DOCUMENT RESUME

ED 294 919 TM 011 651

AUTHOR Hyde, Janet Shibley; Linn, Marcia C.
TITLE Gender Differences in Verbal Ability: A Meta-Analysis.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE Apr 88
GRANT BNS-8508666; BNS-8696128
NOTE 75p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 5-9, 1988).
PUB TYPE Information Analyses (070) -- Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Age Differences; *Cognitive Processes; Essay Tests; High Schools; Lateral Dominance; Literature Reviews; *Meta Analysis; Reading Comprehension; *Sex Differences; Speech Skills; *Verbal Ability; *Verbal Development; Verbal Tests; Vocabulary Skills
IDENTIFIERS Anagrams; Analogies; *Scholastic Aptitude Test

ABSTRACT

Analysis of 165 studies (representing the testing of 1,418,899 subjects) that reported data on gender differences in verbal ability indicated a slight female superiority in performance. The difference is so small that it appears that gender differences in verbal ability no longer exist. A major goal was also to define age trends in the pattern of gender differences. Analyses of effect sizes for different measures of verbal ability showed almost all to be small in magnitude; these measures covered vocabulary, analogies, reading comprehension, speech production, essay writing, anagrams, and general verbal ability. For the 1985 administration of the Scholastic Aptitude Test, verbal scores showed superior male performance. Analysis of tests requiring different cognitive processes involved in verbal ability gave no evidence of substantial gender differences in any aspect of processing. An analysis by age showed no striking changes in the magnitude of gender differences at different ages, countering E. E. Maccoby and C. N. Jacklin's conclusion that gender differences in verbal ability emerge at about 11 years of age. Comparison of studies published in 1973 or earlier with subsequent studies indicates a slight decline in the magnitude of the gender differences in recent years. These findings have implications for theories of sex differences in brain lateralization and changing gender roles. (Six tables are presented, and a list of 165 studies used in the meta-analysis is appended.) (Author/TJH)

Gender Differences in Verbal Ability

submitted to Psychological Bulletin, 10-9-87

Gender Differences in Verbal Ability: A Meta-Analysis

Janet Shibley Hyde

University of Wisconsin-Madison

Marcia C. Linn

University of California, Berkeley

Running head: Gender differences in verbal ability

Address correspondence to:

Janet Shibley Hyde

Department of Psychology

Brogden Psychology Bldg.

University of Wisconsin

Madison, WI 53706

Presented at AERA, 1988

Abstract

Many regard gender differences in verbal ability to be one of the well-established findings in psychology. In order to reassess this belief, we located 165 studies that reported data on gender differences in verbal ability. The weighted mean effect size (d) was +0.11, indicating a slight female superiority in performance. The difference is so small that we argue that gender differences in verbal ability no longer exist. Analyses of effect sizes for different measures of verbal ability showed almost all to be small in magnitude: for vocabulary, d = 0.02; for analogies, d = -0.16 (slight male superiority in performance); for reading comprehension, d = 0.03; for speech production, d = 0.33 (the largest effect size); for essay writing, d = 0.09; for anagrams, d = 0.22; and for tests of general verbal ability, d = 0.20. For the 1985 administration of the SAT - Verbal, d = -0.11, indicating superior male performance. Analysis of tests requiring different cognitive processes involved in verbal ability yielded no evidence of substantial gender differences in any aspect of processing. Similarly, an analysis by age indicated no striking changes in the magnitude of gender differences at different ages, countering Maccoby and Jacklin's conclusion that gender differences in verbal ability emerge around age 11. For studies published in 1973 or earlier, $d = 0.23$ and for studies published after 1973, $d = 0.10$, indicating a slight decline in the magnitude of the gender difference in recent years. The implications of these findings are discussed, including their implications for theories of sex differences in brain lateralization and their relation to changing gender roles.

Gender Differences in Verbal Ability:
A Meta-Analysis

The existence of gender differences in verbal ability has been one of the tried and true "facts" of psychology for decades. Anastasi (1958), in her classic text on differential psychology, stated that females are superior to males in verbal and linguistic functions from infancy through adulthood. Tyler (1965), in another classic text on differential psychology, reached similar conclusions. Maccoby concluded

> Through the preschool years and in the early school years, girls exceed boys in most aspects of verbal performance. They say their first word sooner, articulate more clearly and at an earlier age, use longer sentences, and are more fluent. By the beginning of school, however, there are no longer any consistent differences in vocabulary. Girls learn to read sooner, and there are more boys than girls who require special training in remedial reading programs; but by approximately the age of ten, a number of studies show that boys have caught up in their reading skills. Throughout the school years, girls do better on tests of grammar, spelling, and word fluency. (Maccoby, 1966, p. 26)

In the major contemporary review of psychological gender differences, Maccoby and Jacklin (1974) located 85 studies repor'ing an analysis of gender differences in verbal ability. They concluded that

> It is probably true that girls' verbal abilities mature somewhat more rapidly in early life, although there are a number of recent studies in which no sex difference has been found. During the period from preschool to early adolescence, the sexes are very similar in their verbal abilities. At about age 11, the sexes begin to diverge, with female superiority increasing through high school and possibly beyond. Girls score higher on tasks involving both receptive and productive language, and on "high-level" verbal tasks (analogies, comprehension of difficult written material, creative writing) as well as upon the "lower-level" measures (fluency). The magnitude of the female advantage varies, being most commonly about one-quarter of a standard deviation. (Maccoby & Jacklin, 1974, p. 351)

Denno (1982), in another review, also concluded that females were superior in verbal ability, having a slight advantage beginning in the preschool years, with the difference becoming stronger and more reliable after age 10 or 11. And, in yet another recent review, Halpern (1986) concurred that females have better verbal abilities than males.

Thus, although there is some disagreement among the reviews on details (a point to be discussed below), there is a clear consensus that there are gender differences in verbal ability favoring females. Reflecting this consensus, most textbooks in introductory psychology and developmental psychology present this finding as one of the well-established "facts" of psychology (e.g., Atkinson, Atkinson, & Hilgard, 1983, p. 90; Gleitman, 1981, p. 516; Hetherington & Parke, 1986, p. 626; Mussen, Conger, Kagan, and Huston, 1984, p. 276).

Despite the consensus on the existence of gender differences in verbal ability, the reviews disagree on some important details regarding the nature of the differences. The disagreements fall into two categories: (a) which types of verbal ability show gender differences and which do not; and (b) the developmental timing of the appearance or disappearance of the differences. For example, Anastasi argued that gender differences are found for simpler verbal tasks, whereas Maccoby and Jacklin concluded that female superiority was found in both high-level and low-level tasks. Further, Anastasi (1958) and Maccoby (1966) agreed that females were superior to males in vocabulary in the preschool years, whereas by 1974 Maccoby and Jacklin concluded that the sexes are similar in verbal ability in the preschool and elementary school years, with female superiority emerging around age 11 and increasing through high school and possibly beyond.

We contend, then, that--beyond the global statement that females have superior verbal ability to males--we know very little about the nature of the gender difference in verbal ability, either in terms of the types of abilities showing gender differences or the developmental timing of possible differences. It was the purpose of the present study to extend our knowledge of the nature of gender differences in verbal ability through a meta-analysis of existing primary research reports.

Meta-analysis and psychological gender differences

In order to understand the contributions that meta-analysis can make to clarifying the nature of psychological gender differences, it is helpful to understand the history of methods of reviewing psychological gender differences (Hyde, 1986).

The traditional reviews of psychological gender differences (e.g., Maccoby, 1966) used the method of narrative review. That is, the reviewer located as many studies of gender differences as possible, organized them in some fashion, and reported his or her conclusions in narrative form. The narrative review, however, is subject to some serious criticisms: it is nonquantitative, unsystematic, and subjective, and the task of reviewing 100 or more studies simply exceeds the information-processing capacities of the human mind (Hunter, Schmidt, and Jackson, 1982).

The Maccoby and Jacklin (1974) review represented a considerable advance over previous ones in that it amassed far more studies than had been done before, but also because it permitted the systematic use of the method of vote counting. That is, Maccoby and Jacklin provided a listing of the studies reporting analyses of gender differences in verbal ability, so that one could tally the percentage that found a significant difference favoring females, the percentage that found no significant gender difference, and the percentage that found a significant difference favoring males. For example, Maccoby and Jacklin concluded that in the elementary school years there is little evidence of a gender difference in verbal ability. Their Table 3.3 listed 47 studies of children between the ages of 6 and 10. Of these, 15 (32%) found females performing significantly better, 26 (55%) found no significant difference, and 6 (13%) found males performing better. Maccoby and Jacklin also concluded that female superiority on verbal tasks emerges around age 11. Of the 37 studies in their Table 3.3 dealing only with children 11 years of age and older, 13 (35%) found females performing significantly better, 22 (59%) found no significant difference, and 2 (5%) found males performing better.

Block (1976) provided a detailed critique of the Maccoby and Jacklin review. Block pointed out that Maccoby and Jacklin were inconsistent in the criteria they applied for deciding when a sufficiently large percentage of studies found a gender difference to allow one to conclude that there is a true gender difference.

General criticisms of the method of vote counting have also been raised (e.g., Hedges & Olkin, 1985; Hunter, Schmidt, & Jackson, 1982). Statisticians have pointed out that vote-counting can lead to false conclusions (e.g., Hunter et al., 1982). Specifically, if there is a true effect in the population, but the studies reviewed have poor statistical power (perhaps owing to small sample sizes), only a minority of the studies will find a significant effect, and the reviewer is likely to conclude that there is no effect (for a detailed numerical example of this problem, see Hyde, 1986). Thus the method of vote counting can lead to false conclusions.

Meta-analysis has been defined as the application of "quantitative methods to combining evidence from different studies" (Hedges & Olkin, 1985, p. 13). Meta-analysis began, in the 1980s, to make important contributions to the literature on psychological gender differences, although it should be noted that Maccoby and Jacklin (1974) had earlier estimated effect sizes for a few studies on verbal ability and concluded that the magnitude of the gender difference was about one-quarter standard deviation (i.e., $d = 0.25$). Hyde (1981) performed a meta-analysis on the 27 studies of the verbal ability of subjects 11 or older (corresponding to the age at which Maccoby and Jacklin concluded that the sexes began to diverge in verbal ability) in the Maccoby and Jacklin sample of studies. Her finding of a median value of $d = 0.24$ confirmed Maccoby and Jacklin's estimate, but the median value of $w^2 = .01$ led her to conclude that the magnitude of the gender difference in verbal ability is not large.

Since the time of the Hyde (1981) review, statistical methods in meta-analysis have advanced considerably. Most relevant here is the development of homogeneity statistics by Hedges and others (Hedges, 1982a,b,c: Rosenthal & Rubin, 1982a). These statistical methods allow one to determine whether a group of studies are uniform in their outcomes. Applied to the present problem, they allow one to determine whether the magnitude of the gender difference varies according to the type of verbal task ("verbal ability" having been used as a category to include everything from quality of speech in 2-year-olds, to performance on the Peabody Picture Vocabulary Test by 5-year-olds, to essay writing by high school students, to solutions of anagrams and analogies); and whether the magnitude of the gender difference varies with age. Thus meta-analyses using these techniques can answer considerably more sophisticated questions compared with earlier meta-analyses, and certainly when compared with earlier narrative reviews.

