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Motivation and Achievement of Gifted Children in East Asia and the United States

Harold W. Stevenson, Chuansheng Chen, &
Shinying Lee

Analyses were conducted of data from 5 studies related to the academic achievement and cognitive abilities of students in Japan, Taiwan, Mainland China, and the United States. Cross-sectional and longitudinal data were available for students in kindergarten and grades 1, 5, and 11. The analyses compared the top 10 percent of students with the 10 percent of the students whose scores clustered most closely to the average on (a) tests of cognitive ability and then on (b) tests of mathematics achievement. The high ability students in Asian samples outperformed high ability American students in mathematics at grade level 1, 5, and 11 but not in reading. Parents of high ability students in the United States had a higher opinion of their children's ability and performance than did Japanese parents of high ability students. Many factors related to high ability and/or to high achievement are discussed, including mothers' and students' evaluations of the students' abilities and personality characteristics, attributional beliefs, sources of motivation, psychological well-being, and demographic factors. The relation of cognitive ability to academic achievement is also discussed.

The stunning success of East Asian students in many forms of academic achievement has aroused a great deal of international interest.

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These students, from kindergarten through high school, are consistently among the top performers in international studies of academic achievement and in international academic competitions (e.g., Garden, 1987; Lapointe, Mead, & Askew, 1992; Stevenson, Lee, & Stigler, 1986). If the general level of academic achievement is so high, what are the students like who are at the top of their classes in East Asia? How do these students differ in ways other than academic achievement from average-performing peers in their own countries and from high achieving students in the West? In this paper, we present data from a series of studies in which we have compared students in the United States and in Japan, Mainland China, and Taiwan in terms of such characteristics as intelligence, psychological well-being, beliefs and attitudes, and self-evaluations.

Method

We report analyses for two types of highly able students. In the first set of analyses we focus our attention on the characteristics of students who demonstrate outstanding performance on tests of the types commonly included in intelligence tests. In the second set of analyses we discuss correlates of outstanding achievement in mathematics.

During the past eleven years our research group, in collaboration with colleagues in Sendai (Japan), Taipei (Taiwan), and Beijing (People's Republic of China) has conducted a comprehensive series of studies comparing students in those cities with students in the United States. In these studies we have tested and interviewed students, interviewed their mothers and teachers, given questionnaires to their fathers, and observed their classrooms.

In this article we synthesize a large amount of data from several studies. Syntheses of this type have both advantages and drawbacks. The advantage is that we are able to discuss a broad range of issues that have been replicated in more than a single study. The main drawback is that not all issues are covered with all age groups.

The Studies

We refer to data from five studies in this report. They are discussed, in chronological order, in the following paragraphs.

1. Our first study, conducted in 1980, included 1446 children, selected as representative samples of first and fifth graders from Sendai, Taipei, and Minneapolis. The children were interviewed,

tested for reading and mathematics achievement, and given a battery of ten cognitive tasks. Mothers also were interviewed. We also make brief mention of a parallel study we conducted of 1971 kindergarten children from 72 kindergartens in the three locations.

2. In 1986–87, we completed a more thorough exploration of achievement in mathematics. In this study, we visited 10 schools in Taipei, 10 schools in Sendai, 11 schools in Beijing, and 20 schools in the Chicago metropolitan area. From each school we selected representative samples of 12 first graders and 12 fifth graders. The children were given a battery of mathematics tests and we interviewed the children, their teachers and mothers. In 1990, we replicated this study in Beijing with 382 fifth graders from five schools.

3. We also conducted a study of children's adaptation to school in Beijing and in Chicago in 1986–1987. We gave tests in reading and mathematics achievement to 2405 first-, third-, and fifth-grade students in Beijing and to 2973 in Chicago.

4. We replicated part of Study 1 in 1990 with fifth graders from each of the three cities we visited in 1980: Minneapolis, Taipei, and Sendai. The respective numbers of children were 243, 242, and 284. We visited the same schools included in the 1980 study and tested children with the same tests and interviewed mothers about the same topics included in the earlier study. We also interviewed students about many of the topics included in Study 2.

5. We are currently conducting a large study of eleventh graders in Sendai, Taipei, and Minneapolis. The study includes representative samples of 1197 Japanese, 1475 Chinese, and 1120 American students. We gave them tests of mathematics and general information, and a long questionnaire dealing with their attitudes, beliefs, and current life situations. We are also conducting a follow-up study in which we are including as many as we could find of the approximately 240 first graders from each city included in our 1980 study (now eleventh graders). The data included in this report are based on 212 students in Minneapolis, 169 in Taipei, and 93 in Sendai.

