucasian-American students).

In each of the five schools in Fairfax County, Asian-American students received higher average scores than did Caucasian-American students. This seemed to be especially the case in schools where students received lower average scores. The difference between the average scores of the Asian-American and Caucasian-American students in the five schools, ranked from lowest to highest according to overall score, were 2.2, 2.7, 0.9, 1.8, and 0.5 points. The percentages of Asian-American students attending these schools were 12.4, 9.5, 11.1, 19.4, and 21.0. After controlling for school effects by standardizing scores within school, Asian-American students still had a significantly higher mean score than Caucasian-American students, $F(1, 1230) = 7.25, p < .01$.

The same trend was found with the smaller sample of Asian-American students in Minneapolis. When the schools were grouped according to whether they had above- or below-average mean scores based only on Caucasian-American students' scores, the Asian-American enrollment in the above-average schools was 9% and 6% in the below-average schools. The Asian-American students scored an average of 2.0 points higher than the Caucasian-American students in the below-average schools, but in the above-average schools, the difference was only -0.1 point.

A positive relation between school attended and level of achievement could be a result of several factors. First, the quality of education may differ in different schools. Students attending better schools may have more skilled teachers, better facilities, and more stimulating peers. Second, some schools have minimum requirements for enrollment. For example, the highest scoring Fairfax school requires students to pass an entrance examination in order to attend.

Thus the disproportionately higher percentage of Asian-American students enrolled in that school reflects their higher level of achievement prior to entering high school. Third, enrollment in good schools may also be a result of parental efforts. Anecdotal evidence suggests, for example, that many Asian-American parents are willing to relocate, or even live separately, in order to enroll their children in good schools.

Standards and Expectations

Parents and students.—To explore whether the students believed they were meeting their own and their parents' standards, we posed the following situation: "Let's say there is a math test in which there are 100 points. The average score in your class is 70. What score do you think you would get? What score would you be satisfied with? What score would your parents be satisfied with?"

The average expected scores differed significantly among the four groups, $F(3, 5162) = 249.04, p < .001$. The Asian-American students had the highest expectations, whereas the Japanese had the lowest; the average expected scores were 83 (Asian-American), 78 (Caucasian-American), 72 (Chinese), and 66 (Japanese). The scores with which students said they and their par-

ents would be satisfied also differed significantly. For self-satisfaction, the average scores were 90 (Asian-American), 85 (Caucasian-American), 84 (Chinese), and 82 (Japanese), $F(3, 5098) = 48.19, p < .001$; for parental satisfaction, 92 (Asian-American), 85 (Caucasian-American), 83 (Chinese), and 81 (Japanese), $F(3, 4964) = 36.41, p < .001$.

More informative is the comparison between expected scores and satisfaction scores. This difference serves as an index of standards. Higher standards would be reflected in a positive score (satisfaction score minus expected score). A negative score would reveal lower standards, indicating that the students perceived themselves as performing at a level higher than that with which they or their parents would be satisfied. The average difference score (satisfied - expected) was positive for all groups. However, there were significant differences among the four groups: for example, for perceived parental standards, $F(3, 4560) = 101.99, p < .001$; all Scheffé contrasts, $ps < .001$, except for that between Asian Americans and Chinese, N.S. (see Fig. 3). Asian Americans differed from Caucasian Americans and Japanese, but not from the Chinese. The standards of the Caucasian-American parents were perceived as being significantly below those of the other three groups.

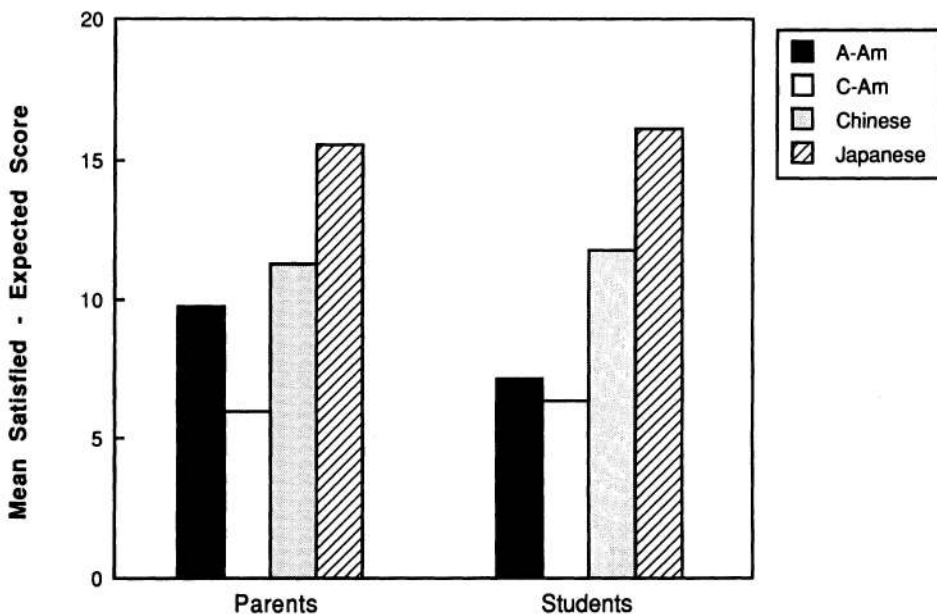


FIG. 3.—Perceived parental standards and students' own standards as measured by the difference between the minimum score with which parents (and students) would be satisfied and the actual expected score.

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The results for students' standards followed a pattern similar to that obtained when parents were the referent. The Asian-American students appeared to hold standards for themselves that were between those of the East Asian and the Caucasian-American students. The highest difference score (satisfied - expected) was obtained for Japanese students and the lowest for the Caucasian-American students. In contrast to the lack of evidence for a generational difference among the other three groups, the difference score for Asian-American students was significantly higher when the referent was their parents than when it was themselves, $t(282) = 4.62, p < .001$.