The Current Study

We performed a meta-analysis of studies reporting statistics on gender differences in verbal ability, including both the Maccoby and Jacklin sample of studies and a large sample of more recent studies. Our goal was to provide answers to the following questions: (a) What is the magnitude of gender differences in verbal ability, using the d metric? (b) Is the magnitude of gender differences in verbal ability declining? (c) Are gender differences in verbal ability uniform across various measures of verbal ability, such as vocabulary, analogies, and essay writing; or does the magnitude of the gender difference vary on these tasks, perhaps being close to zero on some and large on others? (c) Developmentally, at what ages do gender differences appear or disappear, and on what tasks? (d) Combining Hedges' (1982a,b) homogeneity analyses with cognitive-processing analyses, are there gender differences in certain aspects of verbal information processing that produce the gender differences in tested verbal abilities? Our model for the analysis of the last question is Linn and Petersen's (1985) meta-analysis and cognitive analysis of gender differences in spatial ability. Arguing from both a cognitive-processing perspective and a "strategies" perspective, they concluded that there are three distinct categories of spatial tests: spatial perception, mental rotation, and spatial visualization. Combining this categorization with the homogeneity analyses of meta-analysis, they concluded that large gender differences are found only on measures of mental rotation.

Method

The Sample of Studies

The sample of studies came from three sources: (a) the studies listed in Maccoby and Jacklin's Table 3.3 (pp. 78-83); (b) a computerized literature search of the databases PSYCHINFO (indexes Psychological Abstracts) and ERIC (indexes ERIC documents) using the key terms "verbal ability and sex differences"; and (c) inspection of 1986 issues of psychology journals that had yielded pertinent studies in the earlier searches. The result was an initial pool of 176 studies reporting at least some usable information on gender differences in verbal ability.

Glass, McGaw, and Smith (1981) discussed the problems of the sampling of studies in a meta-analysis. They contended that the sampling should be well-defined and complete. Computer searches of the kind described above are ideal in producing a well-defined set of studies. Glass et al. also cautioned against ignoring "hidden" studies such as dissertations or other unpublished reports, the quality of which may be equal to that of published studies, but which may not be published because of null findings; yet it is essential to include such studies in a meta-analysis. Dissertations were included in the present sampling because the PSYCHOINFO database includes dissertations; the sample in fact included 15 dissertations. ERIC indexes many unpublished studies, and 10 unpublished ERIC documents were included in the sample of studies.

Studies were excluded from the sample if they had any of the following characteristics: (a) The sample of subjects was not from the United States or Canada (because gender roles and patterns of gender differences vary cross-culturally, and because it was beyond the scope of the present analysis to explore issues cross-culturally, the sample was restricted to studies of subjects from these two adjacent and similar cultures); (b) the article did not report original data; or (c) the sample was clinical or was purposely selected for extremes of verbal ability. No restriction on selection of studies was made according to age, because a major goal of the present research was to define age trends in the pattern of gender differences.

Because the purpose of this research was to clarify the nature of gender differences in verbal ability in the general population, studies of various defects in verbal performance (e.g., stuttering, dyslexia) were not included. Such studies typically find a preponderance of males with the problem (e.g., Halpern, 1986) and are often used as evidence of female verbal superiority. However, they represent a different population of studies and a different set of hypotheses than the ones currently under investigation.

One other group of studies was excluded: those dealing early language learning by children in the age range 18 months to 3 years. There have been claims that girls are verbally precocious compared with boys, citing evidence that girls learn to talk earlier or produce longer utterances at earlier ages than boys do (e.g., Halpern, 1986). Again, this is a distinct set of studies representing a different set of hypotheses than the ones investigated in the present research.

In cases in which insufficient information for computation of effect sizes was provided in the original article, follow-up letters requesting further information were sent to authors at the address provided in the article or a more recent address as provided in the 1985 APA Directory.

Studies were eliminated from the final sample if, following attempts at correspondence with the author, no information was available either to permit calculation of an effect size or a significance test for gender differences. A total of 11 studies were eliminated for this reason.

The result was 165 usable studies that reported a significance test for gender differences and/or sufficient information to compute an effect size. These 165 studies represent the testing of 1,418,899 subjects.

Coding of the Studies

For each study, the following information was recorded: (a) All statistics on gender differences in the verbal ability measure(s), including means and standard deviations, *t*, *F*, and *df*; (b) the number of male and female subjects; (c) the mean age of the subjects (if the article reported no age but mentioned "undergraduates" or students in Introductory Psychology, the average age was set equal to 19); (d) the type of test (vocabulary, analogies, reading comprehension, speaking or other verbal communication, essay writing, SAT-Verbal, general verbal ability test such as the ACT-Verbal, anagrams, or other); (e) the test's reliability; (f) the kind of sample and how selective it was, using Becker and Hedges' (1984) index of sample selectivity (1 represents unselected samples such as national samples; 2 represents somewhat selective samples such as college students; 3 represents highly selective samples such as students from prestigious colleges); (g) the sex of the first author; and (h) the sex of the experimenter or tester. Studies were also coded for the cognitive processes involved in the particular test used, as explained below.

Cognitive Processing Analysis

Our cognitive processing analysis assumed that there are five basic processes that may be involved in various tests of verbal ability: (a) retrieval of the definition of a word (as occurs in most standard vocabulary tests in which the subject is given a word and must supply the definition); (b) retrieval of the name of a picture (as occurs in vocabulary tests such as the Peabody Picture Vocabulary Test, in which the subject is given a picture and must supply the name for it); (c) analysis of the relationships among words (as occurs when comparing one word with another while solving analogies); (d) selection of relevant information from extensive information (as occurs in reading comprehension tests); and (e) verbal production (as occurs in essay writing or measures of spoken language). Further, a particular task may require a combination of these processes. For example, reading comprehension requires (a), (c), and (d). Verbal analogies require (a) and (c).

Each verbal ability measure was coded for the five processes noted above. Each of the authors independently coded all studies. Disagreements occurred for 10 of the 165 studies, for an interrater agreement of 94%. Disagreements were discussed and resolved.

Statistical Analysis

The effect size computed for each study was *d*, defined as the mean for females minus the mean for males, divided by the pooled within-sex standard deviation. Thus positive values of *d* represent superior female performance and negative values represent superior male performance. Depending on the statistics available for a given study, formulas provided by Hedges and Becker (1986) and Hedges and Olkin (1985) were used for the computation of *d* and the homogeneity statistics. All values of *d* were first corrected for bias, using values tabled by Glass et al. (1981).

The analyses developed by Hedges assume independence of the values of *d* entered into them. Thus multiple measures from the same study should not be included. In cases in which an individual study reported multiple tests of gender differences--either because several ages or several measures were included--one age group and one measure were selected randomly and only that single value of *d* was included in subsequent computations.

Results

Magnitude of Gender Differences in Verbal Ability

The summary results of computations of mean effect size are shown in Table 1. The unweighted mean value of d, averaged over

----

Insert Table 1 here

----

120 available values, was small and positive, indicating that, overall, females outperformed males. When the weighted mean effect size was computed, weighting effect sizes by the number of subjects in the study (Hedges and Becker, 1986), the result was a very small negative value, indicating superior male performance. The shift from a positive to a negative value is largely due to a single study reported by Ramist and Arbeiter (1986), providing data for all persons--977,361 of them--taking the SAT in 1985. The study had a negative value of d and because of the enormous number of subjects, it overshadowed other studies in computations of weighted means and other statistics in the meta-analysis. Hence we assigned it to a separate category and deleted it in all succeeding computations. We consider the SAT-Verbal in a special section of the Discussion. With that study deleted, the weighted mean d is again small and positive (Table 1).

Overall, 29 (24%) of the 120 available values of d were negative, reflecting superior male performance, one was exactly zero, and the remainder (75%) were positive, indicating superior female performance.

Concerning statistical significance, 44 (27%) of the 165 studies found females to perform significantly better than males, 109 (66%) found no significant gender difference, and 12 (7%) found males performing significantly better than females.

Homogeneity analyses using procedures specified by Hedges and Becker (1986) indicated that the set of 119 effect sizes is significantly nonhomogeneous, $H = 2196.08$, $p < .05$, compared against a critical value of X^2 (118) = 146.57. Therefore we can conclude that the set of effect sizes is heterogeneous. We can thus seek to partition the set of studies into more homogeneous subgroups, using factors that we hypothesized would differentiate studies.

Varieties of Verbal Ability

The results of the analysis of effect sizes according to the type of verbal ability test are shown in Table 2. Note that, as

----

Insert Table 2 here

----

with the overall analysis, the magnitude of the gender difference is close to zero (and, in fact, the 95% confidence interval covers zero) for many types of tests. The only exceptions are a modest gender difference of 0.20 standard deviations favoring females on measures of general verbal ability, a difference of similar magnitude favoring females in the solution of anagrams, and a difference of approximately one-third standard deviation favoring females in measures of the quality of speech production.

Note that significant heterogeneity of effect sizes remains, particularly for the category of tests of general verbal ability, as might be expected. True homogeneity of effect sizes means that the studies behave as if they were replications of each other. Because of the large number of studies and the large numbers of subjects, the statistical tests for homogeneity are in a sense too powerful. Experience with meta-analysis suggests that we should tolerate a certain amount of heterogeneity.

Another way to assess these effect sizes is to test the significance of between-groups differences, between-groups homogeneity, $H_B = 518.56$, compared against a critical value of X^2 (df = 8) of 15.51, indicating significant between-groups heterogeneity. That is, there are significant differences in effect sizes (the magnitude of the gender difference) between the types of tests.

Cognitive Processes

The variations in effect size as a function of the cognitive processes used, according to our analysis, are shown in Table 3.

Insert Table 3 here

Note that, as with the analysis for type of test, none of the effect sizes is very large. The largest ones are quite modest values of $d = +0.19$ for tests requiring mixtures of processes (usually general verbal ability tests) and for the category

"Other," which contained, among other things, studies measuring anagram solutions. Five of seven values of d are positive, indicating superior female performance. The two negative values are for retrieval of the name of a picture (d = -0.12) and the combination of retrieval of a definition and analysis of relationships among words (d = -0.11).

The homogeneity analysis indicated significant between-groups heterogeneity, H = 461.78 compared against a critical value of X^2 (df = 6) of 12.59. This indicates significant variations in effect size (magnitude of the gender difference) among the different cognitive processes. Significant heterogeneity within categories of cognitive processes also remained, although, again, it must be remembered that the significance tests are extremely powerful. All categories were actually rather close to homogeneity except for the category "Mixture of cognitive processes" which, as might be expected, was quite heterogeneous.