Detailed descriptions of the methods and materials employed in these studies can be found in Stevenson, Lee, Chen, Stigler, Hsu, and Kitamura (1990), Stigler, Lee, and Stevenson (1990); and Stevenson, Lée, and Chen (in preparation).

Cognitive Tests

The cognitive tasks given to the children in Study 1 included tests of coding, spatial relations, perceptual speed, auditory memory, memory for words, memory for numbers, verbal memory, vocabulary, gen-

eral information, and verbal-spatial representation. These tests are described in detail in Stevenson, Stigler, Lee, Lucker, Kitamura, and Hsu (1985).

Mathematics Tests

We developed our own tests of mathematics achievement in order to be sure that the tests were appropriate for the students in each culture. The tests were based on our detailed analyses of the content of the textbooks (workbooks in the case of kindergarten children) used in the schools of each city. Information from these analyses made it possible to design items of the type and level of difficulty that children encounter every day at school. As a further check on the cross-cultural applicability of our tests and interviews, we routinely submitted all items to psychologists and educators in each culture for review.

Items for the kindergarten test ranged from identifying numerals, counting, and ordering, through adding and subtracting in simple computation and word problems. The test for elementary school students included more difficult computation and word problems. The test for the eleventh graders was comprehensive and contained items ranging from simple inequalities to complex geometry and algebra. Descriptions of these tests are contained in the studies referred to above.

Results and Discussion

Students of High and Average Cognitive Ability

Giftedness is often defined in terms of intelligence. Data from Study 1 make it possible to form groups on the basis of the scores on tests of cognitive ability given to first and fifth graders. We constituted two groups, one we will term "highly able" and the other, "average." At each grade we selected approximately 24 students whose scores were in the top decile of scores on the cognitive tasks for a "highly able" group and a corresponding group of approximately 24 students whose scores clustered most closely to the overall mean for an "average" group.

There was no consistent tendency for boys or girls to be more frequently represented among the highly able students. At first grade, a lower percentage of boys than of girls received the high scores in Minneapolis (39%) and Taipei (37%), but slightly more boys than girls

were in the highly able group in Sendai (56%). The corresponding percentages at fifth grade were 67%, 46%, and 52%.

Academic achievement. One of the first questions we asked about the two groups of children was how well they were achieving in school. Level of cognitive ability has frequently been found to be related to academic achievement. The question of interest here is whether the level of achievement differed between the highly able and the average students to the same degree in three cultures that differ markedly in the students' general levels of academic achievement.

Students who received high scores on the cognitive tests outperformed the average students on both the mathematics and reading tests. First graders in the highly able groups could read many more words and phrases and were better able to understand what they read than were the average children, F 's (1,142) = 63.94 and 70.06, p 's < .001. The highly able students also surpassed the average students in their ability to solve computation and word problems, F 's (1,142) = 60.51 and 32.10, p 's < .001 (see Figure 1). Differences in scores on the achievement tests between the highly able and average groups of children were generally equivalent among the three cultures (p 's for all interactions between location and levels of cognitive ability were larger than .10, with the exception of that found for computation, F (2,142) = 3.15, p < .05).

Differences between the highly able and average groups were less marked at fifth than at first grade, probably reflecting an increasingly strong influence of factors other than children's cognitive ability on academic achievement. Even so, highly able students performed at a higher level than the average students for vocabulary and comprehension, F 's (1,144) = 37.12 and 33.33, p 's < .001, and for computation and word problems, F 's (1,144) = 26.36 and 27.54, p 's < .001. The data are presented in Figure 2.

It should be pointed out that the standard (z) scores of the highly able American children were at the average level (z = approximately 0) for fifth-grade students on both computation and word problems (see Figures 1 and 2); this also occurred for first-grade students in word problems.

The reading scores were in marked contrast with those for the mathematics test: the highly able American students, like their Chinese and Japanese counterparts, were markedly above the average level at both grades.

Scores at eleventh grade. We can also determine the predictive value of the early cognitive tasks by asking whether the scores ob-

Figure 1

Mean standard (z) scores on reading and mathematics achievement tests of the groups of first grade students of high and average cognitive ability

Figure 2

Mean standard (z) scores on reading and mathematics achievement tests of the groups of fifth grade students of high and average cognitive ability

tained in first grade were effective in distinguishing between achievement scores received ten years later, when the students were in high school. Scores were available for mathematics, reading comprehension, and general information. The latter test tapped information that was not necessarily taught in school, such as why blankets keep us warm and why it has been possible in recent years to make smaller computers. Scores were standardized across all eleventh graders in the follow-up sample.

