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ABSTRACT

Drawing on a cross-national study of children's reading, a study examined the correlates of reading success and failure in Taiwan. Subjects, 240 randomly selected Taipei fifth graders, were administered a reading test, cognitive test, and mathematics achievement test. A structured interview with each child's mother and classroom behavior observation also took place. Results indicated that reading disabilities and the prevalence rates of reading failure among children reading the Chinese writing system (logographic) were by no means lower than those among the children in the alphabetic writing systems. Results also showed that general information was the most powerful predictor of the child's reading achievement. Thirty-one family variables and reading achievement turned out to be positively intercorrelated in Chinese culture. It was noteworthy that only the cognitive subtests of verbal tasks were significantly related to reading success or failure in Chinese. In addition, the children's motivation appeared to play an important role in their reading success. (Five tables of data summary tables are included and references are attached.) (JK)

READING SUCCESS AND FAILURE AMONG CHINESE CHILDREN

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Stevenson et al and their collaborators in Japan and Taiwan recently completed a carefully designed "Cross-national study of children's reading,(CNSCR)". The primary purpose of the CNSCR was to validate the widely held claim that children learning to read Japanese and Chinese writing systems did not evidence reading disabilities as thei American counterparts did. The success of the CNSCR depended upon their being able to construct a reading test in each writing system that was reliable, culturally fair and comparable, and, accurately reflected the curricula of the three writing systems. A set of cognitive test, mother interview and classroom behavior observation protocols in each of the three languages also were developed to obtain information which may shed light on the commonalities and differences of reading success and failure in the three cultures. Large samples of children representative of those attending the fifth-grade, first-grade and kindergarten in Minneapolis (USA), Sendai (Japan), and, Taipei (Taiwan) were studied.

Detailed description of case sampling, construction of the reading test, cognitive test, mother interview and classroom behavior observation protocols, standardized procedures of test administration, scoring system, reliabilities of the tools, etc., can be found in a series of papers out of the CNSCR (Stevenson et al, 1982 ,1984 ,1987).

From cross-cultural perspective, the CNSCR, among its many contributions, provided strong evidences to indicate the followings:

1) Reading disabilities, by whatever definition or criteria, did exist among Japanese and Chinese children, and their prevalence rates were by no means lower than their American counterparts (Stevenson et al, 1982).

2) Chinese and Japanese children surpassed their American counterparts both in reading and mathematic performances (Stevenson et al, 1985).

3) The higher achievement of Chinese and Japanese children in reading and mathematic could not be attributed to higher intellectual abilities but was related to their experiences at home and in school (Stevenson et al, 1984, 1985, 1987).

The above listed findings should be enough to draw vivid attention and encourage those concerned to consider tailoring out more collaborative studies involving different orthographic systems.

This particular paper, however, intends to look at part of the voluminous data obtained in the course of the CNSCR from a different perspective; i.e., within-culture search for correlates of reading success and failure in Taiwan which uses a logographic writing system. The CNSCR did investigate fifth graders, first graders and kindergarteners, but I shall limit my presentation to data pertaining only to the fifth graders.

Samples and methods

1. Samples: Samples were the same 240 fifth graders in Taipei City studied in the CNSCR. They came from 10 elementary

schools selected to represent the whole population of the fifth graders of the City. From each of the ten schools, two classes of the fifth-grade were randomly selected. Mentally retarded children were eliminated according to the criterion set by their scores in the Raven's Standard Progressive Matrices (Hsu, 1972). Altogether 932 children were given the reading test individually. Then, two boys and two girls each were chosen randomly from the upper middle and lower thirds of the classroom according to their reading achievement scores.

2. Reading test: The test was constructed to yield three scores. (For detail, see Stevenson et al 1982, Stigler et al 1982).

Vocabulary: This part was designed to assess the child's ability to sight-read simple isolated words. If the vocabulary item was composed of more than a single character as, happens in Chinese writing system very often, all characters had to be read correctly in order for the item to be considered correct.

Reading and comprehending textual material: These portions of the test provided an index of the child's ability to read meaningful textual material and to respond to true-false and multi-choice questions. Three types of items were included in the questions; (a) phrases or sentences describing one of three pictures, (b) sentences in which certain key words were omitted, but for which three alternatives were available, and, (c) paragraphs about which questions were asked. Children were asked to read the item and then chose the correct picture or alternative.