Age Trends

Studies were grouped according to the average age of subjects as follows: 5 years and under, 6 to 10 years, 11 to 18 years, 19 to 25 years, and 26 and older. Those groupings were chosen a priori because of debates in the literature. The 5 and under group (preschoolers) speaks to the issue of whether there is an early advantage for girls in the development of verbal ability. The 6 to 10 age group encompasses the elementary school years. The 11 to 18 group (adolescence) addresses Maccoby and Jacklin's (1974) assertion that the sexes begin to diverge around age 11 in verbal ability, with female superiority increasing through the high school years and possibly beyond. The 19 to 25 age group represents college students and other young adults. The 26 and over group represents adults.

The effect sizes are shown in Table 4. Notice that, when

Insert Table 4 here

----

averaged over all tests, the effect sizes are small and positive for all age groups, and do not show impressive variations. Vocabulary measures yield similar results, with the exception of a negative effect size (indicating superior male performance) for the 6 to 10 age group. Reading comprehension tests show values close to zero for all age groups, with the exception of a value of +0.31 for the 5 and under age group, but this is based on a single study and therefore has little generalizability. Indeed, the very measurement of reading comprehension in 5-year-olds might be questioned.

For the vocabulary studies, all the within-groups (age groups) homogeneity statistics were nonsignificant (with the exception of the 11 to 18 age group, which was barely significant). Thus, the magnitude of gender differences on vocabulary tests was uniform within the age groups.

Selectivity of Sample

As noted above, studies were coded according to the selectivity of the sample of studies. The mean effect sizes as a function of the selectivity of the sample were: 0.05 for unselected samples (based on 74 studies); 0.13 for moderately selective samples (based on 41 studies); and -0.18 for highly selective samples (based on 4 studies). Again, the values are all small.

Year of Publication

Studies were grouped into two categories: those published in 1973 or earlier (corresponding approximately to Maccoby and Jacklin's sample of studies) and those published in 1974 or later (corresponding approximately to the sample of studies that we collected). For the pre-1973 studies, *d* = 0.23 and for the post-1973 studies, *d* = 0.10. Homogeneity analysis indicated that this between-group difference is significant, H = 93.71 compared against a critical $X^2 = 3.84$ for 1 df. Thus the gender difference is significantly smaller in more recent studies.

Author's Sex

The mean effect size was 0.08 for the 60 studies whose first author was male, and 0.15 for the 46 studies whose first author was female. This difference is statistically significant, H_B = 102.4 compared against a critical $X^2 = 3.84$ for 1 df.

Discussion

We are prepared to assert that there are no gender differences in verbal ability, at least at this time, in this culture, in the standard ways that verbal ability has been measured. We feel that we can reach this conclusion with some confidence, having surveyed 165 studies, which represent the testing of 1,418,899 subjects (excluding the Ramist and Arbeiter SAT data, 441,538 subjects) and averaged 119 values of d to obtain a weighted mean value of +0.11. A gender difference of one-tenth of a standard deviation is scarcely one that deserves continued attention in theory, research, or textbooks. Surely we have larger effects to pursue.

It is part of psychologists' creed that one can never accept the null hypothesis, yet here we do just that. We believe that meta-analysis furnishes the tools to allow more symmetrical decision-making in research. Because the technique relies on the estimation of effect size rather than hypothesis-testing, it allows us to determine that some effect sizes are so close to zero that we should conclude that there is no effect.

There nas been some debate over the interpretation of effect sizes. Cohen (1969) considers a value of d of 0.20 small, a value of 0.50 medium, and a value of 0.80 large. Thus the effect size of 0.11 that we obtained falls short even of what he considers to be small. Rosenthal and Rubin (1982c), on the other hand, have introduced the binomial effect size display (BESD) as a means of determining the practical significance of an effect size, and they argue that many effect sizes that seem to be small are actually large in terms of their practical significance. For an example, an effect size reported as a correlation, r = 0.20, when measuring the success of a treatment for cancer, translates into increasing the cure rate from 40% to 60%, something that surely has practical significance. On the other hand, using the formula $\underline{d} = 2r$, our effect size of 0.11 translates to r = 0.055, which only yields a 5% increase in "success rate" (e.g., from 47.5 to 52.5%); thus our effect size is so small that even the binomial effect size technique indicates little practical significance. Further, the question under consideration is gender differences in verbal ability, not curing cancer. While an effect size of 0.11 might have some practical significance if the topic is cancer, it has no significance for understanding the nature of differences between males and female. Such a small difference does not translate into any meaningful psychological or educational implications.

The effect size for the gender difference in verbal ability reported here can also be compared with effect sizes for gender differences reported in meta-analyses of other domains. For gender differences in spatial ability tests involving mental rotations, $\underline{d}$ = .73 (although for other measures of spatial ability the difference is smaller) (Linn & Petersen, 1985). For gender differences in mathematics performance, $\underline{d}$ = .43 (Hyde, 1981). For gender differences in aggression, including studies with subjects of all ages, d = .50 (Hyde, 1984). For social-psychological studies of aggression by adult subjects, d = .40 (Eagly & Steffen, 1986). And for gender differences in helping behavior, d = .13 (Eagly & Crowley, 1986). Thus the magnitude of the gender difference in verbal ability is clearly one of the smallest of the gender differences. One can also compare the magnitude of the effect with effect sizes that have been computed outside the domain of gender differences. For example, the average effect of psychotherapy (comparison of treated and control groups) has been computed to be d = .68 (Smith & Glass, 1977). Again, the gender difference in verbal ability seems small by comparison.

One caveat on sampling should be stated. Earlier we noted the preponderance of boys in various categories of verbal performance deficits such as dyslexia. If more boys than girls are removed from regular classrooms for placement in special classes (such as remedial reading), then test results from general classrooms may have omitted more low-scoring boys than low-scoring girls. The effect would be to reduce the effect size for the gender difference in verbal performance. It remains speculative, of course, whether this disproportionate removal of low-scoring boys occurs.

Implications for Brain Lateralization Theories

Two theories have been proposed to explain cognitive gender differences based on the notion that lateralization of function occurs somewhat differently in male and female brains. The Buffery and Gray hypothesis (1972) is that left hemisphere dominance for verbal functions is attained earlier in girls (consistent with their superior verbal ability), which in turn does not permit spatial processing to be as bilateral in girls as it is in boys. The second theory, which has somewhat better--though certainly not consistent--empirical support, is the Levy hypothesis (Levy, 1976; Levy-Agresti & Sperry, 1968). It states that females, like left-handed males, are more likely to be bilateral for verbal functions; this in turn inhibits the development of spatial processing capabilities, which the theory asserts will develop best with great lateralization of function. Levy also argued that bilateral verbal processing is advantageous. (For reviews of evidence regarding both theories, see Halpern, 1986; Sherman, 1978.)

Both theories assume male superiority in spatial ability and female superiority in verbal ability, and then seek to explain them based on differential patterns of lateralization. However, our research indicates that the belief in the superior verbal ability of females has little empirical support. Thus our research pulls out one of the two wobbly legs on which the brain lateralization theories have rested. (For a tug at the other wobbly leg, spatial ability, see Caplan, MacPherson, & Tobin, 1985.) And Hahn's (1987) extensive review of research on cerebral lateralization lead him to conclude that there was no consistent evidence of sex differences in asymmetrical organization of the brain.

The SAT Verbal Scale

Beginning in 1972, the traditional gender difference favoring females on the SAT-Verbal has been reversed. This can be seen in the data reported by Ramist and Arbeiter (1986a) for the 1985 administration of the SAT. For males, M = 437, SD = 112, and for females, M = 425, SD = 109, for an effect size d = -.1086. The test affects the lives of hundreds of thousands of people each year, so the finding is an important one and requires some consideration. Although many explanations are possible, we offer two. One possibility is that the content of the material--either vocabulary words or reading passages that measure comprehension--has become more technical in recent years; if, for example, it is material covered in physics or chemistry classes, to which females have had less exposure, then females would be at a disadvantage in performing on the test.

A second possibility has to do with sampling. The magnitude and even the direction of gender differences can be profoundly affected by the way in which the sample of males and the sample of females is drawn (Hyde, 1981). The 1985 SAT data represent the testing of 471,992 males and 505,369 females. Substantially more females took the test. Those who take the SAT are a selected sample to begin with, and it may be that the male sample (smaller in number) is somewhat more highly selected than the female, creating higher scores for males on the test even though the difference might be nonexistent or reversed if the general population were sampled. Data from ETS support this hypothesis; females taking the SAT in 1985 were disadvantaged compared with males taking the test on the following variables: parental income, father's education, and attendance at private schools, although all the differences are small (Ramist & Arbeiter, 1986). Further, there may be increasing numbers of women in the middle-adult years returning to college and taking the SAT to meet entrance requirements; having been out of school for many years, they are not practiced test-takers, a factor that would be particularly handicapping on a timed test such as the SAT.

Developmental Trends

Meta-analysis is capable of detecting age trends in the magnitude of gender differences. For example, Hyde (1984) found that gender differences in aggression were twice as large for preschoolers ($\underline{d}$ = .58) as for college students ($\underline{d}$ = .27). The present analysis, however, found little evidence of age trends in the magnitude of gender differences, either when considering the evidence from all measures of verbal ability combined, or when considering two particularly frequently studied aspects of verbal ability, vocabulary and reading comprehension (Table 4). The majority of the effect sizes are .11 or less. The largest value is -.26 for vocabulary measures with 6- to 10-year-olds, based on 9 studies. This finding of male superiority can be traced to four studies (Buswell, 1980; Corah, 1965; France, 1973; and Rebecca, 1974), all of which found moderate-to-large differences favoring males. Of those studies, 2 of the 4 were unpublished, and 3 of the 4 had rather small sample sizes (n = 36, 60, and 40). It is difficult to say whether there is sufficient evidence of this effect to warrant pursuing it with further research.

Year of Publication

For the group of studies published in 1973 and earlier, d = .23, and for the group of post-1973 studies, d = .10. Thus there has been some decline in the magnitude of the gender difference in verbal ability in more recent research. Hyde (1984) found a similar trend toward smaller gender differences in aggression in more recent studies. Linn and Petersen (1985) reported some decline in gender differences in spatial ability in recent years. And Chipman, Brush, and Wilson (1985) reported declines in gender differences in mathematics performance. Thus the present findings are consistent with trends in other areas.

Several interpretations of this recent smaller gender difference in verbal ability are possible. It is unclear whether it results from increases in male performance or declines in female performance. These two possibilities cannot be sorted out because there is not a common metric across studies. One possibil .y is that, with increased flexibility in gender roles beginning in the 1970s, boys have been permitted or encouraged to engage in more activities formerly reserved for girls, and these activities foster verbal ability. Similarly, girls have been permitted to engage in more activities formerly reserved for boys and participation in these activities has fostered spatial ability and mathematics performance.

On the other hand, it may be that the trend is simply the result of changing publication practices on the part of researchers. Maccoby and Jacklin's work may have been pivotal, because it pointed out the selective tendency not to publish studies of gender differences in which no significant effect was found. Perhaps researchers now feel encouraged to report null findings about gender differences, so that more small effect sizes are uncovered in literature searches.