Bright first graders not only were high achievers at first grade, but also ten years later when they were in high school (see Figure 3). They knew more than the average students about reading and mathematics, and also had a broader fund of information about the everyday world, F 's (1, 91 to 93) = 10.41 to 26.41, p 's < .01.

Mothers' perceptions. Mothers in all three cultures tended to rate their children as being average or above in intelligence and in achievement in mathematics and reading. This is evident in the data summarized in Figure 4. The average group of students received ratings that were above average—but generally significantly lower than those obtained by the highly able students, F 's (1,137) = 4.15 to 31.01, p 's < .05. The differences between the ratings for the highly able and average groups were largest in Minneapolis and smallest in Sendai. The interaction terms were significant for mathematics and reading achievement at fifth grade, F 's (2,137) = 4.66 and 11.67, p 's < .05.

Mothers in all three locations gave other indications of their awareness of their children's level of cognitive ability. Mothers of highly able students consistently gave their children higher ratings than did the mothers of average children on memory and ability to learn new things at the first grade, F 's (1,142 and 137) = 12.55 and 13.05, p 's < .01, and at fifth grade, on the ability to learn new things, to be motivated to do well in school, to express themselves verbally, and to pay attention, F 's (1,137) = 6.32 to 18.66, p 's < .05.

In addition, mothers of highly able fifth graders believed that their children would complete more years of school than did mothers of children in the average group, F (1,135) = 4.06, p < .05, and that their children had higher potential to do well in school, F (1,137) = 29.83, p < .001.

Only on two characteristics related to cognitive ability, creativity and curiosity, did the highly able and average groups consistently receive similar ratings. We have no explanation for this departure from the general pattern other than to suggest that the mothers may not have had clear conceptions of these attributes.

Ratings made by mothers of the highly able and average students

Figure 3

Weighted mean z scores of eleventh grade students who at first grade were in the average and highly able groups in terms of cognitive ability

generally differed from each other to the same degree in all three locations, with two exceptions. Significant interactions between country and achievement level were found at fifth grade for potential to do well in school, $F(1,137) = 7.08, p < .01$, where the smaller difference was found in Japan, and for the number of years of schooling their children would complete, $F(1,137) = 3.20, p < .05$, where smaller differences were found in both Taiwan and Japan.

The picture was different for personality and social characteristics. Ratings of the children's level of anxiety, approval seeking, obedience, restlessness, and shyness generally were not related to their level of cognitive ability. Significant differences appeared for only two characteristics, and then only at fifth grade. Highly able students were rated as being more persistent and given higher ratings for self-

Figure 4

Mothers' ratings of the intellectual ability and reading and mathematics ability of the groups of fifth grade students who received high and average scores on the cognitive tasks

confidence than were average students, F 's (1, 138 and 137) = 8.92 and 4.75, p 's < .05.

Use of out-of-school time. One might expect that highly able and average students would spend their out-of-school time in different ways. According to their mothers, this was not the case for watching television, doing homework, and at first grade, for playing, p 's > .10. At fifth grade, however, highly able students spent less time playing than their average peers, $F(1, 125) = 7.31, p < .01$. In Minneapolis, for example, the highly able students spent 14 hours a week playing; the average students, 21 hours. Nevertheless, the highly able students in Minneapolis spent more time playing than did their counterparts in Sendai and Taipei, who were estimated to spend 13.0 and 6.3 hours a week, respectively.

One way in which highly able and average students differed consistently was in the amount of time they spent each week in reading for pleasure. Highly able students in all three cities spent more time reading for pleasure than did the average students at both first grade, $F(1, 135) = 3.93, p < .05$, and at fifth grade, $F(1, 133) = 9.63, p < .01$. The estimates for the time spent by highly able and average first graders differed in Minneapolis, Taipei, and Sendai, respectively, by a quarter hour, half hour, and over three hours a week. By fifth grade, the corresponding differences were one hour, two and a half hours, and nearly three hours. These data offer interesting support for the view that highly able students are distinguished by their ability to learn a great deal by themselves.

Students with High and Average Achievement in Mathematics

We turn next to comparisons of students who displayed high levels of achievement in mathematics with those who performed at an average level. Performance in mathematics was selected as a second example of giftedness because of the widespread interest in the topic and because we have a great deal of information about students who do well in mathematics.

We formed high-achieving groups in each city by selecting the students whose scores were in the top decile on the mathematics test. We also formed contrast groups of average students by selecting the 10 percent of students whose scores clustered around the average for the total group in each city.