Perhaps as a result of this generational gap in standards, 43% of Asian-American students responded positively when asked whether the expectations their parents held for them were too high. In comparison, only 24% of Caucasian-American students believed this to be the case. The two Asian groups were in between: the corresponding percentages were 35% (Chinese) and 29% (Japanese), overall $\chi^2(3, N = 4,706) = 78.80, p < .001$.

Other indicators of students' perceptions of parental expectations are the ratings of how strongly the students believed their parents valued getting good grades and going to college. They again made the ratings with reference both to their parents and to themselves. The average ratings were all high, but compared to the other three groups, Asian-American students tended to believe more strongly that going to college and getting good grades were very important to both their parents and themselves (see Table 2).

Peers.—We inquired about the students' perceptions of the norms held by their peers in two ways. The first dealt with how frequently they thought high school students their age studied for 3 hours or more every night. Ratings were made on a seven-point scale ranging from "not at all frequently" to "very frequently." The percentage of students who made positive ratings of 4 or above, that is, "somewhat frequently" to "very frequently," was much lower among Caucasian-American (37%) and Asian-American students (44%) than among the Chinese (80%) and Japanese students (60%), $\chi^2(3, N = 2,390) = 347.00, p < .001$.

A second question concerned the students' perceptions of how frequently high school students would rather have fun with

friends than study. Fewer Chinese students (46%) than Asian-American (81%), Caucasian-American (93%), and Japanese students (88%) believed this occurred "somewhat frequently" to "very frequently," overall $\chi^2(3, N = 2,386) = 573.63, p < .001$. It is worth pointing out the percentage of Asian-American students (81%) was also significantly lower than that of the Caucasian-American students (93%), $p < .001$ after Bonferroni correction.

According to all of these measures, the two groups of U.S. students perceived that they, their parents, and their peers held lower standards for accomplishment and investment in education than did the Chinese and Japanese. There was also a tendency for Asian-American students to give frequent indications of holding higher standards than Caucasian-American students. This was true whether the index was the type of performance that would satisfy their parents, their parents' expectations about their academic work, or the seriousness with which their peers were involved in studies.

Beliefs about Effort

Confucian doctrine, which has had a pervasive influence in East Asia, emphasizes the malleability of human behavior and the importance of effort as the route to accomplishment. Chinese and Japanese elementary school students and their parents, presumably influenced by this doctrine, place greater emphasis on the role of effort than do their U.S. counterparts (e.g., Hess & Azuma, 1991; Holloway, 1988; Stevenson, Lee, Chen, Stigler, et al., 1990).

We now ask whether high school students in East Asia place a similar emphasis on effort and whether the Asian-American students also demonstrate this cultural belief to a greater degree than do their Caucasian-American peers. We approached these questions by asking the students to choose what they thought was the most important from among four factors that may influence students' performance in mathematics: a good teacher, innate intelligence, home environment, and studying hard. Fewer than 20% of the students in any of the groups chose "innate intelligence" or "home environment." In line with the results from previous studies, the majority of the Chinese and Japanese high school students chose "studying hard," whereas the predominant choice of both the Asian-American and Caucasian-American groups was "having a good teacher," $\chi^2(9, N = 2,399) = 572.45, p <$

TABLE 2
PERCEIVED IMPORTANCE OF GETTING GOOD GRADES AND GOING TO COLLEGE

	Asian-American	Caucasian-American	Chinese	Japanese	F
Parents:					
Get good grades	6.6	6.2	5.9	5.3	150.85
Go to college	6.8	6.4	5.6	4.8	306.75
Students:					
Get good grades	6.4	6.0	5.9	5.4	72.74
Go to college	6.7	6.5 ^a	5.8	5.1	219.43
Ns	294-296	1,915-1,918	1,471-1,473	1,048-1,059	

NOTE.—Ratings were made on seven-point scales ranging from 1 (not at all important) to 7 (very important). All *F*s were significant at the .001 level. All means for Asian-American students were significantly higher than those for the other three groups, Scheffé contrasts, *ps* < .001, except for ^a*p* < .05. All Scheffé contrasts among the Caucasian-American, Chinese, and Japanese students were significant at .001 level, except for that between Caucasian-American and Chinese students on students' own value of getting good grades, *p* < .01.

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.001. Between the two U.S. groups, a greater percentage of Asian-American than of Caucasian-American students chose "studying hard" and a lower percentage chose "having a good teacher" (see Fig. 4).

Further evidence of the tendency of the responses of Asian-American students to lie between those of the Caucasian-American and East Asian students was found in two additional items. The students were also asked to rate their agreement with the statement: "Everyone in my class has about the same natural ability in math." A low rating indicates a belief in the differences in innate ability among individuals; a high rating reflects a deemphasis of the possible differences in natural ability. Asian-American students gave higher ratings than Caucasian-American students, but their ratings were lower than those of either the Chinese or Japanese students. The mean ratings were 3.0 (Asian-American), 2.5 (Caucasian-American), 3.8 (Chinese), and 3.8 (Japanese), $F(3, 4744) = 260.81$, $p < .001$, all Scheffé contrasts, $ps < .001$, except for that between Chinese and Japanese students, N.S.

We also asked students to rate the statement, "Anyone can do well in math if he/she works hard enough," on a scale ranging

from "strongly disagree" (1) to "strongly agree" (7). High ratings obviously reflect an acceptance of the belief that academic achievement is strongly dependent upon effort. The Asian-American students were more likely than the Caucasian-American students to endorse the statement, but their ratings were also higher than those for the East Asian students. Their average rating was 5.3, while those of the other groups were 4.6 (Caucasian-American), 4.9 (Chinese), and 5.0 (Japanese). The overall differences were significant, $F(3, 4746) = 22.90$, $p < .001$, as were all Scheffé contrasts, $ps < .05$, except for that between Chinese and Japanese students, N.S.