This trend over time also helps to reconcile the difference between our conclusions and Maccoby and Jacklin's. They computed a few effect sizes for gender differences in verbal ability, found that the effect size was typically $\underline{d} = .25$, and concluded that the gender difference in verbal ability was "well established," but that it was smaller than the gender difference in quantitative ability or spatial ability. Hyde's (1981) more systematic analysis of those studies yielded $\underline{d} = .24$. And our current analysis of pre-1973 studies yielded $\underline{d} = .23$. Thus all these findings are highly congruent. The new information comes from the post-1973 studies, many of them based on large sample sizes, which yield $\underline{d} = .10$.

Author's Sex

Other meta-analysts have found significant fluctuations in effect sizes depending on the sex of the researchers. For example, Eagly and Carli (1981) found that male researchers obtained greater gender differences, i.e., greater persuasibility among females compared with males, than female researchers did. We found a significant difference in effect sizes for those studies whose first author was male compared with those whose first author was female, with female authors reporting a larger difference and therefore greater female superiority in performance. However, both effect sizes are close to zero (0.08 and 0.15), so the effect of author's sex cannot be considered substantial. It may be that social-psychological variables are more sensitive than ability variables are to the researcher's sex. Social psychology studies involve designing a social setting in which to measure the behavior, and it may be that male researchers design settings that are more comfortable for male subjects. Research on abilities, on the other hand, typically taps performance on standardized tests not designed by the researcher, so that the researcher's sex has little influence on the stimulus materials (although, of course, there may be sex-biased items on the test). In addition, the sex of the person actually collecting data from subjects has been demonstrated to have an effect in social-psychological research (e.g., Walters, Shurley, & Parsons, 1962), in part because the experimenter actually becomes a part of the social environment of the study.

In contrast, measures of abilities are often collected by large-scale testing, where the experimenter has little or no contact with the individual subject.

Conclusion

Our meta-analysis provides strong evidence that the magnitude of the gender difference in verbal ability is currently so small that it can effectively be considered to be zero. More detailed analysis of various types of verbal ability (e.g., vocabulary, reading comprehension, analogies) similarly yielded no evidence of a substantial gender difference. The one possible exception is measures of speech production, which favor females, $d = .33$. It should be noted that most of these studies used measures of the quality of speech. In terms of other kinds of measures, such as total talking time, males exceed females (e.g., Swacker, 1975), contrary to stereotypes.

Where do we go from here? First, we need to rewrite some textbooks. We also need to study gender differences in abilities more precisely. We need to move away from the old model of intellect that specified only three rather general cognitive abilities--verbal ability, mathematical ability, and spatial ability--toward investigating the possibility of gender differences in new, more refined, and more expansive models of intellect such as those proposed by Gardner (1983) and Sternberg (1982; 1984; Sternberg & Walter, 1982). Only then will we gain a more advanced understanding of gender differences--and gender similarities--in abilities.

In the meantime, we should keep in mind that--even with more refined studies of gender differences based on more sophisticated models of abilities--we might still conclude that gender differences in cognitive abilities are nonexistent and that other explanations must be found for the large gender differences in earning power and career advancement in our society.

References

Anastasi, A. (1958). Differential psychology (3rd ed.). New York: Macmillan.

Atkinson, R. L., Atkinson, R. C. & Hilgard, E. R. (1983). Introduction to psychology (8th ed.). New York: Harcourt, Brace, Jovanovich.

Becker, B. J. & Hedges, L. V. (1984). Meta-analysis of cognitive gender differences: A comment on an analysis by Rosenthal and Rubin. Journal of Educational Psychology, 76, 583-587.

Block, J. H. (1976). Issues, problems, and pitfalls in assessing sex differences: A critical review of The psychology of sex differences. Merrill-Palmer Quarterly, 22, 283-308.

Buffery, A. W. H. & Gray, J. A. (1972). Sex differences in the development of spatial and linguistic skills. In C. Ounsted & D. C. Taylor (Eds.), Gender differences: Their ontogeny and significance (pp. 123-157). Edinburgh: Churchill Livingstone.

Buswell, J. H. (1980). The relationships between oral language competency and reading achievement of second and third grade students. Ed.D. dissertation, University of NOrthern Colorado.

Caplan, P. J. , MacPherson, G. M., & Tobin, P. (1985). Do sex-related differences in spatial abilities exist? American Psychologist, 40, 786-799.

Chipman S. F., Brush, L. R., & Wilson, D. M. (Eds.) (1985). Women and mathematics: Balancing the equation. Hillsdale, NJ: Erlbaum.

Clark, M. J. & Grandy, J. (1984). Sex differences in the academic performance of scholastic aptitude test takers. New York: College Board Publications, Report No. 84-8.

Cohen, J. (1969). Statistical power analysis for the behavioral sciences. New York: Academic Press.

Corah, N. L. (1965). Differentiation in children and their parents. Journal of Personality, 33, 300-308.

Denno, D. (1982). Sex differences in cognition: A review and critique of the longitudinal evidence. Adolescence, 17, 779-788.

Eagly, A. H. & Carli, L. L. (1981). Sex of researchers and sex-typed communications as determinants of sex differences in influenceability: A meta-analysis of social influence studies. Psychological Bulletin, 90, 1-20.

Eagly, A. H. & Crowley, M. (1986). Gender and helping behavior: A meta-analytic review of the social psychological literature. Psychological Bulletin, 100, 283-308.

Eagly, A. H. & Steffen, V. J. (1986). Gender and aggressive behavior: A meta-analytic review of the social psychological literature. Psychological Bulletin, 100, 309-330.

France, K. (1973). Effects of "white" and of "Black" examiner voices on IQ scores of children. Developmental Psychology, 8, 144.

Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York: Basic Books.

Glass, G. V, McGaw, B. & Smith, M. L. (1981). Meta-analysis in social research. Beverly Hills: Sage.

Gleitman, H. (1981). Psychology. New York: Norton.

Hahn, W. K. (1987). Cerebral lateralization of function: From infancy through childhood. Psychological Bulletin, 101, 376-392.

Halpern, D. F. (1986). Sex differences in cognitive abilities. Hillsdale, NJ: Lawrence Erlbaum.

Hedges, L. V. (1982a). Fitting categorical models to effect sizes from a series of experiments. Journal of Educational Statistics, 7, 119-137.

Hedges, L. V. (1982b). Fitting continuous models to effect size data. Journal of Educational Statistics, 7, 245-270.

Hedges, L. V. (1982c). Estimation of effect size from a series of independent experiments. Psychological Bulletin, 92, 490-9.

Hedges, L. V. & Becker, B. J. (1986). Statistical methods in the meta-analysis of research on gender differences. In J. S. Hyde & M. C. Linn (Eds.), The psychology of gender: Advances through meta-analysis (pp. 14-50). Baltimore: Johns Hopkins University Press.

Hedges, L. V. & Olkin, I. (1985). Statistical methods for meta-analysis. New York: Academic Press.

Hetherington, E. M. & Parke, R. D. (1986). Child psychology: A contemporary viewpoint (3rd ed.). New York: McGraw-Hill.

Hunter, J. E., Schmidt, F. L. & Jackson, G. B. (1982). Meta-analysis: Cumulating research findings across studies. Beverly Hills: Sage.

Hyde, J. S. (1981). How large are cognitive gender differences? A meta-analysis using w^2 and d. American Psychologist, 36, 892-901.

Hyde, J. S. (1984). How large are gender differences in aggression? A developmental meta-analysis. Developmental Psychology, 20, 722-736.

Hyde, J. S. (1986). Introduction: Meta-analysis and the psychology of gender. In J. S. Hyde & M. C. Linn (Eds.), The psychology of gender: Advances through meta-analysis (pp. 1-13). Baltimore: Johns Hopkins University Press.

Levy, J. (1976). Cerebral lateralization and spatial ability. Behavior Genetics, 6, 171-188.

Levy-Agresti, J. & Sperry, R. W. (1968). Differential perceptual capacities in major and minor hemispheres. Proceedings of the National Academy of Science U.S.A., 61, 1151.

Linn, M. C. & Petersen, A. C. (1985). Emergence and characterization of sex differences in spatial ability: A meta-analysis. Child Development, 56, 1479-1498.

Maccoby, E. E. (1966). Sex differences in intellectual functioning. In E. E. Maccoby (Ed.), The development of sex differences. Stanford: Stanford University Press.

Maccoby, E. E. & Jacklin, C. N. (1974). The psychology of sex differences. Stanford: Stanford University Press.

Mussen, P. H., Conger, J. J., Kagan, J. & Huston, A. C. (1984). Child development and personality (6th ed.). New York: Harper & Row.

Ramist, L. & Arbeiter, S. (1986). Profiles, college-bound seniors, 1985. New York: College Entrance Examination Board.

Rebecca, M. (1974). The relationship of creativity to field-independence and field-dependence. (Developmental Program Report No. 40). University of Michigan.

Rosenthal, R. & Rubin, D. B. (1982a). Comparing effect sizes of independent studies. Psychological Bulletin, 92, 500-504.

Rosenthal, R. & Rubin D. B. (1982b). Further meta-analytic procedures for assessing cognitive gender differences. Journal of Educational Psychology, 74, 708-712.

Rosenthal, R. & Rubin D. B. (1982c). A simple, general purpose display of magnitude of experimental effect. Journal of Educational Psychology, 74, 166-169.

Sherman, J. A. (1978). Sex-related cognitive differences. Springfield, IL: Charles C Thomas.

Signorella, M. L. & Jamison, W. (1986). Masculinity, femininity, androgyny, and cognitive performance: A meta-analysis. Psychological Bulletin, 100, 207-228.

Smith, M. L. & Glass, G. V (1977). Meta-analysis of psychotherapy outcome studies. American Psychologist, 32, 752-760.

Sternberg, R. J. (1982). Reasoning, problem solving, and intelligence. In R. J. Sternberg (Ed.), Handbook of human intelligence. New York: Cambridge University Press.

Sternberg, R. J. (1984). Testing intelligence without IQ tests. Phi Delta Kappan, 65(10), 694-698.

Sternberg, R. J. & Salter, W. (1982). Conceptions of intelligence. In R. J. Sternberg (Ed.), Handbook of human intelligence. New York: Cambridge University Press.

Swacker, M. (1975). The sex of the speaker as a sociolinguistic variable. In B. Thorne & N. Henley (Eds.), Language and sex: Difference and dominance (pp. 76-83). Rowley, MA: Newbury House.

Tyler, L. E. (1965). The psychology of human differences. New York: Appleton-Century-Crofts.

Walters, C., Shurley, J. T., & Parsons, O. A. (1962). Differences in male and female responses to underwater sensory deprivation: An exploratory study. Journal of Nervous and Mental Disease, 135, 302-310.

Author Notes

This research was supported by grants BNS 8508666 and BNS 8696128 from the National Science Foundation to the first author. The opinions expressed are those of the authors and not the National Science Foundation.