Mathematics achievement. Scores on the mathematics tests of both the high achievers and the average students from Taipei and

Figure 5

Mean standard (z) scores on the mathematics test of groups of kindergarten, first, fifth, and eleventh grade students in Taipei, Sendai, and Minneapolis who received high and average scores on the mathematics test

Sendai exceeded those of their Minneapolis peers at all grades after kindergarten. The degree of difference between the cities was so great that students considered to be high achievers in mathematics in Minneapolis were within the range of average students in Taipei and Sendai. This is illustrated graphically in Figure 5, where the data are plotted in terms of weighted z scores computed at each grade level from kindergarten through eleventh grade. The average scores of the high-achieving American fifth- and eleventh graders departed little, if at all, from those of the average Chinese and Japanese students.

The same effect appeared when comparisons were made between high achievers and average groups in Beijing and Chicago (see Figure 6). In these comparisons, the high achievers in Chicago at first, third, and fifth grade received scores at or below those of the average groups in Beijing. Clearly, we are not talking about the same degree of proficiency in mathematics when we compare children in the top decile of mathematics scores in Mainland China, Taiwan, and Japan with children in the top decile in the United States.

Figure 6

Mean scores on the mathematics test of groups of first, third, and fifth graders in Beijing and Chicago who received high and average scores on the mathematics test

Sex differences. In both Taipei and Sendai, boys predominated at all grade levels. This was dramatically evident in Sendai, where nearly all of the high achieving students at the eleventh grade were boys. This appears to be due, however, to the fact that the all-boys' schools included in our sample were of a higher level than the all-girls' schools. (Our sample included schools for boys, girls, and co-educational schools.) In Minneapolis, the groups included more girls than boys through fifth grade, but boys outnumbered girls at eleventh grade (see Table 1). In Beijing, there was also a higher percentage of boys in the high achieving groups: 64 percent (first grade), 58 percent (third grade), and 63 percent (fifth grade).

Educational level of parents. Parents of high achieving and average students differed much more in their educational levels in Taipei and Sendai than in Minneapolis. In the eleventh grade, the difference in years of education for Minneapolis fathers was only half a year, but was 2.3 years in Taipei and 1.3 years in Sendai; for mothers the corresponding differences were 0.4, 2.5, and 0.8 years. Thus, while the

Table 1
Percentage of Boys in Kindergarten, First, Fifth, and Eleventh
Grades Who Received High Scores in Mathematics

	USA	Taiwan	Japan
Kindergarten	48.2	65.6	62.3
Grade 1	47.3	53.8	67.5
Grade 5	40.6	62.1	60.7
Grade 11	61.9	63.6	98.1

socioeconomic status of the homes as indicated by parental education was greater in all cases for the high achievers than for the average students, it played a potentially much stronger role for the performance of high school students in the East Asian families. This was also the case among parents of elementary school students; the differences in average level of parental education of highly able and average students was greater in Taipei and Sendai than in Minneapolis.

Classrooms and schools. If all of the high-scoring elementary school students came from only a few of the 20 classrooms at each grade in each location, our findings might be attributable to the effects of a few teachers or to ability grouping. This was not the case. In each of the three locations—Minneapolis, Sendai, and Taipei—the high achievers came from 13 or more of the 20 first-grade classrooms and from 12 or more of the 20 fifth-grade classrooms we visited. In none of the cities, therefore, was high achievement in elementary school attributable to a small number of especially skilled teachers or to other characteristics of a few classrooms.

The picture is much different at eleventh grade. In Japan, 83.1 percent of the students came from two of the eight schools involved in the study; in Taiwan, 82.1 percent of the high achievers came from five of the eighteen schools. Thus, the dispersion of high achievers among different schools during the elementary school grades was replaced by a much higher concentration of high-achieving eleventh graders in a small number of high schools. High schools in Taiwan and Japan fall into a hierarchy that is defined by the severity of the entrance requirements imposed upon the students. It is not surprising, therefore, that the greatest number of high achievers came from the most highly rated high schools. The concentration of students in a few schools was somewhat less in Minneapolis, where 66 percent of the high achievers in mathematics came from three of the nine

schools involved in the study. Although there are differences among American high schools in any large city in the quality of instruction and in the students' abilities, a clear hierarchy produced by different entrance requirements does not exist.

Longitudinal data. Because we followed the first graders until they were in eleventh grade, we can ask how the high achievers in mathematics at first grade scored when they were in eleventh grade. The eleventh-grade percentile scores in mathematics for the high-achieving Minneapolis first graders was 77.7; for the high-achieving Taipei first graders, 68.3, and for Sendai, 86.2. These data indicate that the top-scoring first graders were likely to continue to do well in mathematics throughout their schooling.