Although not completely consistent, the trend was for the responses of the Asian-American students to fall between those of Caucasian-American and the East Asian students. There is a vestige, therefore, of the Confucian legacy in the beliefs of the Asian-American students, but their acculturation to American norms apparently had reduced its influence. It is unfortunate that we did not have information that would have permitted us to evaluate possible generational effects, whereby we could examine possible differences between first- and later-generation Asian-American students.

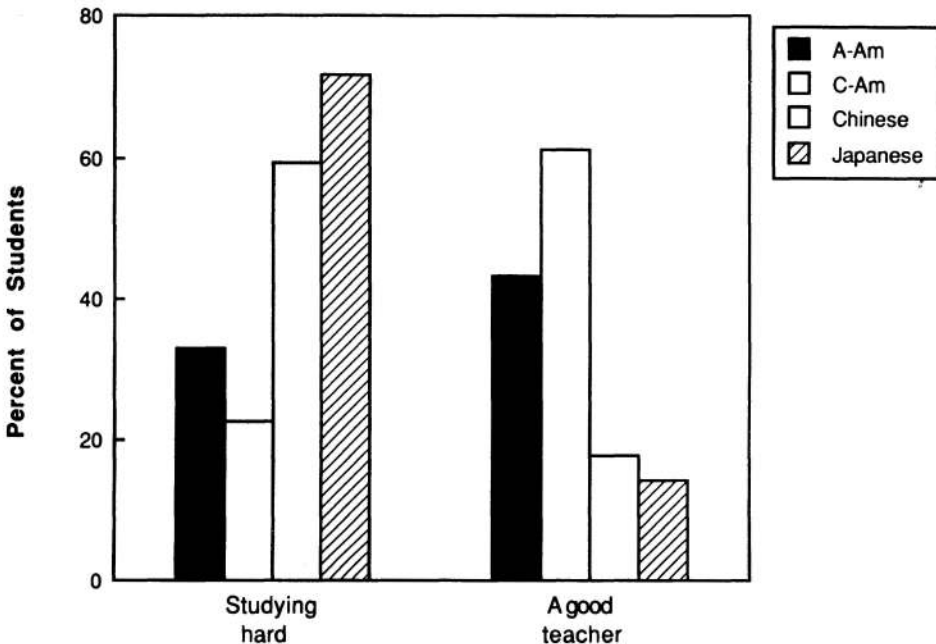


FIG. 4.—Percent of students who picked "studying hard" or "a good teacher" as the most important factor in influencing performance in mathematics.

Motivation

Another aspect of students' beliefs about effort is why they might work hard. We compiled a list of nine common reasons why students say they study hard. The list included the following: to gain more knowledge, to get good grades, to go to college, to please parents, to please teachers, to get a better job in the future, and because they set high standards for themselves, had no other choice, or did not know what to do with their time. Students were asked to pick the most important reason for them to work hard. The three most frequent choices, in order, were to get a better job, to go to college, and to gain more knowledge. Each of the other six choices was made by fewer than 15% of the students in each culture and followed no clear pattern.

Finding a better job was the first choice of the Asian-American students, a finding that is consistent with the suggestion of Sue and Okazaki (1990) that a motive for the diligence Asian-American students display in their studies is to overcome barriers in employment. This percentage of Asian-American students who chose finding a better job (40%) greatly exceeded the percentages who believed that going to college (19%) or gaining knowledge (20%) were the primary reasons for studying. This was not true for the Caucasian-American or East Asian students; nearly as many students chose going to college (25%, 25%, and 28% for Caucasian-American, Chinese, and Japanese students) as had chosen getting a good job (31%, 28%, and 30%, respectively), overall $\chi^2(6, N = 1,797) = 23.65, p < .001$.

When we examined the relation between students' type of motivation and their level of achievement, we found that those whose primary reason was that they set high standards for themselves generally scored highest, whereas those who indicated that they studied because they wanted to get a good job in the future were among the students receiving the lowest average scores (see Fig. 5). These findings create an apparent paradox: more Asian-American students considered getting a better job in the future to be the primary motivation for studying, but the least effective of the Asian-American students were the most likely to choose this alternative. The paradox can be resolved if we assume that the Asian-American students who are doing well in school and who study because they want to go to college, to gain more knowledge, and who set high standards for themselves, are confident of their

ultimate ability to get a good job. The Asian-American students who are not doing so well in their academic work may believe they have reason to worry about eventually finding a good job.

Attitudes about Mathematics

Motivation to study a topic is influenced by students' attitudes about what they are studying. We found that Asian-American students had very positive attitudes about mathematics. Their responses to each of our questions about mathematics were more favorable than were those of the other groups of students (see Table 3). The Asian-American students, to a greater degree than the Caucasian-American, Chinese, and Japanese students, thought they were good at mathematics, liked mathematics, thought it was interesting, and found it not very difficult.

Nearly all of these attitudes were significantly related to the students' mathematics scores for all four groups (see Table 4). There were a few consistent cross-cultural differences in the pattern of relations. As is evident in Table 4, the Asian-American and Caucasian-American students appeared to be more aware of how well they were doing in mathematics and how difficult mathematics was for them than were the Chinese and Japanese students. The differences between correlations for the East Asian and U.S. students were all significant, $t_s(1321-3178) = 2.83$ to $14.89, p_s < .01$ (based on t tests of correlations after Fisher r to z transformation).