The reading test was administered approximately 4 months after the children started the fifth grade. The test was adiministered individually by carefully trained examiners who were senior college students majoring in paychology and social work.All children were tested starting from the fifth-grade level. If they were correct on at least 75% of the vocabulary and comprehension items, they were continued to the highest level of the test, 6th grade level. If they incorrectly read more than one-fourth of the vocabulary items, or missed more than one-fourth of the comprehension items at the fifth-grade, they were tested at the fourth grade level. These criteria were used at each grade level for taking the child to the next lower grade level. Test was concluded when the child reached a grade level at which more than 75% of the vocabulary and comprehension items were correct. Children were given credit for all items for the grade level preceding the last one on which they were tested.

Since there is no clear definition of a word in Chinese, we simply computed percentage of all characters that were read correctly among those that appeared in the text. The comprehension score was the number of correct alternatives chosen in multiple-choice items and the number of true-false items answered correctly.

3. Cognitive test: Ten cognitive tasks were constructed for the purpose of the CNSCR and were administered individually to the children approximately three months after the reading test

was given. Two types of tasks were constructed, verbal and performance tasks. Tasks were selected either on the basis of a hypothesized differential relation to reading ability in the three languages or on the basis of prior research in which similar tasks have been found to be related to reading ability. In addition to their use in possibly clarifying bases of differences among children's reading performance, the cognitive tasks also provided a general index of each child's level of cognitive functioning.

Coding : A timed coding task was used in which the figures capitalized on the detection of spatial differences involving up-down, left-right relations, dimensions of difference often found to produce problems in reading English.

Spatial relations and perceptual speed: These tasks, both of which use geometrical figures, were adapted from the Thurston Primary Mental Abilities Battery. It was assumed that performance on these tasks would be more closely related to reading Chinese characters than do English.

Auditory memory: Many have suggested that memory for auditory sequences may be related to reading English. Because of differences among China, Japan, and the United States in musical and speech tones and in experience with other auditory material, the task we constructed involved memory for patterns of atonal sequences of different duration.

Serial memory for words and numbers: Words were selected from the readers and were reviewed by native speakers for their relevance and usefulness. The numbers were selected at random. Guidance concerning the number of items to use for the fifth grade level came from various standardized tests of intelligence.

Verbal-spatial representation: This task of 13 items was an adaptation and extension of an earlier task constructed by Yung-ho Ko, Profesor of Psychology at National Taiwan University, who found that children's ability to draw figures varying in their spatial arrangements on the basis of verbal directions was related to the rate at which children learn Chinese characters.

Verbal memory: Many studies (Stevenson, et al, 1986) have found that memory for textual material is a significant predictor of reading ability. The three versions of the story written for this task were judged by colleagues in Taiwan, Japan and the U.S.A. to be culturally fair and linguistically comparable.

Vocabulary: Items were obtained for consideration from the Japanese, Taiwanese, and American versions of the Wechsler Intelligence Scale for Children, from the University of Michigan computer lexicon built for purpose of constructing the reading tests, and from popular books and magazines from each country.

General information: A distinction was made between items tapping inferential reasoning and common information. It was decided to minimize the number of the first type since the purpose of the test was to assess the amount of common knowledge the child had accumulated through everyday experience.

Reliability of the test was assessed by computing Cronbach's alpha. For the fifth graders in Taipei it ranged from, .55 for verbal memory to .98 for coding. It was described

in detail in another paper (Stevenson et al, 1985).

4. Mathematics achievement test: In addition to the cognitive tasks the children were given an arithmetic test that was constructed for the purpose of this study. The test was individually administered, approximately seven months after the fifth grade started. All word problems were read to the child to avoid the possibility that failure to solve the problems was due to poor reading ability.

5. Classroom behavior observation protocol: A comprehensive time sampling method of classroom observation was developed. The goal was to sample each child's behavior for 200 10-second intervals, or a total of approximately 33 minutes of observation for each child. The goal in the observation of the teacher was to sample each teacher's behavior 480 times at 15-second intervals for a total of 120 minutes . The categories of behavior included in the student and teacher coding schemes were defined in great detail together with a description of each category. These were described in another paper (Stevenson et al, 1987). The classroom behavior observation was conducted by well-trained senior college students usually also the ones who administered the individual cognitive test and who conducted the mother interviewing to be described below .

The observer's reliability in using the observational scheme was tested and mastery was assumed when 80% agreement with an experienced observer was reached. The actual observations began only after the observer had spent at least two classroom periods in an assigned classrom and was familiar with the children and the teacher.