But was the reverse true? Had the top achievers in mathematics at eleventh grade also been high achievers at first grade? To answer this question, we looked back at the first-grade mathematics scores of the students who were in the top ten percent of the students on the eleventh-grade mathematics test. In all three cities the high achieving eleventh graders were found to have been above average at first grade. The mean percentiles of first grade mathematics scores for Minneapolis, Taipei, and Sendai students were 79.8, 72.1, and 85.2. In general, therefore, the top students in eleventh grade were much above average according to tests given approximately six months after they entered first grade.

The relationship between earlier and later levels of achievement was not perfect, which leads us to wonder what happened to the children who did very well in mathematics in first grade but did not do well in high school, or to those who did very well in mathematics in high school but did not do well in first grade. What might account for the fact that of the very top achievers among the eleventh-grade Minneapolis students, one received the top score at first grade, while another was over a standard deviation below the mean of all Minneapolis first graders? We do not have sufficient information to answer these important questions.

Correlates of High Mathematics Achievement

We looked further at factors that differentiated high achievers from their average-performing peers. Both in-school and out-of-school factors were considered, but our major interest was in how high levels of achievement are related to cultural values about education, parents' attitudes and beliefs about children's development, and scholastic performance.

Cognitive ability. Replicating the finding that academic achievement differs according to students' cognitive ability is not especially useful, but it is of potential value to know whether the patterns of abilities of high achievers were similar among the three cultures.

Scores differed on nearly all of the tasks between the high and average achievers in all three cultures. The only exceptions were for the rote memory and perceptual tasks (Uttal, Lummis, & Stevenson, 1988). Not surprisingly, the more complex cognitive tasks emerged as the best discriminators of performance in mathematics. Multiple discriminant function analyses of the data for the high achievers at each grade and in each city revealed that tasks such as verbal-spatial representation (identifying and drawing spatial patterns on the basis of verbal instructions), verbal memory (recalling the details of a short story), vocabulary, and general information were the strongest predictors of mathematics achievement. Although the patterns of these tasks were not identical in each location, we did not find a set of abilities related to high levels of achievement that was unique to any location.

Self-evaluations of elementary school students. Fifth-grade students in the 1990 study were asked to evaluate their own levels of academic achievement, intelligence, and performance in mathematics. As is evident in Figure 7, the high achievers did not rate themselves as being truly outstanding. In Sendai, they gave themselves ratings in all three domains that were higher than those of the average students, F 's (1,52) = 14.58 to 20.13, p 's < .001. In Taipei, high achievers also gave themselves higher ratings in mathematics and academic achievement, but not in intelligence, than did the average students, F 's (1,46) = 10.24 and 5.84, p 's < .05.

None of the differences between the ratings made by the high and average achievers was significant in Minneapolis, p 's > .10. This was due in part to the fact that the average American students gave themselves ratings as high as those made by the high achievers (see Figure 7). Thus, the similarity in scores was due to the elevated ratings of the average students rather than to depressed ratings by the high achievers.

The lack of self-insight of the average American fifth-grade students may be a result of the lack of information available to them in American schools. The relative standing of all students is common knowledge among students in the classrooms of East Asia; scores on all important tests are reported publicly. This rarely occurs in American schools. Grades are available only to the individual student, and

Figure 7

Self-evaluations of their academic achievement, intellectual ability, and mathematics ability of fifth graders in the high and average achieving groups

even then they may be disclosed in such general terms that the students are not aware of their actual standing in the class. Report cards in American elementary schools typically offer global evaluations, such as "satisfactory," while East Asian schools provide numerical grades. Because of this, it may be more difficult for average students to gain an accurate estimate of their relative status in American than in Asian elementary schools.

Self-evaluations of achievement and intelligence among high school students. Eleventh-grade high achievers, like their fifth-grade counterparts, were aware of the fact that they were doing well in

Figure 8

Self-evaluations by eleventh graders in the high and average achieving groups of their academic achievement, intellectual ability, and mathematics ability

school (see Figure 8). American students were the most positive about themselves, and Japanese students the least. However, in contrast to the younger students, where the Minneapolis high achievers and average students gave themselves similar ratings, Minneapolis high school students who were average achievers in mathematics gave themselves lower ratings than did the high achievers. For many non-academic characteristics, however, the high and average achievers gave themselves similar ratings. These included physical appearance, ability to get along with others, having good family relations, caring about others, wanting to study rather than having fun, not wanting

to skip school, and not feeling satisfied with just a passing grade, p 's $> .10$.