One possible reason for the lower correlations and apparent poorer understanding of their level of performance found for the Chinese and Japanese students is that these students attended either academic high schools for students aspiring to enter college or vocational high schools. Because students in these two types of schools might have different reference groups, the correlations between students' self-rating of mathematics performance and their actual test scores may have been suppressed. This explanation, however, received no support when the mathematics scores of Chinese and Japanese students were first standardized within school and then were correlated with their ratings of mathematics performance. The correlations remained lower for the East Asian than for the American students. The correlations between the ratings of how well they did in mathematics and their mathematics scores changed from .25 to .36 for the

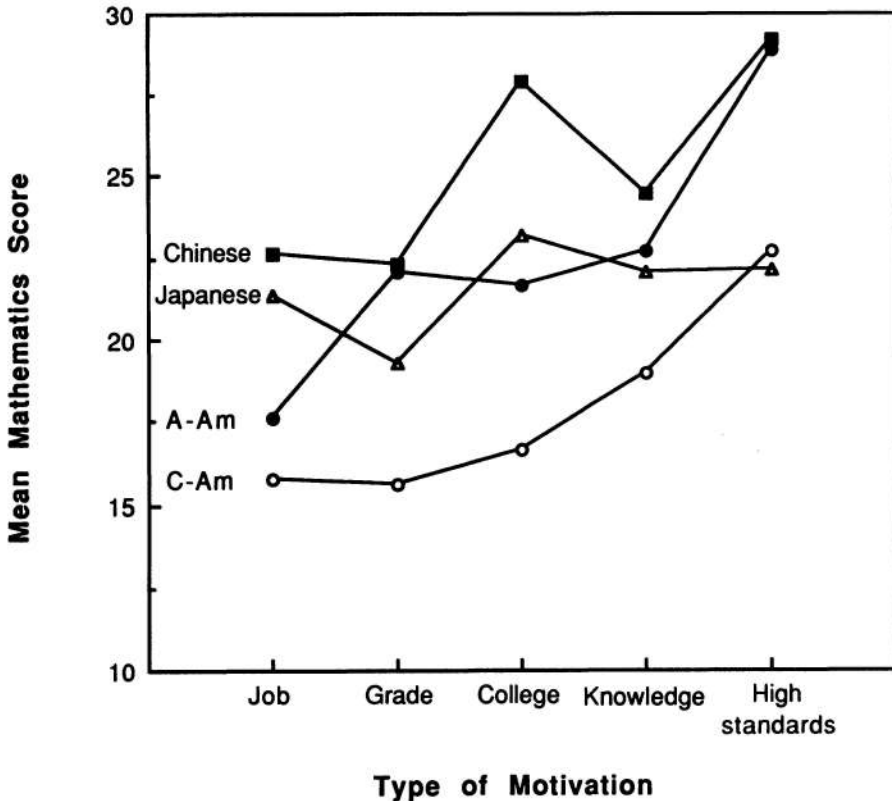


FIG. 5.—Students' mathematics scores as a function of their type of motivation

Chinese students, and from .38 to .47 for the Japanese students. The correlations between the ratings of how difficult mathematics was and their mathematics scores changed from $-.22$ to $-.23$ for the Chinese students, and from $-.20$ to $-.28$ for the Japanese students. It is unclear, therefore, why Asian students were less aware of their level of achievement than the U.S. students.

Another interesting finding was the significantly lower correlations between Asian-American students' achievement and their interest in mathematics than those for the other three groups, $t(1321-1967) = 1.65$ to 3.77 , $ps < .05$. It seems possible that, under strong parental pressure as reported in an earlier section, Asian-American students tried to achieve in this subject regardless whether they were interested or not.

Achievement-Related Behaviors

Students' behavior was consistent with their beliefs, values, and attitudes. This was evident according to many indices: their estimates of the time they spent studying, the ways in which they spent their out-of-school hours, their record of attendance at school,

and the courses in which they were enrolled.

Allocation of time.—When the students were asked to estimate the number of hours they spent each week studying outside of their classes, the estimates by the Asian-American students were significantly higher than those of the Caucasian-American students. The respective means were 19.9 and 13.8 hours, $t(1325) = 8.08$, $p < .001$. Within these hours, the Asian-American students estimated that they spent an average of 5.3 hours studying mathematics, whereas the average Caucasian-American students' estimate was only 3.2 hours, $t(1564) = 7.31$, $p < .001$. We also asked a small sample of Chinese ($N = 218$) and Japanese students ($N = 151$) these questions. They reported spending 16.6 hours (Chinese) and 11.4 hours (Japanese) per week studying, both of which were lower average estimates than that made by Asian-American students. The time the East Asian students spent studying mathematics—5.1 hours (Chinese) and 3.2 hours (Japanese) per week—were also somewhat lower than that for the Asian-American students.

TABLE 3

STUDENTS' ATTITUDES ABOUT MATHEMATICS

	Asian-American	Caucasian-American	Chinese	Japanese	F
How good at math are you? (1 = not at all good, 7 = very good)	5.4	4.9	4.0	3.5	309.41
In general, how hard is math for you? (1 = very easy, 7 = very hard)	3.4	3.8 ^a	4.1	5.0	184.83
How much do you like math? (1 = not at all, 7 = very much)	5.1	4.3	4.2 ^b	3.7	58.96
How interesting is math for you? (1 = not at all interesting, 7 = very interesting) ...	4.7	4.1	4.2 ^b	3.7	45.79
Ns	297-298	1,919-1,921	1,472-1,474	1,062-1,063	

NOTE.—All Fs were significant, $ps < .001$. All means for Asian-Americans differed significantly from those for the other three groups, Scheffé contrasts, $ps < .001$, except for ^a $p < .01$. The means for Caucasian-Americans differed from those for Chinese and Japanese students, Scheffé contrasts, $ps < .001$, except for ^b $p < .05$. All means for Chinese differed from those of Japanese students, Scheffé contrasts, $ps < .001$.

TABLE 4

CORRELATIONS BETWEEN STUDENTS' ATTITUDES ABOUT MATHEMATICS AND THEIR MATHEMATICS SCORES

	Asian-American	Caucasian-American	Chinese	Japanese
How good at math are you? .....	.62	.66	.25	.38
In general, how hard is math for you?	-.39	-.48	-.22	-.20
How much do you like math? .....	.22	.44	.32	.34
How interesting is math for you?17 ^a	.39	.30	.31
Ns	265-266	1,708-1,709	1,472-1,474	1,061-1,062

NOTE.—All $ps < .001$, except for ^a $p < .01$.