We thank Eleanor Maccoby and Amy Halberstadt for comments on an earlier draft of this article.

Requests for reprints should be sent to Janet Hyde, Department of Psychology, Brogden Psychology Building, University of Wisconsin, Madison, WI 53706.

Table 1

Summary of Effect Size Statistics for All Studies

Variable	Number of Studies	d
Unweighted mean d, all studies	120	+0.14
Weighted mean d, all studies	120	-0.04
Weighted mean d, excluding national SAT data	119	+0.11

Table 2

Magnitude of Gender Differences as a Function of Type of Verbal Ability Test

Type of Test	k*	d.	95% confidence interval for d.	H*
Vocabulary	40	0.02	-0.02 to 0.06	116.88**
Analogies	5	-0.16	-0.26 to -0.06	30.34**
Reading comprehension	18	0.03	0.01 to 0.04	159.84**
Speech production	12	0.33	0.20 to 0.46	11.34
Essay writing	5	0.09	0.08 to 0.10	123.77**
SAT	4	-0.03	-0.08 to 0.03	5.69
Anagrams	5	0.22	0.10 to 0.33	5.72
General/mixed	25	0.20	0.19 to 0.21	1217.46**
Other	5	0.08	-0.04 to 0.20	6.48

Total	119	0.11	0.10 to 0.12	2196.08**

* k = the number of studies, i.e., the number of effect sizes; H is the within-groups homogeneity statistic (Hedges &Becker,1986).
**significant nonhomogeneity at $p < .05$, according to X2 test. All other categories are homogeneous.

Table 3

Magnitude of Gender Differences as a Function of Hypothesized Types of Cognitive Processes

Cognitive Process	k*	d.	95% confidence interval for d.	H*
Retrieval of definition of a word (RD)	29	0.08	0.04 to 0.13	63.46**
Retrieval of name of a picture (RN)	13	-0.12	-0.19 to 0.04	33.75**
Analysis of relationships among words (A,	0			
Selection of relevant information (S)	0			
RD + A	8	-0.11	-0.20 to -0.03	37.04**
RD + A + S	17	0.02	0.01 to 0.04	161.99**
Production (written or oral)	17	0.09	0.08 to 0.10	148.27**
Mixture of				

Table 3 (continued)

processes	28	0.19	0.18 to 0.20	1283.42**
Other	7	0.19	0.10 to 0.29	6.37

*k = the number of studies, i.e., the number of effect sizes; H is the within-groups homogeneity statistic.

**significant nonhomogeneity at $p < .05$, according to X^2 test. All other categories are homogeneous.

Table 4

Magnitude of Gender Differences (d) As a Function of Age (Number of Studies in Parentheses)

Age Group	All Tests	Vocabulary Tests	Reading Comprehension Tests
5 years and under	0.13 (24)	0.07 (9)	0.31 (1)
6 to 10	0.06 (29)	-0.26 (9)	0.09 (7)
11 to 18	0.11 (39)	0.01 (10)	0.02 (7)
19 to 25	0.06 (18)	0.23 (7)	-0.03 (3)
26 and older	0.20 (9)	0.05 (5)	NA (0)

Note: NA = not available; no studies in this category were found.

Table 5

Studies of Gender Differences in Verbal Ability, Maccoby ar i Jacklin's Sample (in same order as Maccoby & Jacklin, Table 3.3).

Study	Mean Age	N	Difference	da	Type of Testb	Cognitive Processesc	Sample Selectivityd
Moore, 1967	7	76	None	.09	1	1	1
Clarke-Stewart, 1973	2	36	Females	NA	4	NA	1
Reppucci, 1971	2	48	None	NA	1	2	1
Rhine, Hill, & Wandruff, 1967	4	50	None	-.15	1	2	1
McCarthy & Kirk, 1963	3	50	None	NA	2	5	1
Dickie, 1968	4	50	None	NA	1	2	2
Sitkei & Meyers, 1969	4	100	None	NA	1	2	1
Shipman, 1971	4	1198	None	.07	1	2	2
Williams & Fleming, 1969	4	45	None	.10	1	2	2
Brown, 1971	4	96	None	.32	3	5	1
Friedrichs et al., 1971	4	50	None	NA	9	5	2
Mehrabian, 1970	4	127	None	.44	1	1	1
Shipman, 1972	4	82	Females	NA	3	6	2
Klaus & Gray, 1968	6	88	None	NA	9	9	2
Jeruchimowicz, Costello, & Bagur, 1971	4	79	None	NA	1	2	2

Table 5 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Shure, Spivack, & Jaeger, 1971	4	62	None	.31	1	2	2
Ali & Costello, 1971	4	56	None	-.14	1	2	2
Harrison & Nadelson, 1972	4	50	None	.17	1	2	1
Osser, Wang, & Zaid, 1969	5	32	None	NA	1	2	1
Suppes & Feldman, 1971	6	64	None	NA	3	5	1
James & Miller, 1973	6	32	None	NA	9	9	1
Masters, 1969	6	72	None	.19	9	1	1
Brimer, 1969	8	606	Males	-.26	1	2	1
Winitz, 1959	5	150	None	.27	4	8	1
McCarver & Ellis, 1972	6	60	None	NA	1	2	1
Milgram, Shore, & Malasky, 1971	6	90	None	NA	4	8	1
Saltz, Soller, & Sigel, 1972	8	24	None	NA	1	5	1
Stanford Research Institute, 1972	7	3486	Females	.01	3	6	2
Cowan, Weber, Hoddinott, & Klein, 1967	8	96	None	.16	4	8	1
Routh & Tweney, 1972	10	60	None	NA	4	8	1

Table 5 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Darley & Winitz, 1961	5	150	None	.08	6	7	1
Davis & Slobodian, 1967	5	238	None	.11	9	9	1
Dykstra & Tinney, 1969	6	3283	Females	.08	3	6	1
Lesser, Fifer, & Clark, 1965	6	320	None	-.12	1	1	1
France, 1973	8	252	Males	.44	1	2	1
Graves & Koziol, 1971	7	67	None	NA	9	9	1
Penk, 1971	9	100	Females	NA	9	8	1
Gates, 1961	7	1826	Females	.27	3	6	1
Parsley, Powell, O'Connor, & Deutsch, 1963	9	717	None	.01	3	6	1
Harris & Hassemer, 1972	8	96	None	NA	4	8	1
Lipton & Overton, 1971	10	80	None	.16	8	9	1
Eska & Black, 1971	8	100	None	NA	6	7	2
Eisenberg, Berlin, Dill, & Frank, 1968	9	64	Females	.56	4	8	1
Corah, 1965	9	60	Males	-.66	1	1	2
Hoemann, 1972	11	40	None	NA	4	8	1

Table 5 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Stevenson, Hale, Klein, & Miller, 1968a	13	85	Females	.42	8	9	1
Stevenson, Klein, Hale, & Miller, 1968b	11	529	Females	.34	8	9	1
Palmer & Masling, 1969	12	48	None	NA	1	5	2
Cohen & Klein, 1968	10	80	None	.66	4	8	1
Hopkins & Bibelheimer, 1971	10	354	None	.04	6	7	1
Cotler & Palmer, 1971	11	120	Females	.36	4	8	1
Penney, 1965	11	108	None	NA	1	2	1
Preston, 1962	11	686	Females	.22	3	6	1
Stevenson & Odom, 1965	10	318	None	.06	8	9	1
Shepard, 1970	11	137	Females	.47	1	1	1
Baldwin, McFarlane, & Garvey, 1971	10	96	None	NA	4	8	2
Heider, 1971	10	143	None	NA	4	8	1
Achenbach, 1969	12	48	Females	.50	1	1	1
Cicirelli, 1967	11	641	Females	NA	6	7	1
Weinberg & Rabinowitz, 1970	15	48	None	NA	1	1	4

Table 5 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Flanagan et al., 1961	14	1545	Females	NA	3	6	2
Walberg, 1969	16	2074	Females	.32	6	7	2
Backman, 1972	17	2925	Females	1.43	6	7	2
American College Testing Program, 1976-1977	18	45222	Females	.26	6	7	2
Rosenberg & Sutton-Smith, 1966	19	600	None	NA	6	7	2
Bieri, Bradburn, & Galinsky, 1958	18	76	None	.18	7	7	3
DeFazio, 1973	19	44	None	.21	1	1	2
Feather, 1968	19	60	None	NA	8	9	2
Feather, 1969b	19	167	None	NA	8	9	2
Koen, 1966	19	72	None	NA	4	8	3
Laughlin, Brauch, & Johnson, 1969	19	528	None	-.03	9	5	2
Marks, 1968	18	760	None	NA	7	7	2
Mendelsohn & Griswold, 1966	19	223	None	.16	1	1	3
Mendelsohn & Griswold, 1967	19	181	None	.07	8	9	3
Sarason & Minard, 1962	19	96	None	NA	1	1	2
Very, 1967	19	355	Females	.26	3	6	2

Table 5 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Rosenberg & Sutton-Smith, 1964	19	377	Females	NA	6	7	2
Rosenberg & Sutton-Smith, 1969	19	1013	Females	.44	6	7	2
Sutton-Smith, Rosenberg, & Landy, 1968	19	1055	None	.08	6	7	2
Bayley & Oden, 1955	41	1102	Males	-.31	2	5	3
Blum, Fosshage, & Jarvik, 1972	64	54	None	.56	1	1	1

Note: NA = Not available.

[a]Positive values reflect superior performance by females; negative values reflect superior performance by males.

[b]Type of test: 1 = vocabulary, 2 = analogies, 3 = reading comprehension, 4 = speaking or other verbal communication, 5 = essay writing, 6 = general verbal ability (mixture of items), 7 = SAT-Verbal, 8 = anagrams, 9 = other.

[c]Cognitive processes: 1 = retrieval of definition of word, 2 = retrieval of name of picture, 3 = analysis of relationships among words, 4 = selection of relevant information, 5 = 1 and 3, 6 = 1 and 3 and 4, 7 = mixture of all processes, 8 = verbal production (spoken or written), 9 = other.

[d]Sample selectivity: 1 = general, unselected, 2 = somewhat selected, 3 = highly selected.

Table 6

Studies of Gender Differences in Verbal Ability, Recent Sample (in alphabetical order).