Attributions. The Confucian emphasis on the malleability of human beings and the perfectibility of human behavior through proper experiences continues to have a pervasive influence in Chinese and Japanese cultures. This was evident in the results of our research. We have found, for example, that Chinese and Japanese mothers, teachers, and students are more likely than their American counterparts to attribute success in school to hard work and less likely to attribute it to innate ability (Stevenson, Lee, Chen, Lummis, Stigler, Liu, & Fang, 1990). Would these tendencies also be found among high achieving students? Would high-achieving Chinese and Japanese students give even more emphasis to hard work, and high achieving American students give more emphasis to the importance of innate ability, or would all of these highly able students emphasize the importance of ability in producing high achievement?

Evidence related to these questions was obtained from ratings made by fifth graders. American high achievers disagreed more strongly (i.e., made lower ratings) than the Chinese and Japanese students with the statement that everybody in their class has about the same amount of ability in mathematics. The mean ratings on a 7-point scale (1 = strongly disagree and 7 = strongly agree) were 2.7, 3.6, and 3.7 for the American, Chinese, and Japanese students. Conversely, when the high achieving students were asked whether they believed they could be good at any type of mathematics problem if they worked hard enough, the Chinese and Japanese students expressed greater agreement than the American students: the mean ratings were 5.7, 6.2, and 6.6, respectively. Some evidence was found, therefore, that the highly able fifth graders follow the attributional patterns characteristic of each culture.

Indices of stress. One domain we were able to explore with high school students that we could not investigate with young children was their level of stress. Parents and teachers often worry that high achievement may come at the cost of an increased incidence of psychological disturbance. We have not found this to be the case in analyses of eleventh graders in Taipei, Sendai, and Minneapolis, even though their levels of achievement differed greatly. Nor did we find it to be true of the high and average achievers in each city. In fact, if anything, it was the average achievers, not the high achievers, who were likely to describe more frequent indications of tension.

We asked the students to indicate the frequency with which they experienced a large variety of disorders, such as feeling tired for no reason, having problems with sleeping, eating, and elimination, and having headaches and stomachaches. Among American students, the average achievers reported more frequent indications of stress than did the highly able students for 14 out of the 17 indices (see Table 2). Seven of these differences were significant at the .05 level or above, F 's (1, 192) = 4.74 to 23.25. The average students reported significantly more frequent headaches and frequent urination than did the high achievers. They also indicated that they were more anxious when they take tests and when they receive the tests back; they were more frequently angry at their teacher and felt like hitting someone or destroying something.

There were many fewer indications of differences between the average and high achievers in Sendai and Taipei. The differences were significant in Taipei only for stomachaches, and in Sendai for depression and anxiety when taking tests, F 's (1, 221 to 303) = 3.93 to 7.03, p 's < .05. The high achieving Sendai students did, however, report more frequent feelings of wanting to destroy things.

Reasons for studying hard. Another new area that we were able to explore with high school students was the basis of their motivation for studying hard. As shown in Table 3, high achievers were more likely in general than average achievers to believe that they studied hard because they wanted to gain more knowledge, to go to college, and because they set high standards for themselves, F 's (1, 362–363) = 4.59 to 19.73, p 's < .05. In contrast, the average achievers were more likely than high achievers to say they studied hard to please their parents and teachers, and because they had no other choice, F 's (1, 362–363) = 7.30 to 10.52, p 's < .01. In other words, the motivation of high achievers for studying hard lay within themselves, but for low achievers it was more likely to depend on external factors.

Additional evidence of the self-motivation of high achievers appeared in the students' ratings of the importance of getting good grades. We asked the students first to rate the importance of this for their parents and then for themselves. High achievers believed it was more important to themselves than to their parents to get good grades, t (90, 103) for Minneapolis and Sendai = 3.37 and 3.30, respectively, p 's < .01. The average achievers in all three locations thought it was equally important to their parents as it was to themselves.

Expectations and satisfaction. Another approach to exploring students' motivation for studying hard is to compare how well they

expect to do on an examination and with what they would consider to be a satisfactory grade. We told the students: "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 results are summarized in Figure 9.

There were significant differences between the estimates made by the high and average achievers. The average students expected to get a score around average; the high achievers, especially the Americans, expected to do much better, $F(1, 709) = 117.46, p < .001$. The scores with which the high achievers would be satisfied were also higher than those indicated by the average achievers, $F(1, 703) = 93.05, p < .001$.

Three interesting phenomena appeared in the scores with which the students would be satisfied. First, the mean scores for the three cultures were remarkably similar, as were the estimates of the scores with which they believed their parents would be satisfied. This was true for both the high and average achievers.

Second, the Chinese and Japanese students set standards for themselves that exceeded those they expected, while the American students did not. These results offer some insight into why Chinese and Japanese students perform more effectively in academic achievement than American students. American students in our studies set standards for themselves that did not depart greatly from their expectations. The difference between the two values was 3.8 points—a marked contrast with the difference of 9.7 and 13.9 found for the Chinese and Japanese students, respectively, $F(2, 704) = 48.59, p < .001$.