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It was easier for the Asian-American than the Caucasian-American students to spend large amounts of time studying because fewer of them participated in activities that might interfere with their schoolwork. Fewer Asian-American (53%) than Caucasian-American students (68%) held part-time jobs. The percentage of the Chinese and Japanese students who held part-time jobs was even lower: 21% in each case, overall $\chi^2(3, N = 4,726) = 986.02, p < .001$. The Asian-American students also spent less time each week socializing than did the Caucasian-American students (means = 12.0 vs. 16.8 hours a week), $t(1294) = 5.02, p < .001$. Data from the small sample showed that Chinese students spent even less time (mean = 9.5 hours) socializing than the Asian-American students, but the average for the Japanese students was slightly higher (12.5 hours). The groups also differed greatly in a specific aspect of socializing: dating. Among Asian-American students, 60% said they dated, compared to 85% of the Caucasian-American students. Fewer Chinese (37%) and Japanese (37%) said they were dating, overall $\chi^2(3, N = 4,714) = 1023.00, p < .001$.

Attendance at school.—Another indication of a student's dedication to schoolwork is evident in the number of days the student is absent from school. Asian-American students reported that they were absent an average of 3.0 days during the preceding semester, nearly always with an excuse. Caucasian-American students said they were absent an average of 4.5 days and, among these days, 1.0 was without an excuse. These rates of absence were higher than those reported by Chinese (1.7 days) and Japanese students (1.9 days), $F(3, 2205) = 77.89, p < .001$, all Scheffé contrasts significant, $ps < .05$, except for that between Chinese and Japanese, N.S.

Courses.—The courses students select to study provide a further indication of their dedication to their schoolwork. Serious students are more likely to select a more rigorous academic program. Although most students (98% of the Asian-American and 94% of the Caucasian-American students) were taking mathematics in eleventh grade, they took very different classes. Fewer Asian-American than Caucasian-American students were taking advanced algebra (28% vs. 46%); in contrast, more than half (55%) of the Asian-American students but only 37% of the Caucasian-American students were taking courses in pre-calculus, $\chi^2(1, N = 1,004) = 29.90, p < .001$. Asian-American

students were twice as likely (9.6%) as Caucasian-American students (4.8%) to be enrolled in calculus classes. Chinese and Japanese students follow a national curriculum and have no choice in the level of the course in which they are enrolled.

Both Asian-American and Caucasian-American students who were enrolled in pre-calculus or calculus classes obtained high, and nearly identical, average scores on the mathematics test; 27.2 (Asian-American) and 27.1 (Caucasian-American). Thus, an important variable in accounting for the overall difference between Asian-American and Caucasian-American students in mathematics achievement is the larger number of Asian-American students who were enrolled in the advanced mathematics classes. Of course, a difference in selection of advanced classes is related, in turn, to other variables such as their prior selection of classes and their prior level of performance.

Regression Analyses

Thus far we have identified a number of factors that are related to the mathematics achievement of Asian-American students. We now wish to examine whether the differences between the achievement level of Asian-American and Caucasian-American students and of Asian-American and East Asian students remain after these factors have been controlled for. For this purpose we conducted a set of regression analyses in which we asked whether the group differences disappear after we have controlled for several of the most salient of these factors. The two East Asian groups were combined for purposes of simplicity, and dummy variables were created for contrasting the Asian-American with the Caucasian-American students and the Asian-American with the East Asian students. Because all items were not presented to all students, separate analyses were performed combining the first part of the questionnaire given to all students with each of the two sections of the second part of the questionnaire (Samples A and B).

Entries in the regression analyses included those variables that had been found to differentiate the Asian-American students from students in the other three groups and that had high correlations with mathematics scores. Two analyses were conducted; the first included entries that differentiated among all three groups—the Asian-American, the Caucasian-American, and the East Asian groups (Table 5)—and the second included entries that differentiated only

TABLE 5

REGRESSION ANALYSES OF MATHEMATICS SCORES ON VARIABLES THAT ACCOUNT FOR CULTURAL DIFFERENCES BETWEEN ASIAN-AMERICAN AND EAST ASIAN STUDENTS: SHOWN IN TABLE ARE UNSTANDARDIZED COEFFICIENTS (and Standard Errors)

	Sample A	Sample B
Gender	-4.96 (.34)***	-2.69 (.36)***
Working now	-3.28 (.41)***	-3.26 (.43)***
Dating now	-1.10 (.40)**	-1.39 (.42)**
Study 3 hours (peers) .....	.78 (.10)***	...
Belief in effort	-.07 (.37)	...
Days of school skipped .....	...	-.36 (.09)***
Asian-American vs. Caucasian-American	2.83 (.75)***	2.53 (.82)**
Asian-American vs. East Asian	-.62 (.75)	-.09 (.81)
R ² .....	.24	.14
N	2,229	2,040

NOTE.—Missing items in each column were contained in only one section of the second part of the questionnaire.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

between the Asian-American and Caucasian-American groups (Table 6). Variables such as course selection were not included, for, as indicated earlier, it alone could account for all the group differences between Asian-American and Caucasian-American students. In other words, the purpose of these regression analyses was not to see which variables made significant contributions to achievement but, rather, to investigate whether the variables we have discussed so far, singly or in combination, could

account for the differences in the level of mathematics achievement among different cultural groups.