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Alesandrini, 1981	19	383	Males	-.32	3	6	2
Applebee, Langer, & Mullis, 1986	13	2000	Females	.57	5	8	1
Averitt, 1981	5	100	Females	.43	6	7	1
Baden, 1981	9	81	None	.14	5	8	1
Berry & Webb, 1985	58	119	None	.35	6	7	2
Bodner, McMillen, Greenbowe, & McDaniel, 1983	19	1300	None	.07	7	7	2
Bristow, 1978	10	76	None	.22	3	6	1
Brownell & Smith, 1973	4	56	Females	.58	4	8	2
Buswell, 1980	8	36	None	-.41	4	8	1
Carter, 1976	33	683	None	-.03	1	1	1
Chase, 1981	18	3839	Males	-.07	7	7	2
Clarke-Stewart, Umeh, Snow, & Pederson, 1980	2	60	Females	.54	6	7	1
Coie & Dorval, 1973	8	90	None	NA	1	1	1
Cole & LaVoie, 1985	4	78	None	-.17	1	2	1
Dawson, 1981	12	40	None	NA	1	1	1

Table 6 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Denno, 1983	15	987	Females	.14	3	6	1
Denno, Meijs, Nadishon, & Aurand, 1981	7	3013	None	.05	6	7	1
Dunn, 1977	8	144	None	.30	4	8	1
Elfman, 1978	4	121	None	.16	2	5	1
Enright, Manheim, Franklin, & Enright, 1980	6	22	None	-.29	1	2	1
Feely, 1975	15	304	Males	-.22	1	1	1
Fennema & Sherman, 1978	12	431	None	.07	6	7	1
Fiore, 1977	22	40	Females	NA	1	5	2
Fisher & Mandinach, 1985	13	132	None	-.16	1	1	1
Forte, Mandato, & Kayson, 1981	19	40	None	.33	1	1	2
Frederiksen & Evans, 1974	18	395	Females	.34	1	1	2
Gjerde, Block, & Block, 1985	11	59	None	-.23	6	7	1
Harris & Siebel, 1976	11	144	Females	.61	5	8	1
Hartle, Baratz, & Clark, 1983	40	34,298	Females	.22	6	7	2
Haslett, 1983	4	49	Females	NA	4	8	1

Table 6 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Hennessy & Merrifield, 1978	18	2985	None	.20	6	7	2
Hertzog & Carter, 1982	49	421	None	.15	1	1	1
Hogrebe, Nist, & Newman, 1985	18	23,362	Males	-.05	3	6	1
Houtz, Montgomery, Kirkpatrick, & Feldhusen, 1979	9	156	Females	NA	6	7	1
Hyde, Geiringer, & Yen, 1975	19	81	Females	.54	1	1	2
Ingersoll, 1978	9	7119	None	NA	1	1	1
Ironsmith & Whitehurst, 1978	8	64	Females	.61	9	6	1
Johnson, 1974	4	40	None	-.38	6	5	1
Jordan, 1981	14	328	Males	-.33	1	2	2
Kappy, 1980	23	37,112	Females	.04	6	7	2
Khatena, 1975	13	50	None	[illegible]	2	5	2
Klecan-Aker, 1984	14	24	None	[illegible]	4	8	1
Koffman & Lips, 1980	34	70	None	.18	6	7	2
Kuchler, 1983	21	97	None	NA	1	1	2
Linn & Pulos, 1983	14	778	None	-.07	1	1	1
Long, 1976	5	151	None	.08	6	7	1
Lunneborg & Lunneborg, 1985	17	632	None	.03	1	1	2

Table 6 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
McGee, 1982	19	454	Females	.24	1	1	1
McKeever & Van Deventer, 1977	19	151	None	NA	6	6	2
McLoyd, 1980	4	36	Females	.75	4	8	2
Mills, 1981	13	115	None	-.17	6	7	1
National Assessment of Educational Progress, 1985	13	22,693	Females	.12	3	6	1
Perney, Freund, & Barman, 1976	5	202	None	.16	9	9	1
Posluszny & Barton, 1981	10	42	None	-.03	6	7	1
Purdue University Measurement and Research Center, 1974	17	100	Females	.38	1	1	1
Pusser & McCandless, 1974	4	181	None	NA	1	2	2
Ramist & Arbeiter, 1986a	18	977,361	Males	-.11	7	7	2
Ramist & Arbeiter, 1986b	18	188,[illegible]1	Females	.09	5	8	2
Rebecca, 1974	9	40	Males	-.87	1	2	2
Riley & Denmark, 1974	9	53	None	-.22	1	1	2
Roberge & Flexer, 1981	12	450	None	.12	3	7	2

Table 6 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Rock, Hilton, Pollack, Ekstrom, & Goertz, 1985	18	25,948	None	-.02	3	6	1
Sanders & Soares, 1986	19	274	Females	.32	1	1	2
Sassenrath & Maddux, 1974	5	98	None	.10	6	7	2
Sause, 1976	5	144	Males	NA	4	8	1
Schuerger, Kepner, & Lawler, 1979	17	234	None	.22	6	7	1
Schultz, Elias, Robbins, Streeten & Blakeman, 1986	40	54	None	NA	6	6	1
Searleman, Herrmann & Coventry, 1984	18	86	None	.14	7	7	2
Sherman, 1979	14	108	None	.04	1	1	1
Signorella, 1984	19	75	None	-.07	3	6	2
Silverman & Zimmer, 1976	25	20	None	.41	4	8	2
Skanes, 1970	12	644	None	.06	6	1	1
Sobol, 1980	21	408	None	.13	1	1	1
Soriano, 1975	18	168	Females	.56	2	5	1
Stephenson, 1973	4	120	None	.19	4	8	1
Stevenson & Newman, 1986	7	136	Females	.44	3	6	1
Stoner, Panek, & Satterfield, 1982	73	50	None	.19	1	1	1

Table 6 (continued)

Study	Mean Age	N	Difference	d[a]	Type of Test[b]	Cognitive Processes[c]	Sample Selectivity[d]
Stoner & Spencer, 1983	4	108	None	-.14	1	2	2
Tseng & Rhodes, 1973	14	99	None	.25	3	6	1
Vance, Hankins, & McGee, 1979	10	60	None	NA	3	6	1
Waber, 1977	13	40	None	.44	6	7	1
Wilkie & Eisdorfer, 1977	69	64	None	-.13	1	1	1
Wolf & Gow, 1986	8	98	None	.05	3	6	1
Wormack, 1979	19	106	Females	.49	5	8	2

Note: NA = Not available.

[a]Positive values reflect superior performance by females; negative values reflect superior performance by males.

[b]Type of test: 1 = vocabulary, 2 = analogies, 3 = reading comprehension, 4 = speaking or other verbal communication, 5 = essay writing, 6 = general verbal ability (mixture of items), 7 = SAT-Verbal, 8 = anagrams, 9 = other.

[c]Cognitive processes: 1 = retrieval of definition of word, 2 = retrieval of name of picture, 3 = analysis of relationships among words, 4 = selection of relevant information, 5 = 1 and 3, 6 = 1 and 3 and 4, 7 = mixture of all processes, 8 = verbal production (spoken or written), 9 = other.

[d]Sample selectivity: 1 = general, unselected, 2 = somewhat selected, 3 = highly selected.

Appendix

Studies Used in the Meta-Analysis

Achenbach, T. M. (1969). Cue learning, associative responding, and school performance in children. Developmental Psychology, 1. 717-725.

Alesandrini, K. L. (1981). Pictorial-verbal and analytic-holistic learning strategies in science learning. Journal of Educational Psychology, 73, 358-368.

Ali, F., & Costello, J. (1971). Modification of the Peabody Picture Vocabulary Test. Developmental Psychology, 5, 86-91.

American College Testing Program. (1976-1977). College student profiles: American College Testing Program. Iowa City: ACT Publications.

Applebee, A. N., Langer, J. A., & Mullis, I. V. S. (1986). The writing report card: Writing achievement in American schools (Report No. 15-W-02). Princeton: Educational Testing Service.

Averitt, C. H. (1981). The interrelationships between several socio-cultural variables and cognitive sex differences in preschool children. Unpublished doc . al dissertation, North Carolina State University.

Backman, M. E. (1972). Patterns of mental abilities: Ethnic, socioeconomic, and sex differences. American Educational Research Journal, 9, 1-12.

Baden, M. J. P. (1981). A comparison of composition scores of third-grade children with reading skills, pre-kindergarten verbal ability, self-concept, and sex. Unpublished doctoral dissertation, University of Nebraska, Lincoln.

Baldwin, T. L., McFarlane, P. T., & Garvey, C. J. (1971). Children's communication accuracy related to race and socioeconomic status. Child Development, 42, 345-357.

Bayley, N., & Oden, M. (1955). The maintenance of intellectual ability in gifted adults. Journal of Gerontology, 10, 91-107.

Berry, D. T. R., & Webb, W. B. (1985). Sleep and cognitive functions in normal older adults. Journal of Gerontology, 40, 331-335.

Bieri, J., Bradburn, W., & Galinsky, M. (1958). Sex differences in perceptual behavior. Journal of Personality, 26, 1-12.

Blum, J. E., Fosshage, J. L., & Jarvik, L. F. (1972). Intellectual changes and sex differences in octogenarians: A twenty-year longitudinal study of aging. Developmental Psychology, 7, 178-187.

Bodner, G. M., & McMillen, T. L. B., Greenbowe, T. J., & McDaniel, E. D. (1983, August). Verbal, numerical, and perceptual skills related to chemistry achievement. Paper presented at the convention of the American Psychological Association. (ERIC document 238 349)

Brimer, M. A. (1969). Sex differences in listening comprehension. Journal of Research and Development in Education, 3, 72-79.

Bristow, P. S. (1978). The relationship of reading ability, freedom from distractibility, verbal knowledge, and ability, and sex to amount of subvocalization during reading. Unpublished doctoral dissertation, University of Georgia.

Brown, H. (1971). Children's comprehension of relativized English sentences. Child Development, 42, 1923-1936.

Brownell, W., & Smith, D. R. (1973). Communication patterns, sex, and length of verbalization in speech of four-year-old children. Speech Monographs, 40, 310-316.

Buswell, J. H. (1980). The relationships between oral language competency and reading achievement of second and third grade students. Ed.D. dissertation, University of Northern Colorado.

Carter, S. L. (1976). The structure and transmission of individual differences in patterns of cognitive ability. Unpublished doctoral dissertation, University of Minnesota.

Chase, C. I. (1981). GPA prediction procedures and normative data for freshmen. Indiana Studies in Higher Education, No. 44. Bloomington: Bureau of Evaluative Studies and Testing, Indiana University.

Cicirelli, V. G. (1967). Sibling constellation, creativity, IQ, and academic achievement. Child Development, 38, 481-490.

Clarke-Stewart, K. A. (1973). Interactions between mothers and their young children: Characteristics and consequences. Monographs of Society for Research in Child Development, 38(153).

Clarke-Stewart, K. A., Umeh, B. J., Snow, M. E., & Pederson, J. A. (1980). Development and prediction of children's sociability from 1 to 2½ years. Developmental Psychology, 16, 290-302.

Cohen, B. D., & Klein, J. F. (1968). Referent communication in school age children. Child Development, 39, 597-609.

Coie, J. D., & Dorval, B. (1973). Sex differences in the intellectual structure of social interaction skills. Developmental Psychology, 8, 261-267.

Cole, D., & LaVoie, J. C. (1985). Fantasy play and related cognitive development in 2- to 6-year-olds. Developmental Psychology, 21, 233-240.

Corah, N. L. (1965). Differentiation in children and their parents. Journal of Personality, 33, 300-308.