6. Mother interview protocol: A structured interview with mothers that lasted from 1 to 2 hours was scheduled. We sought to insure comparability across the three cultures by constructing an interview consisting primarily of objective, forced choice questions. Because of possible differences in loquacity, willingness to verbalize about certain topics, or other possible cultural differences, alternative answers were supplied within the interview whenever possible Some open-ended, subjectively coded questions were also included in order to guard against missing important information that might not emerge from the objective responses. The first step was to interview American mothers, mothers in Japan and Taiwan with open-ended questions which were developed and refined by researchers from the three cultures. Based on the results of these open-ended exploratory interviews, the researchers then developed a final set of questions that was acceptable to representatives from each country. The questions can be devided into eight categories: demographic characteristics of the family, parent activities, mother's beliefs about child reading , motber's attitudes toward school and learning, parent-child relationships, mother's ratings of child's academic, cognitive and personality characteristics, and of self, and, child's preschool experiences.

The interview was conducted by local residents who were carefully trained in the interview procedures. More detailed

description of the interview protocol can be seen in other paper (Stevenson et al, 1984).

7. Data processing: Raw material was sent to the University of Michigan and coded by graduate student assistants from the three countries. For this particular within-culture analysis, all of the data for the Chinese samples was then transcribed onto computor tapes from the University of Michigan CNSCR data base and sent to Taipei for analysis utilizing the SPSS programs.

Results

1. Sex difference:

Table 1. Summary table of means, standard deviations by sex and the result of t-test.

	Male(N=120)		Female(N=120)		t-value
	Mean	SD	Mean	SD	
Reading test:					
Vocabulary	49.68	7.78	49.97	6.13	-.31
Comprehension	84.81	7.45	84.48	6.79	.36
Reading test	.85	.12	.85	.10	-.11
Cognitive test:					
Coding	50.04	9.29	51.83	7.84	-1.61
Spatial relation	14.87	2.72	14.24	2.70	1.79
Perceptual speed	16.99	1.63	17.02	1.71	-.12
Auditory memory	6.45	2.98	6.98	3.33	-1.31
General information	33.6	7.67	31.13	7.06	2.66**
Vocabulary	28.14	6.18	26.90	7.40	1.44
Verbal memory	9.83	2.09	10.05	2.33	-.76
Serial memory for words	11.48	5.57	11.78	5.79	-.41
Serial memory for numbers	41.39	4.28	42.15	3.59	-1.50
Verbal-spatial representation	17.08	4.61	16.63	4.18	.79
Mathematics	50.54	6.46	50.89	4.93	-.47

** p<.001

Out of the 14 comparisons only one item, i.e. general information, showed a significant sex difference in favor of boys. Since the sex difference could be said to be negligible, most of the following analyses were made by putting boys and girls together.

2. Intercorrelations of reading subscores

The three portions of the reading test were highly intercorrelated as can be seen in Table 2. The sex difference in this regard was negligible.

Table 2: Correlation between the three reading subscores (N=240)

Subscores	Correlation coefficients
Vocabulary-Comprehension	.867
Vocabulary-Reading of text	.887
Comprehension-Reading of text	.853

It is apparent that the reading test is highly reliable.

3. Factor analysis of the three reading subtests

Table 3 shows the results of factor analysis of the three reading subtests.

Table 3. Result of factor analysis of the three reading subtests (N=240)

Subtests	Factor 1	
	Factor loading	communality
Vocabulary	.974	.948
Comprehension	.925	.854
Reading of text	.933	.869
Eigenvalue	2.673	2.672 (89.9%)

It indicated that the three reading subtests actually measured only one common factor which we designated "reading achievement factor". For each child a reading achievement factor score could be computed according to the factor loading. The highest reading factor scores attainable and the 75% reading factor scores for each grade which was set to define " suceess" or "failure" of given child at each grade level were also computed.