Third, the standards high achieving students set for themselves offer another example of their high self-motivation. They set higher standards for themselves than they believed their parents would impose (mean differences were 3.9, 3.7 and 3.3 for Minneapolis, Taipei, and Sendai, respectively). All three means departed significantly from zero, t 's = 3.33, 4.64, 2.80, p 's < .01. This was not true for the average students, whose estimates of the standards they would impose and that their parents would impose did not differ significantly in any of the cultures. The respective mean differences were -0.3, 0.5, 0.3.

These data give us some insight into the reasons why East Asian students study harder than their American peers. If standards do not exceed the individuals' expected level of achievement, there is little reason for increasing effort. On the other hand, if a satisfying score is above what the individual expects to achieve, there is reason to

Table 2
Means (and Standard Deviations) for Indices of Psychological Well-Being
for Average and High Achieving Eleventh Grade Students

	USA		Taiwan		Japan	
	Average N=102-103	High N=91	Average N=160-162	High N=142-143	Average N=116-119	High N=103-107
Depression ^a	3.0 (1.1)	3.2 (0.9)	3.5 (1.1)	3.4 (1.0)	3.2 (0.9)	2.9 (1.2)
Stress ^a	4.0 (1.0)	4.0 (1.0)	3.3 (1.3)	3.6 (1.1)	3.2 (1.2)	3.2 (1.3)
Somatic Symptoms ^a						
Tired	3.1 (1.3)	2.8 (1.3)	3.0 (1.2)	3.0 (1.1)	2.7 (1.3)	2.5 (1.5)
Headache	2.5 (1.1)	2.1 (0.9)	2.0 (1.1)	1.8 (1.0)	1.9 (1.0)	1.9 (1.1)
Stomach ache	2.0 (0.9)	1.8 (0.9)	2.2 (1.1)	1.9 (0.9)	1.8 (1.0)	1.6 (1.1)
Trouble sleeping	2.3 (1.2)	2.2 (1.1)	2.9 (1.4)	2.6 (1.2)	1.5 (1.0)	1.7 (1.2)
Appetite loss	1.8 (1.0)	1.6 (0.8)	2.2 (1.0)	2.0 (1.0)	1.4 (0.8)	1.5 (1.0)
Overeating	2.0 (1.1)	1.9 (1.1)	2.5 (1.2)	2.3 (1.1)	1.8 (1.2)	1.8 (1.3)

Diarrhea	1.3 (0.6)	1.3 (0.5)	1.9 (0.9)	1.8 (0.8)	1.6 (0.9)	1.4 (0.8)
Frequent urination	1.9 (1.2)	1.5 (0.9)	1.6 (1.0)	1.5 (0.9)	1.2 (0.7)	1.4 (1.0)
School anxiety ^b						
Keeping up with schoolwork	4.6 (1.5)	4.5 (1.7)	3.9 (1.6)	3.7 (1.6)	3.9 (1.4)	3.6 (1.5)
Taking tests	3.9 (1.6)	3.0 (1.5)	3.9 (1.6)	3.9 (1.5)	3.5 (1.6)	3.0 (1.6)
Getting tests back	4.2 (1.5)	3.2 (1.6)	4.1 (1.7)	4.3 (1.4)	4.3 (1.6)	4.0 (1.8)
Aggressive Feelings ^a						
Hitting someone	2.6 (1.2)	2.2 (1.0)	2.2 (1.3)	2.1 (1.1)	1.9 (1.3)	2.1 (1.5)
Wanting to destroy something	2.2 (1.1)	1.8 (1.0)	1.8 (1.1)	1.9 (1.1)	1.7 (1.2)	2.1 (1.5)
Arguments, fights	1.4 (0.6)	1.3 (0.6)	1.6 (1.0)	1.6 (0.9)	1.2 (0.5)	1.4 (0.9)
Angry at teacher	2.3 (1.0)	2.0 (0.9)	2.5 (1.1)	2.2 (1.0)	2.6 (1.4)	2.6 (1.5)

^a 1 = Never; 2 = Once every couple of months; 3 = Once a month; 4 = Once a week; 5 = Almost every day.

^b 1 = Not worried or nervous at all; 7 = Very worried or nervous.