Cotler, S., & Palmer, R. J. (1971). Social reinforcement, individual difference factors, and the reading performance of elementary school children. Journal of Personality and Social Psychology, 18, 97-104.

Cowan, P. A., Weber, J., Hoddinott, B. A., & Klein, J. (1967). Mean length of spoken response as a function of stimulus, experimenter, and subject. Child Development, 38, 191-203.

Darley, F. L., & Winitz, H. (1961). Comparison of male and female kindergarten children on the WISC. Journal of Genetic Psychology, 99, 41-49.

Davis, O. L., & Slobodian, J. J. (1967). Teacher behavior toward boys and girls during first grade reading instruction. American Education Research Journal, 4, 261-270.

Dawson, G. D. (1981). Sex differences in dichaptic processing. Perceptual and Motor Skills, 53, 935-944.

DeFazio, V. J. (1973). Field articulation differences in language abilities. Journal of Personality and Social Psychology, 25, 351-356.

Denno, D. J. (1983, August). Neuropsychological and early maturational correlates of intelligence. Paper presented at the Annual Convention of the American Psychological Association. (ERIC document 234 920)

Denno, D., Meijs, B., Nachshon, I., & Aurand, S. (1981). Early cognitive functioning: Sex and race differences. Paper presented at the annual meeting of the American Psychological Association. (ERIC document 207 707)

Dickie, J. P. (1968). Effectiveness of structured and unstructured (traditional) methods of language training. Monographs of the Society for Research in Child Development, 33(Serial No. 124).

Dunn, J. A. (1977). The effect of creative dramatics on the oral language abilities and self-esteem of Blacks, Chicanos, and Anglos in the second and fifth grades. Unpublished doctoral dissertation, University of Colorado.

Dykstra, R., & Tinney, R. (1969). Sex differences in reading readiness--First-grade achievement and second grade achievement. Reading & Realism, 13, 623-628.

Eisenberg, L., Berlin, C. I., Dill, A., & Frank, S. (1968). Class and race effects on the intelligibility of monosyllables. Child Development, 39, 1077-1089.

Elfman, J. A. (1978). The effects of Piagetian developmental level, sex, and method of presentation on the acquisition of figurative language in young children. Unpublished doctoral dissertation, University of Georgia.

Enright, R. D., Manheim, L. A., Franklin, C. C., & Enright, W. F. (1980, April). Assessing young children's moral development: A standardized and objective scale. Paper presented at the meeting of the American Educational Research Association. (ERIC document 196 963)

Eska, B., & Black, K. N. (1971). Conceptual tempo in young grade-school children. Child Development, 42, 505-516.

Feather, N. T. (1963). Change in confidence following success or failure as a predictor of subsequent performance. Journal of Personality and Social Psychology, 9, 38-46.

Feather, N. T. (1969b). Attribution of responsibility and valence of success and failure in relation to initial confidence and task performance. Journal of Personality and Social Psychology, 13, 129-144.

Feely, T. (1975). Predicting students' use of evidence: An aspect of critical thinking. Theory and Research in Social Education, 3, 63-72.

Fennema, E. H., & Sherman, J. A. (1978). Sex-related differences in mathematics achievement and related factors: A further study. Journal for Research in Mathematics Education, __, 189-203.

Fisher, C., & Mandinach, E. (1985, March). Individual differences and acquisition of computer programming skill. Paper presented at the annual meeting of the American Educational Research Association, Chicago.

Flanagan, J. C., et al. (1961). Counselor's technical manual for interpreting test scores. (Project Talent). Palo Alto, CA. Cited in E. E. Maccoby & C. N. Jacklin (Eds.), The psychology of sex differences. Stanford: Stanford University Press, 1974.

Forte, F. L., Mandato, D., & Kayson, W. A. (1981). Effect of sex of subject on recall of gender-stereotyped magazine advertisements. Psychological Reports, 49, 619-622.

France, K. (1973). Effects of "white" and of "Black" examiner voices on IQ scores of children. Developmental Psychology, 8, 144.

Frederiksen, N., & Evans, F. R. (1974). Effects of models of creative performance on ability to formulate hypotheses. Journal of Educational Psychology, 66, 67-82.

Friedrichs, A. G. et al. (1971). Interrelations among learning and performance at the preschool level. Developmental Psychology, 4, 164-172.

Gates, A. I. (1961). Sex differences in reading ability. Elementary School Journal, 61, 431-434.

Gjerde, P. F., Block, J., & Block, J. H. (1985). Longitudinal consistency of Matching Familiar Figures Test performance from early childhood to preadolescence. Developmental Psychology, 21, 262-271.

Graves, M. F., & Koziol, S. (1971). Noun plural development in primary grade children. Child Development, 42, 1165-1173.

Harris, M. B., & Hassemer, W. G. (1972). Some factors affecting the complexity of children's sentences: The effects of modeling, age, sex, and bilingualism. Journal of Experimental Child Psychology, 13, 447-455.

Harris, M. B., & Siebel, C. E. (1976). Effects of sex, occupation, and confidence of model and sex and grade of subject on imitation of language behaviors. Developmental Psychology, 12, 89-90.

Harrison, A., & Nadelman, L. (1972). Conceptual tempo and inhibition of movement in black preschool children. Child Development, 43, 657-668.

Hartle, T., Baratz, J., & Clark, M. J. (1983). Older students and the GRE aptitude test (Research Report 83-20). Princeton: Educational Testing Service.

Haslett, B. J. (1983). Communicative functions and strategies in children's conversations. Human Communication Research, 9, 114-129.

Hautz, J. C., Montgomery, C., Kirkpatrick, L., & Feldhusen, J. F. (1979). Relationship among measures of evaluation ability (problem solving), creative thinking, and intelligence. Contemporary Educational Psychology, 4, 47-54.

Heider, E. R. (1971). Style and accuracy of verbal communications within and between social classes. Journal of Personality and Social Psychology, 18, 33-47.

Hennessy, J. J., & Merrifield, P. R. (1978). Ethnicity and sex distinctions in patterns of aptitude factor scores in a sample of urban high school seniors. American Educational Research Journal, 15, 385-389.

Hertzog, C., & Carter, L. (1982). Sex differences in the structure of intelligence: A confirmatory factor analysis. Intelligence, 6, 287-303.

Hoemann, H. W. (1972). The development of communication skills in deaf and hearing children. Child Development, 43, 990-1003.

Hogrebe, M. C., Nist, S. L., & Newman, I. (1985). Are there gender differences in reading achievement? An investigation using the high school and beyond data. Journal of Educational Psychology, 77, 716-724.

Hopkins, K. D., & Bibelheimer, M. (1971). Five-year stability of intelligence quotients from language and non-language group tests. Child Development, 42, 645-649.

Hyde, J. S., Geiringer, E. R., & Yen, W. M. (1975). On the empirical relation between spatial ability and sex differences in other aspects of cognitive performance. Multivariate Behavioral Research, 10, 289-310.

Ingersoll, G. M. (1978). A non-recursive analysis of antecedents to reading achievement. Paper presented at the annual conference of the American Educational Research Association. (ERIC document 155 594)

Ironsmith, M., & Whitehurst, G. J. (1978). The development of listener abilities in communication: How children deal with ambiguous information. Child Development, 49, 348-352.

James, S. L., & Miller, J. F. (1973). Children's awareness of semantic constraints in sentences. Child Development, 44, 69-76.

Jeruchimowicz, R., Costello, J., & Bagur, J. S. (1971). Knowledge of action and object words: A comparison of lower and middle class Negro preschoolers. Child Development, 42, 455-464.

Johnson, D. L. (1974). The influence of social class and race on language test performance and spontaneous speech of preschool children. Child Development, 45, 517-521.

Jordan, T. J. (1981). Self-concepts, motivation, and academic achievement of black adolescents. Journal of Educational Psychology, 73, 509-517.

Kappy, K. A. (1980). Differential effects of decreased testing time on the verbal and quantitative aptitude scores of males and females. Unpublished doctoral dissertation, Fordham University.

Khatena, J. (1975). Imagination imagery of children and the production of analogy. The Gifted Child Quarterly, 19, 310-315.

Klaus, R. A., & Gray, S. W. (1968). The early training project for disadvantaged children: A report after five years. Monographs of the Society for Research in Child Development, 33(Serial No. 120).

Klecan-Aker, J. S. (1984). A study of the syntactic skills of normal middle-school males and females. Language and Speech, 27, 205-215.

Koen, F. (1966). Codability of complex stimuli: Three modes of representation. Journal of Personality and Social Psychology, 3, 435-441.

Koffman, S., & Lips, H. M. (1980). Sex differences in self-esteem and performance expectancies in married couples. Social Behavior and Personality, 8, 57-63.

Kuchler, C. J. (1983). Hemispheric laterality and cognitive style. Unpublished doctoral dissertation, University of North Dakota.

Laughlin, P. R., Brauch, L. G., & Johnson, H. H. (1969). Individual versus triadic performance on a unidimensional complementary task as a function of initial ability level. Journal of Personality and Social Psychology, 12, 144-150.

Lesser, G. S., Fifer, G., & Clark, D. H. (1965). Mental abilities of children from different social-class and cultural groups. Monographs of the Society for Research in Child Development, 30(4, Serial No. 102).

Linn, M. C., & Pulos, S. (1983). Male-female differences in predicting displaced volume: Strategy use, aptitude relationships, and experience influences. Journal of Educational Psychology, 75, 86-96.

Lipton, C., & Overton, W. F. (1971). Anticipatory imagery and modified anagram solution: A developmental study. Child Development, 42, 615-623.

Long, M. L. (1976). The influence of sex, race, and type of preschool experience on scores on the McCarthy scales of children's abilities. Unpublished doctoral dissertation, University of Georgia, Athens.

Lunneborg, P. W., & Lunneborg, C. E. (1985). Nontraditional and traditional female college graduates: What separates them from the men? Journal of College Student Personnel, __, 33-36.

Marks, E. (1968). Personality factors in the performance of a perceptual recognition task under competing incentives. Journal of Personality and Social Psychology, 8, 69-74.

Masters, J. C. (1969). Word association and the functional definition of words. Developmental Psychology, 4, 517-519.

McCarthy, J. J., & Kirk, S. A. (1963). The construction, standardization, and statistical characteristics of the Illinois Test of Psycholinguistic Abilities. Urbana: University of Illinois Press.

McCarver, R. B., & Ellis, N. R. (1972). Effect of overt verbal labeling on short-term memory in culturally deprived and nondeprived children. Developmental Psychology, 6, 38-41.

McGee, M. G. (1982, August). Cognitive sex differences and their practical implications. Paper presented at the Annual Convention of the American Psychological Association. (ERIC document 229 703)

McKeever, W. F., & van Deventer, A. D. (1977). Failure to confirm a spatial ability impairment in persons with evidence of right hemisphere speech capability. Cortex, 13, 321-326.

McLoyd, V. C. (1980). Verbally expressed modes of transformation in the fantasy play of black preschool children. Child Development, 51, 1133-1139.