In addition to gender, five other variables were included in the first analysis: whether the students held a part-time job, whether they were dating, how frequently they thought their peers studied 3 hours or more every night, their choice of hard work as the most important factor in achievement, and days absent from school. Dichotomous

TABLE 6

REGRESSION ANALYSES OF MATHEMATICS SCORES ON VARIABLES THAT ACCOUNT FOR CULTURAL DIFFERENCES BETWEEN ASIAN-AMERICAN AND CAUCASIAN-AMERICAN STUDENTS: SHOWN IN TABLE ARE UNSTANDARDIZED COEFFICIENTS (and Standard Errors)

	Sample A	Sample B
Gender	-2.13 (.46)***	-1.18 (.48)*
Working now	-3.09 (.48)***	-2.72 (.52)***
Dating now	-1.44 (.59)*	-1.69 (.63)**
Value of education	1.43 (.28)***	1.11 (.32)***
Mathematics attitudes	2.84 (.17)***	3.25 (.19)***
Study 3 hours (peers) .....	.04 (.14)	...
Belief in effort	-.20 (.52)	...
Days of school skipped .....	...	-.24 (.10)*
Asian-American vs. Caucasian-American .....	.75 (.67)	.61 (.72)
R ² .....	.33	.38
N	975	825

NOTE.—Missing items in each column were contained in only one section of the second part of the questionnaire.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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variables were coded as 0 (boys) and 1 (girls) or 0 ("no") and 1 ("yes"); ratings were coded according to a seven-point scale (1 = "not at all frequently," 7 = "very frequently"). Two analyses are reported, one for the sample that received the first section of the second half of the questionnaire (Sample A) and one for the sample that received the second section of the second half of the questionnaire (Sample B).

Four of the five variables made unique contributions to the prediction of the achievement scores. Whether or not students worked made a difference of more than three points on the mathematics test. Students who were dating scored more than one point lower than the others. Students who reported having more hard-working peers received higher scores, such that each unit on the seven-point scales was equivalent to .78 points on the test. Finally, each day of school skipped by a student was accompanied by a decline of .36 points on the mathematics test. Selection of hard work over the other alternatives (quality of teacher, innate ability, and home environment) did not make a significant contribution to the prediction of the mathematics scores after the other variables were taken into account. Overall, these variables accounted for 24% of the variance in mathematics scores for Sample A and 14% for Sample B.

Of special interest is the fact that, when the effects of the four variables were eliminated, the difference between the scores of the Asian-American and Caucasian-American students remained significant (albeit smaller than the original difference of 3.60), whereas the difference between the Asian-American and the East Asian students did not.

Regression analyses were then conducted in which two more variables that differentiated the Asian-American and Caucasian-American students were added to examine whether the new equations would account for the group difference between Asian-American and Caucasian-American students. The two new variables were the value of education and attitudes toward mathematics. The score for value of education was the mean of four seven-point items dealing with how important the students thought it was to themselves and to their parents to go to college and to get good grades. Cronbach alpha for this scale was .64 (Asian-American), .71 (Caucasian-American), .75

(Chinese), and .75 (Japanese). The score for attitudes toward mathematics was the mean of the seven-point items about how much the students liked mathematics, how interesting they found mathematics to be, how good they thought they were at mathematics, and how easy mathematics was for them (a reverse of the original "difficulty of mathematics" item). Cronbach alpha for this scale was .83 (Asian-American), .88 (Caucasian-American), .83 (Chinese), and .87 (Japanese). After controlling for these variables, the difference in mathematics achievement between Asian-American and Caucasian-American students was reduced to a nonsignificant level (see Table 6). The percentage of variance in mathematics scores accounted for by these variables was 33% for Sample A and 38% for Sample B.

Taken together, the factors we have identified can explain the bases for the differences in performance of different cultural groups. Here, as was the case in the earlier discussion of course selection, we find that the number of variables necessary to eliminate differences associated with American students' ethnic status can be quite small. Because these are correlational data it is impossible to attribute causality to these variables, but it seems reasonable to assume that variables of the types we have described, or variables closely related to these variables can assume causal status.

Psychological Maladjustment

The psychological well-being of Asian-American students has been a concern of many educators and writers who have asked whether the long hours Asian-American students spend in academic pursuits and the greater emphasis in Asian-American families on academic achievement limit the degree to which Asian-American students can live a "normal" life. We were interested in knowing whether Asian-American students experienced greater maladjustment than the Caucasian-American students, and whether the degree of maladjustment was related to their achievement in mathematics. Information relevant to this issue was available from questions we asked about the frequency or degree to which the students experienced various moods or symptoms often attributed to psychological distress. With the exception to be described, all ratings were made on five-point scales ranging from "never" (1) to "almost every day" (5). We selected these variables from among those that had been included in discussions with colleagues from each of the cultural backgrounds. Two

were single-item scales measuring depression and stress. The other three measures of psychological adjustment were scales with multiple items: aggressive feelings (four items), somatic symptoms (eight items), and academic anxiety (three items). The Cronbach alphas ranged from .71 to .77 for these scales, with the exception of academic anxiety among Japanese, which had an alpha of .56 (for a more detailed discussion of these scales, see Crystal et al., 1994).

As is evident in Figure 6, the American students, both Asian-American and Caucasian-American, reported the same high level of stress. Their average rating of 4 ("once a week") was significantly higher than those for both the Chinese and Japanese students, $F(3, 4721) = 134.59, p < .001$. Students generally reported somewhat less frequent feelings of depression. There was no significant difference between the ratings of the Asian-American and Caucasian-American students. Chinese students reported somewhat higher frequencies of depression than did the other three groups; Japanese students reported somewhat lower frequencies, $F(3, 4716) = 40.70, p < .001$.

All four groups of students reported a low frequency of aggressive feelings and somatic symptoms. Items concerning aggressive feelings tapped four aspects of aggression: feelings of wanting to hit someone, feelings of wanting to destroy something, being angry with the teacher, and actually getting into serious arguments or fights with other students. The Asian-American students made ratings similar to those of the Caucasian-American and Chinese students. Japanese students reported a lower frequency of aggressive feelings, $F(3, 4736) = 41.46, p < .001$. Somatic symptoms included feeling tired for no reason, headaches, stomach aches, having sleep problems, poor appetite, overeating, diarrhea, and frequent urination. Asian-American and Caucasian-American students reported lower frequencies of somatic complaints than did the Chinese students, but higher frequencies than did the Japanese students, $F(3, 4738) = 115.14, p < .001$.