Table 3
Means (and Standard Deviations) of the Importance of Various Reasons
for Studying Hard for Eleventh Grade Students

	USA		Taiwan		Japan	
	Average N=59	High N=37	Average N=68	High N=80-81	Average N=66-68	High N=55-56
Gain more knowledge	5.1 (1.3)	5.7 (1.3)	5.0 (1.4)	5.5 (1.3)	4.6 (1.6)	5.2 (1.5)
Go to college	6.2 (1.1)	6.1 (1.5)	5.5 (1.5)	6.1 (1.0)	5.4 (1.6)	5.7 (1.6)
I set high standards for myself	5.2 (1.2)	6.1 (1.3)	4.9 (1.4)	5.8 (1.1)	4.2 (1.4)	4.5 (1.6)
Please my parents	5.1 (1.7)	4.3 (1.6)	4.9 (1.6)	4.9 (1.4)	4.1 (1.6)	3.2 (1.6)
Please my teachers	4.2 (1.5)	3.3 (1.9)	3.3 (1.6)	3.0 (1.4)	2.9 (1.5)	2.4 (1.5)
I have no other choice	3.2 (1.8)	2.3 (1.7)	3.1 (1.6)	2.7 (1.6)	3.6 (1.6)	3.4 (1.8)

Note: 1 = Not at all important; 7 = Very important.

Figure 9

Mean scores students would (a) expect, (b) be satisfied with, and (c) believe their parents would be satisfied with on a hypothetical mathematical test with 100 points and an average score of 70 points

persist. This prediction is supported by the students' reports of how much they study mathematics each week. Whereas the American eleventh grade high achievers reported studying mathematics after school only a little over three hours a week, both Chinese and Japanese high achievers reported that they studied mathematics after school over six hours a week.

Conclusions

The most notable finding in our comparative research is how similar the bright and high achieving students were in the different cultures in which we conducted the research. Only rarely did the degree of difference between students in the high scoring and average groups depend on a particular culture. There were no especially outstanding characteristics that distinguished gifted and talented East Asian students from their American peers, except for their marked superiority in mathematics achievement.

There is no tracking in the elementary schools of Taiwan and Japan. All children follow the same curriculum and very few educational opportunities are offered to gifted and talented students beyond those in the standard curriculum. Resource rooms exist in a few schools in Taiwan, but not in Japan. Despite this, the differences in performance between the highly able and average groups of students in Taiwan and Japan were as great as those in the United States. Lack of opportunity to participate in groups composed of fast learners or in special classes did not result in greater similarity in the performance of highly able and average East Asian students.

A related effect was found for the high school students. The high school to which students in Taiwan and Japan will be admitted depends upon scores obtained on an entrance examination. As a result, there is a hierarchy of schools in each city, ranging from those that enroll the most able students to those enrolling students of below-average ability. Nevertheless, differences in achievement between the Chinese and Japanese students in the highly able and average groups were no greater at the eleventh grade than they were at the fifth grade. This is an interesting phenomenon and may be a result of the national curricula followed in East Asian schools. Adherence to a national curriculum appears to reduce the degree to which academic achievement differs among students attending different schools, even when the schools differ in their admission standards.

As might be expected, the students and their mothers were generally aware of the relative status of high-scoring and average students. This was true in the East Asian societies that attempt to de-emphasize individual differences among children and in the United States, where individual differences are a matter of great interest. One exception occurred in Minneapolis. The average American elementary school students and their mothers generally considered the students to be more outstanding than was justified by their test

scores. At eleventh grade, the average American students continued to give themselves above-average ratings, but by this time the self-ratings made by the highly able students exceeded those made by the average students. It seems likely that this is due, in part, to the lack of comparative information and more global evaluations of their academic performance received by American students.

Highly able and average students expressed different sources of motivation for studying. In all three locations, the highly able students were more likely to depend upon intrinsic sources of motivation, such as wanting to gain more knowledge, while the average students were more dependent upon extrinsic sources, such as wanting to please their parents. Moreover, the highly able students, to a greater degree than the average students, imposed higher standards upon themselves than they believed their parents would impose and directed their own lives in ways that would foster their academic success, such as spending more time reading for pleasure.

The concern that high achievement is obtained at a psychological cost was not supported. Comparisons of the average and high achievers indicated, primarily among American students, that average achievers, not high achievers, described the most frequent problems in adjustment as evidenced by psychosomatic and psychological problems. This finding is not surprising in view of our more general finding that the high levels of performance by East Asian students are not accompanied by various types of psychological disturbance.

Cross-national studies appear from these data to be productive sources of information about gifted and talented students in different cultures. The present report consists of post-hoc analyses of studies that were not initially planned as investigations of the characteristics of gifted and talented students. The next step is to design studies so that they are specifically oriented toward this goal. We will then have a clearer understanding of how gifted and talented children fare in countries where the educational and child-rearing systems differ markedly from each other.

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