Mehrabian, A. (1970). Measures of vocabulary and grammatical skills for children up to age six. Developmental Psychology, 2, 439-446.

Mendelsohn, G. A., & Griswold, B. B. (1966). Assessed creative potential, vocabulary level, and sex as predictors of the use of incidental cues in verbal problem solving. Journal of Personality and Social Psychology, 4, 423-431.

Mendelsohn, G. A., & Griswold, B. B. (1967). Anxiety and repression as predictors of the use of incidental cues in problem solving. Journal of Personality and Social Psychology, 6, 353-359.

Milgram, N. A., Shore, M. F., & Malasky, C. (1971). Linguistic and thematic variables in recall of a story by disadvantaged children. Child Development, 42, 637-640.

Mills, C. J. (1981). Sex roles, personality, and intellectual abilities in adolescents. Journal of Youth and Adolescence, 10, 85-112.

Moore, T. (1967). Language and intelligence: A longitudinal study of the first eight years. Part 1. Patterns of development in boys and girls. Human Development, 10, 89-106.

National Assessment of Educational Progress. (1985). The reading report card: Progress toward excellence in our schools (Report No. 15-R-01). Princeton, NJ: Educational Testing Service.

Osser, H., Wang, M., & Zaid, F. (1969). The young child's ability to imitate and comprehend speech: A comparison of two subculture groups. Child Development, 40, 1063-1075.

Palmer, R. M., & Masling, J. (1969). Vocabulary for skin color in Negro and white children. Developmental Psychology, 1, 396-401.

Parsley, K. M., Powell, M., O'Connor, H. A., & Deutsch, M. (1963). Are there really sex differences in achievement? Journal of Educational Research, 57, 210-212.

Penk, W. (1971 [illegible] elopmental changes in idiodynamic set responses of children's word associations. Developmental Psychology, 5, 55-63.

Penney, R. K. (1965). Reactive curiosity and manifest anxiety in children. Child Development, 36, 697-702.

Perney, J., Freund, J., & Barman, A. (1976). Television viewing: Its relationship to early school achievement. Unpublished manuscript. (ERIC document 153 723)

Posluszny, R., & Barton, K. (1981). Dichaptic task performance as a function of ability pattern, sex, and hand preference. Perceptual and Motor Skills, 53, 435-438.

Preston, R. C. (1962). Reading achievement of German and American children. School and Society, 90, 350-354.

Purdue University Measurement and Research Center. (1974). Freedom to read issues. Purdue Opinion Panel Poll Report No. 100. West Lafayette, IN: Author.

Pusser, H. E., & McCandless, B. R. (1974). Socialization dimensions among inner-city five-year-olds and later school success: A follow-up. Journal of Educational Psychology, 66, 285-290.

Ramist, L., & Arbeiter, S. (1986a). Profiles, college-bound seniors, 1985. New York: College Entrance Examination Board.

Ramist, L., & Arbeiter, S. (1986b). Profiles, college-bound seniors, 1985. New York: College Entrance Examination Board.

Rebecca, M. (1974). The relationship of creativity to field-independence and field-dependence. (Developmental Program Report No. 40). University of Michigan.

Reppucci, N. D. (1971). Parental education, sex differences, and performance on cognitive tasks among two-year-old children. Developmental Psychology, 4, 248-253.

Rhine, R. J., Hill, S. J., & Wandruff, S. E. (1967). Evaluative responses of preschool children. Child Development, 38, 1035-1042.

Riley, R. T., & Denmark, F. L. (1974). Field independence and measures of intelligence: Some reconsiderations. Social Behavior and Personality, 2, 25-29.

Roberge, J. J., & Flexer, B. K. (1981). Re-examination of the covariation of field independence, intelligence, and achievement. British Journal of Educational Psychology, 51, 235-236.

Rock, D., Hilton, T., Pollack, J., Ekstrom, R., & Goertz, M. (1985, September). Psychometric analysis of the NLS and the High School and Beyond Test Batteries (NCES 85-218). Washington, DC: National Center for Education Statistics.

Rosenberg, B. G., & Sutton-Smith, B. (1964). The relationship of ordinal position and sibling sex status to cognitive abilities. Psychonomic Science, 1, 81-82.

Rosenberg, B. G., & Sutton-Smith, B. (1966). Sibling association, family size, and cognitive abilities. Journal of Genetic Psychology, 109, 271-279.

Rosenberg, B. G., & Sutton-Smith, B. (1969). Sibling age spacing effects upon cognition. Developmental Psychology, 1, 661-668.

Routh, D. K., & Tweney, R. D. (1972). Effects of paradigmatic response training on children's word associations. Journal of Experimental Child Psychology, 14, 398-407.

Saltz, E., Soller, E., & Sigel, I. E. (1972). The development of natural language concepts. Child Development, 43, 1191-1202.

Sanders, B., & Soares, M. P. (1986). Sexual maturation and spatial ability in college students. Developmental Psychology, 22, 199-203.

Sarason, I. G., & Minard, J. (1962). Test anxiety, experimental instructions and the Wechsler Adult Intelligence Scale. Journal of Educational Psychology, 53, 299-302.

Sassenrath, J. M., & Maddux, R. E. (1974). Language instruction, background, and development of disadvantaged kindergarten children. California Journal of Educational Research, 25, 61-68.

Sause, E. F. (1976). Computer content analysis of sex differences in the language of children. Journal of Psycholinguistic Research, 5, 311-324.

Schuerger, J. M., Kepner, J., & Lawler, B. (1979). Verbal-quantitative differential as indicator of temperamental differences. Multivariate Experimental Clinical Research, 4, 57-66.

Schultz, N. R., Elias, M. F., Robbins, M. A., Streeten, D. H. P., & Blakeman, N. (1986). A longitudinal comparison of hypertensives and normotensives on the Wechsler Adult Intelligence Scale: Initial findings. Journal of Gerontology, 41, 169-175.

Searleman, A., Herrmann, D. J., & Coventry, A. K. (1984). Cognitive abilities and left-handedness: An interaction between familial sinistrality and strength of handedness. Intelligence, 8, 295-304.

Shepard, W. O. (1970). Word association and definition in middle childhood. Developmental Psychology, 3, 412.

Sherman, J. (1979). Cognitive performance as a function of sex and handedness: An evaluation of the Levy hypothesis. Psychology of Women Quarterly, 3, 378-390.

Shipman, V. C. (1971). Disadvantaged children and their first school experiences. Educational Testing Service Head Start Longitudinal Study.

Shipman, V. C. (1972). Disadvantaged children and their first school experiences. Educational Testing Service Head Start Longitudinal Study, Report PR-72-18.

Shure, M. B., Spivack, G., & Jaeger, M. (1971). Problem-solving thinking and adjustment among disadvantaged preschool children. Child Development, 42, 1791-1803.

Signorella, M. L. (1984). Cognitive consequences of personal involvement in gender identity. Sex Roles, 11, 923-939.

Silverman, E., & Zimmer, C. H. (1976, January). The fluency of women's speech. Paper presented at the Conference on the Sociology of the Languages of American Women. (ERIC document 126 547)

Sitkei, E. G., & Meyers, C. E. (1969). Comparative structure of intellect in middle- and lower-class four-year-olds of two ethnic groups. Developmental Psychology, 1, 592-604.

Skanes, G. R. (1970). Ability changes in children moving from small to large isolated communities. Institute for Research in Human Abilities Research Bulletin No. 70-003. (ERIC document 157 647)

Sobol, D. R. (1980). Academic performance of community college students as a function of method of instruction, personality, and verbal ability. Unpublished doctoral dissertation, University of Michigan.

Soriano, L. V. (1975). Sex differences in analogy test performance. Unpublished doctoral dissertation, University of Minnesota.

Stanford Research Institute. (1972). Follow-through pupil tests, parent interviews, and teacher questionnaires. Cited in Maccoby, E. E., & Jacklin, C. N. (1974), The psychology of sex differences. Stanford: Stanford University Press.

Stephenson, T. R. (1973). Task persistence in early childhood education. Unpublished doctoral dissertation, Utah State University.

Stevenson, H. W., Hale, G. A., Klein, R. E., & Miller, L. K. (1968a). Interrelations and correlates in children's learning and problem solving. Monographs of the Society for Research in Child Development, 33(7, Serial

No. 123).

Stevenson, H. W., Klein, R. E., Hale, G. A., & Miller, L. K. (1968b). Solution of anagrams: A developmental study. Child Development, 39, 905-912.

Stevenson, H. W., & Newman, R. S. (1986). Long-term prediction of achievement and attitudes in mathematics and reading. Child Development, 57, 646-659.

Stevenson, H. W., & Odom, R. D. (1965). The relation of anxiety to children's performance on learning and problem-solving tasks. Child Development, 36, 1003-1012.

Stoner, S., Panek, P., & Satterfield, G. T. (1982). Age and sex differences on the Hand Test. Journal of Personality Assessment, 46, 260-264.

Stoner, S. B., & Spencer, W. B. (1983). Sex differences in expressive vocabulary of Head Start children. Perceptual and Motor Skills, 56, 1008.

Suppes, P., & Feldman, S. (1971). Young children's comprehension of logical connectives. Journal of Experimental Child Psychology, 12, 304-317.

Sutton-Smith, B., Rosenberg, B. G., & Landy, F. (1968). Father-absence effects in families of different sibling compositions. Child Development, 39, 1213-1221.

Tseng, M. S., & Rhodes, C. I. (1973). Correlates of the perception of occupational prestige. Journal of Counseling Psychology, 20, 522-527.

Vance, H. B., Hankins, N., & McGee, H. (1979). A preliminary study of black and white differences on the revised Wechsler Intelligence Scale for Children. Journal of Clinical Psychology, 35, 815-819.

Very, P. S. (1967). Differential factor structures in mathematical abilities. Genetic Psychology Monographs, 75, 169-207.

Waber, D. P. (1977). Sex differences in mental abilities, hemispheric lateralization, and rate of physical growth at adolescence. Developmental Psychology, 13, 29-38.

Walberg, H. J. (1969). Physics, femininity, and creativity. Developmental Psychology, 1, 47-54.

Weinberg, S., & Rabinowitz, J. A. (1970). A sex difference in the Wechsler IQ vocabulary scores as a predictor ı strategy in a probability-learning task performed by adolescents. Developmental Psychology, 3, 218-224.

Wilkie, F. L., & Eisdorfer, C. (1977). Sex, verbal ability, and pacing differences in serial learning. Journal of Gerontology, 32, 63-67.

Williams, T. M., & Fleming, J. W. (1969). Methodological study of the relationship between associative fluency and intelligence. Developmental Psychology, 1, 155-162.

Winitz, H. (1959). Language skills of male and female kindergarten children. Journal of Speech and Hearing Research, 2, 377-386.

Wolf, M., & Gow, D. (1986). A longitudinal investigation of gender differences in language and reading development. First Language,

Wormack, L. (1979). Cognitive predictors of articulation in writing. Perceptual and Motor Skills, 48, 1151-1156.