4. Reading "success" and "failure"

Table 4. Numbers and percentage of children failing to meet criteria for success at each grade level

Grade	Boys(%)	Girls(%)	Both(%)
5th	32(32.5%)	38(31.6%)	77(32.08%)
4th	26(21.6%)	31(25.8%)	57(23.75%)
3rd	11(9.1%)	12(10.0%)	23(9.5%)
2nd	3(2.5%)	1(.8%)	4(1.6%)

An example will help in interpreting this table. When one looks at the lower grade level for boys, the table indicates that 11 (9.1%) of the fifth graders failed to meet the criteria imposed at grade 3 and, therefore, were taken back to grade 2; out of the 11 boys 3 (2.5%) failed to meet the criteria for success at the second grade level and were taken back to the first grade level. Putting boys and girls together, Table 3 also indicates that there were 163 of the fifth graders who succeeded the grade level they should be in. As a matter of fact 79 (32.91%) out of the 163 not only succeeded in meeting the criteria for success at the fifth grade level but also went up to the 6th grade, a sort of successful readers. If one defines "lagging more than two grades behind" as the criterion of "reading failure" or "reading disabilities" or "poor readers", at least 4(1.6%) of the Taipei children apparently belonged to the category. One, however, should remember that the reading test was administered 4 months after the children started to attend 5th grade, and therefore, the exact grade level for defining "reading failure " should be 2 and 1/3 grade, somewhere between 3rd and 2nd grade. The real number and percentage of reading disabilities acorrding to this criterion were 10 and 4.17%, with a sex ratio of 7 boys to 3 girls.

If one takes "lagging at least more than 1 grade behind" as a cutting point for "reading failure" then more than 9.5% of the Taipei children belonged to this category.

Another common definition of reading failure or reading disability is low reading ability together with average or near average IQ. Approximation of each child's IQ can be obtained from the cognitive tasks. A z score was computed for each child for each task, standardized within Taiwan. An average z score was then computed for each child separately for the verbal, performance tasks and for the whole tasks. We then determined the percentage of children who were both within the lowest 10% of the distribution of reading achievement scores and who obtained an average z score higher than 1 standard deviation below the mean for the cognitive tasks. The percentage of children classified as "reading failure" or "reading disabled" by this

criterion was 16 (6.6%), 9 boys and 7 girls. If only verbal tasks or performance tasks alone was used in this criterion, then the numbers and percentages of "reading failure" was 19(7.9%) and 22(9.1%) respectively. The sex difference again was negligible, i.e. 11:8 and 11:11 respectively.

So far two replication studies have been carried out in other parts of Taiwan and the prevalence rates of "reading failure" or "reading disabilities" of whatever difinition were reported to be similar to this particular one (Guo et al, 1982 ; Lee,1986)

5. Cognitive functions and reading achievements:

How did the individual cognitive tasks included in the cognitive test related to the reading achievement? The results of multiple linear regresion showed that reading achievement scores were highly correlated with cognitive tasks with multiple correlation coefficient of .581. The summary table of stepwise regression between reading achievement and cognitive task is as following.

Table 5. Summary table of stepwise regression between reading achievement and cognitive tasks

Step number	Variables Entered	Removed	Multiple R	RSQ	Change in RSQ	F to Enter	Remove
1	General information		.474	.225	.225	34.27	
2	Verbal memory		.528	.280	.054	8.79	
3	Verbal-spatial representation		.566	.320	.041	7.02	

General information was the most powerful predictor of the child's reading achievement . The child's ability to remember the details of a brief story that had read to them (verbal memory) was the second task. The third task related significantly was verbal-spatial representation. Putting the three cognitive tasks together could explain 32% of the total variance of the reading achievement scores.

6. Family variables and reading achievement :

Reponses to mother's interview were analyzed primarily by means of ANOVA. The results of trend analysis and Scheffe's exact analysis test yielded 31 items which positively intercorrelated with reading achievement scores. They are listed below.

1) Father's education, 2) Mother's education, 3) The degree to which mother was satisfied with child's academic performance, 4) Mother's expectation about the future educational level the child might reach, 5) The frequency with which mother rendered help to child's problem in reading, 6) The frequency with which

mother rendered help to child's mathematic problem, 7) The frequency with which father engaged in physical exercise with the child, 8) The frequency with which the child talked with mother about the daily happening in the school, 9) The frequency with which the parents read stories to the child before the child attended school, 10) The length of time the child attended kindergarten before going to elementary school, 11) The number of Chu-yin-fu-hao which the child could read before the child attended the first grade, 12) The amount of time the child read newspaper at home, 13) Mother's estimate of the "memory ability" of the child, 14) Mother's estimate of child's ability to learn novel stuff, 15) Mother's estimate of child's abillity to express himself verbally, 16) Mother's estimate of the general intellectual ability of the child, 17) Mother's estimate of the reading ability of the child, 18) Mother's estimate of the mathematic ability of the child, 19) Mother's estimate of the ability of the child to concentrate, 20) Mother's estimate of motivation of the child to express himself, 21) Mother's estimate of child's ability to arrange his extracurricular activities properly, 22) Mother's estimate of the academic achievement of the child, and, 23) Mother's estimate of the frequency of appropriate behaviors of the child in school.