The final set of ratings dealt with three aspects of anxiety about academic matters: how nervous the student felt while taking tests and when the teacher gave back tests,

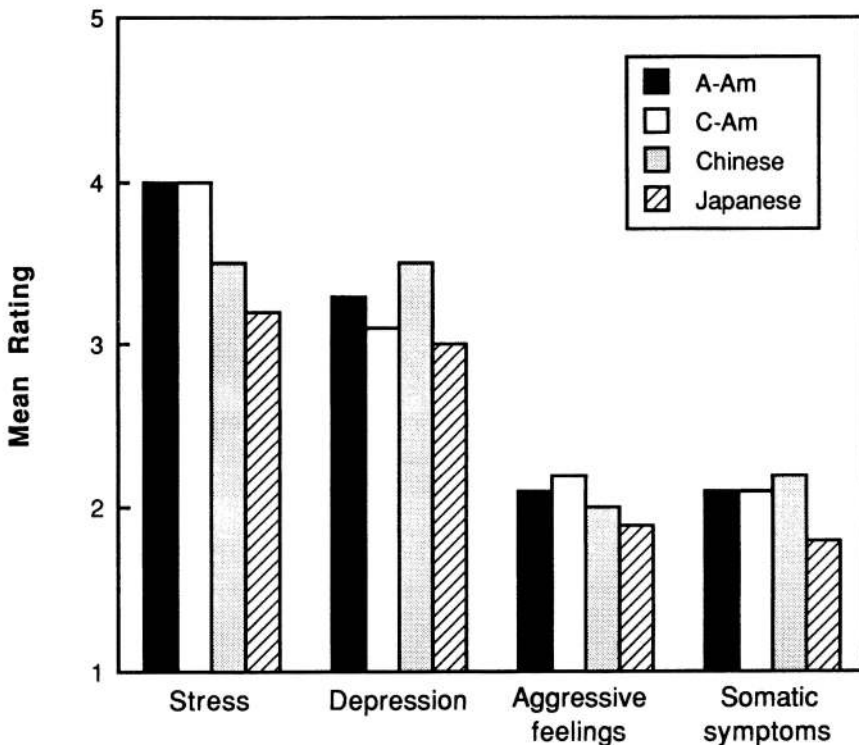


FIG. 6. Measures of psychological maladjustment

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and how worried the student felt about keeping up with schoolwork. These ratings were made on scales ranging from "not at all nervous/worried" (1) to "very nervous/worried" (7). This was one case in which the average rating made by the Asian-American students (4.5) was significantly higher than those for the Caucasian-American (4.1), Chinese (4.1), or Japanese students (3.8), $F(3, 4745) = 25.77, p < .001$.

To further explore the relations between achievement and psychological maladjustment, correlations were obtained between mathematics achievement and the four indices of psychological adjustment. As is evident in Table 7, there is little evidence to link high achievement with psychological maladjustment. About half of the correlations were not significant, even with large sample sizes. Among the significant correlations, most were in fact negative: the higher the achievement, the less the evidence for maladjustment. It was the low-achieving students who suffered from some psychological disturbance, although the causal direction is unclear. The only two significant positive correlations were between stress and mathematics score for Asian-American ($r = .17$) and Chinese students ($r = .06$). The trend for these two groups was for higher level of achievement to be related to higher level of stress.

In summary, many hours of studying and high parental standards did not appear to result in notable indications of psychological disturbance on the part of Asian-American high school students. Even in the one domain in which they made higher self-ratings than the other groups, that of academic anxiety, their average rating was only slightly above the midpoint on the scale of intensity. With the exception of the high lev-

els of stress reported by both of the U.S. groups, none of the groups can be characterized as displaying high levels of psychological maladjustment. Furthermore, there was little evidence that within each group high level of achievement resulted in psychological maladjustment.

Discussion

In this study we examined the academic achievement—in this case achievement in mathematics—of Asian-American students from a cross-cultural perspective. As we have reported elsewhere for elementary school students (Stevenson, Lee, Chen, Lummis, et al., 1990), the achievement scores of Asian-American students exceeded those of Caucasian-American students but were lower than those of Chinese and Japanese students in East Asia.

The factors found to differentiate Asian-American students from their Caucasian-American schoolmates encompassed many aspects of the students' lives. Asian-American students attended good schools, had parents and peers who held high academic standards, believed that the road to success was through effort, had very positive attitudes about mathematics, were enrolled in more challenging courses, studied diligently, and experienced less interference with their schoolwork from jobs and informal peer interactions. The practices and beliefs that characterize Asian-American students also describe Chinese and Japanese students, but they appear to have been modified through the process of the Asian Americans' acculturation in the United States.

Cultural modification appeared in many ways. On many measures, the Asian-

TABLE 7

CORRELATIONS BETWEEN INDICES OF STUDENTS' PSYCHOLOGICAL MALADJUSTMENT AND THEIR MATHEMATICS SCORES

	Asian-American	Caucasian-American	Chinese	Japanese
Stress .....	.17**	.04	.06*	-.03
Depression	-.00	-.06**	.05	-.09**
Aggressive feelings	-.03	-.11***	-.03	.02
Somatic symptoms	-.22***	-.18***	-.16***	-.07*
Academic anxiety	-.14*	-.17***	.01	-.10***
Ns	264-265	1,701-1,708	1,470-1,474	1,042-1,058

* $p < .05$.

** $p < .01$.

*** $p < .001$.

American students stood between the Caucasian-American students on the one hand and the East Asian students on the other. For example, they were more likely than the Caucasian-American students, but less likely than the Chinese and Japanese students, to adhere to the belief that studying is the major avenue to academic success. Asian-American students also believed that their parents held higher standards for academic achievement than those estimated by the Caucasian-American students, but the standards were lower than those of the Chinese and Japanese parents. Asian-American students were also less likely than Caucasian-American students—but more likely than the Chinese and Japanese students—to hold part-time jobs, to have dates, and to skip school. Cultural modification was also evident in another form, that is, the special importance of education for Asian-American students. Compared to the other three groups, Asian-American students expressed the strongest value for education, had very positive attitudes about mathematics, and were the most likely to link education and employment.

Consistent with the results of another recent study (Chiu, Feldman, & Rosenthal, 1991), Asian-American students were not found to experience a greater frequency of maladjustive symptoms than Caucasian-American students. The only exception was in the somewhat higher level of anxiety about academic matters expressed by Asian-American students. Even these feelings were within a moderate range.

The findings of the current study combine to support a cultural-motivational theory of academic achievement. Beliefs and attitudes that lead to high level of motivation and achievement-related behaviors reflect a cultural heritage that emphasizes education and the ability of all persons to benefit intellectually from diligent application of effort. These beliefs and attitudes are maintained when families emigrate, but the acculturation process necessitated by residence in a different culture appears to change their cultural heritage. Generally, this process results in the modification of beliefs and attitudes, and the resultant levels of motivation, to levels that lie between the two cultures. However, in an apparent effort to overcome any barriers that minority status might create, minority students may at times outdo their peers in both cultures. As a result of these various forms of adaptation, the minority students' level of academic achievement

may exceed that of members of the majority culture but may still fall behind that of persons who continue to adhere to the precepts of the immigrants' original culture. A critical question is how rapidly the beliefs and attitudes of the majority culture are adopted by members of minority groups and how pervasive the influence turns out to be.

The factors we have identified are neither elusive nor unexpected. Undoubtedly, other factors, such as the students' school behavior and the direct involvement of parents in their children's education need to be directly examined. But the success represented by the Asian-American family in terms of the children's academic achievement offers ideas and suggestions to which a broader range of Americans might well pay closer attention.

References

- Caplan, N., Choy, M. H., & Whitmore, J. K. (1992). Indochinese refugee families and academic achievement. *Scientific American*, *266*, 36–42.
- Chen, C., & Stevenson, H. W. (1989). Homework: A cross-cultural examination. *Child Development*, *60*, 551–561.
- Chiu, M. L., Feldman, S. S., & Rosenthal, D. A. (1991). The influence of immigration on parental behavior and adolescent distress in Chinese families residing in two Western nations. *Journal of Research in Adolescence*, *2*, 205–240.
- Crystal, D. S., Chen, C., Fuligni, A. J., Stevenson, H. W., Hsu, C.-C., Ko, H.-J., Kitamura, S., & Kimura, S. (1994). Psychological maladjustment and academic achievement: A cross-cultural study of Japanese, Chinese, and American high school students. *Child Development*, *65*, 738–753.
- Garden, R. A. (1987). The second IEA mathematics study. *Comparative Education Review*, *31*, 47–68.
- Hess, R. D., & Azuma, H. (1991). Cultural support for schooling: Contrasts between Japan and the United States. *Educational Researcher*, *20*, 2–8, 12.
- Hess, R. D., Chang, C., & McDevitt, T. M. (1987). Cultural variations in family beliefs about children's performance in mathematics: Comparisons among People's Republic of China, Chinese-American, and Caucasian-American families. *Journal of Educational Psychology*, *79*, 179–188.
- Hirschman, C., & Wong, M. G. (1986). The extraordinary educational attainment of Asian Americans: A search for historical evidence and explanations. *Social Forces*, *65*, 1–27.

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- Holloway, S. (1988). Concepts of ability and effort in Japan and the United States. *Review of Educational Research*, *58*, 327–345.
- Hsia, J. (1988). *Asian Americans in higher education and at work*. Hillsdale, NJ: Erlbaum.
- Lapointe, A. E., Mead, N. A., & Askew, J. M. (1992). *Learning mathematics*. Princeton, NJ: Educational Testing Service.
- Lapointe, A. E., Mead, N. A., & Philips, G. (1989). *A world of differences: An international assessment of mathematics and science*. Princeton, NJ: Educational Testing Service.
- Lin, C-Y. C., & Fu, V. R. (1990). A comparison of child-rearing practices among Chinese, immigrant Chinese, and Caucasian-American parents. *Child Development*, *61*, 429–433.
- Lynn, R. (1977). The intelligence of the Japanese. *Bulletin of the British Psychological Society*, *40*, 464–468.
- Rohlen, T. (1983). *Japan's high schools*. Berkeley: University of California Press.
- Rushton, J. P. (1985). Differential K theory: The sociobiology of individual and group differences. *Personality and Individual Differences*, *6*, 441–452.
- Steinberg, L., Dornbusch, S. M., & Brown, B. B. (1992). Ethnic differences in adolescent development: An ecological perspective. *American Psychologist*, *47*, 723–729.
- Stevenson, H. W., Chen, C., & Lee, S. Y. (1993). Mathematics achievement of Chinese, Japanese, and American children: Ten years later. *Science*, *259*, 53–58.
- Stevenson, H. W., Lee, S. Y., Chen, C., Lummis, M., Stigler, J., Fan, L., & Ge, F. (1990). Mathematics achievement of children in China and the United States. *Child Development*, *61*, 1053–1066.
- Stevenson, H. W., Lee, S. Y., Chen, C., Stigler, J. W., Hsu, C. C., & Kitamura, S. (1990). Contexts of achievement: A study of American, Chinese, and Japanese children. *Monographs for the Society for Research in Child Development*, *55*(1–2, Serial No. 221).
- Sue, S., & Okazaki, S. (1990). Asian-American educational achievements: A phenomenon in search of an explanation. *American Psychologist*, *45*, 913–920.
- White, M. (1993). *The material child: Coming of age in Japan and America*. New York: Free Press.