The above listed items also were found to be positively related with reading achievement scores of the first graders.

The other eight items which appeared only among the fifth graders to be positively related to success in reading were; 1) The degree with which the child liked to go to school, 2) The child had his own desk at home, 3) The child had a quiet place at home for his academic work, 4) The frequency with which child talked to mother what happened on the day, 5) The mother's own estimate of her ability in mathematics as compared with her classmates, 6) Mother's estimate that the child spended less time playing after school as compared with same agers, 7) Interviewer's general impression as to the degree which the mother understood the content of the interview, and, 8) The mother did not think that the child had problem in reading.

7. Classroom behavior and reading achievement:

Cross-cultural comparison revealed many classroom behavioral items which differed in the three cultures and were found to be able to explain partly the relative superiority in academic achievements of Japanese and Chinese children over their American counterparts. (Stevenson et al, 1987). This within-culture anylsis, however, yielded only one item which differentiated significantly the success and failure in reading. The item was the frequency with which a child volunteered to answer questions in the classroom.

Discussion

The findings that, whatever difinition one likes to use, we did have reading disabilities among children reading Chinese writing system (logographic system) and that the prevalence rates of reading failure were by no means lower than those among the children in the alphabetic writing systems which provided no

support to the argument that specific writing systems are easier to learn to read and thus preclude the incidence of reading disabilities. The fact that two replication studies carried out in other parts of Taiwan provided similar findings strongly underscore this point.

It is noteworthy that only the cognitive subtests belonging to verbal tasks such as general information, verbal memory and verbal spatial representation were significantly related to reading success or failure in Chinese. This is consonant with the recent hypothesis which claims that reading is a general mechanism of verbal processing (Vellutino, 1979). In the cross-cultural comparison "general information" was the only one common cognitive subtest found to be significantly associated with success and failure in reading of the three orthographic systems (Stevenson et al, 1985) . This finding is consistent with the point made by Perfetti that it is axiomatic that a reader understands what he reads, only in relation to what he already knows (Perfetti, 1982).

Glancing at the 31 family variables which were found to be correlated with reading success and failure in Chinese culture, one finds that only 5 of them appear to exercise some direct impact on reading achievement. The 5 items were; 1) Mother rendered help to child's problem in reading, 2) Parents frequently read to the child before he/she attended elementary school, 3) The amount of time the child read newspaper at home, 4) The number of phonetics which the child could read before entering the first grade, and 5) Mother's estimate of child's reading ability as compared with the same agers. The rest of the other 26 family variables are those which have been known to enhance development of wholesome parent-child relationship (Smilkistein, 1982), satisfactory academic achievement of which reading is only a part (Hsu, 1973), general cognitive ability of the child and the child's motivation and positive attitudes toward learning (Hetherington and Park, 1986). Cross-cultural comparison of the classroom behavior between the three cultures revealed many variables which helped elucidate why Japanese and Chinese children surpassed American children in academic achievements including reading success and failure. For instance, American children spent much less time in school; in the classroom both the teacher and children in the U.S.A. were spending less time engaging in activities appropriate for learning of subject; American children were expected to accomplish much more on their own than they were capable of; American teachers less frequently imparted information to children; they wasted more time outside of the classroom and in irrelevant and transitional behavior within the classroom; they also spent more time working alone, etc.. The only one classroom behavior which appeared to be significantly related to reading achievement among the fifth graders in Taipei was the frequency with which children volunteered to answer questions in the classroom.

In this study we did not examine children neurologically. In other study (Hsu et al, 1985) it was found that the so-called neurological soft sings appeared slightly more frequently among those with reading problems, but we also did encounter with

children whose reading achievements were excellent but did manifest soft sings.

I would like to conclude that reading of whatever writting systems appears to be a mechanism of verbal information processing. Cognitive functions related to verbal processing tasks may play more important role than the performance tasks in determining reading failure and success. Adequate cerebral and cognitive functions, however, play only a part in reading achievement. Motivation of the children, family and classroom variables which are encouraging and conducive to academic achievement appear to play important role in success or failure of children's reading which consists only a part of general academic performance of the children in school. More comparative reading studies across these different types of orthographies, with respect both to successful and failing readers, would certainly help us to unravel the tangled story of the most remarkable specific performance, i.e. reading, which civilization has developed in human history.

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