I

Sex Differences in Human Behavior

As the twenty-first century began, over 90% of violent criminals in U.S. prisons were men; in the period from 1951 to 1999, the ratio of male to female murderers remained stable at 10:1. On the other hand, over 90% of university professors in chemistry, physics, mathematics and engineering during the same period were men.

Among families where both parents work full time, the majority of household chores and child care is done by women. The income of the average working woman is substantially less than that of the average working man (about 70 cents for women to each dollar for men at the last count).

Most positions of political power in the United States are held by men. There has never been a woman president or vice president. Until 1981, when Sandra Day O'Connor joined the Supreme Court, no justice had been a woman; in that same year 98 of 100 U. S. senators were men. There have been some changes in these numbers. As of 2002, there were two women on the Supreme Court and 13 women senators. Despite these increases in representation, women are still far short of the slight majority they would be in these institutions if their representation reflected their numbers.

These numbers apply only to the United States. Precise statistics differ somewhat in other countries, although in most cases represen-

tation of women in positions of power is lower than in the United States. Some countries such as the United Kingdom have had female heads of government. However, even in the United Kingdom, the gap between males and females in other spheres is larger than in the United States. In academia, for instance, not only do males dominate the sciences, but, across all disciplines, only 8.5% of professors are female. In no country are violent crime, science, or political and economic power dominated by women; these arenas remain largely the provinces of men throughout the world.

What causes these sex differences in social roles, earning power, and occupational status? It would seem easy to explain the differences in terms of social factors. Parents treat girls and boys differently. So do teachers. Society in general expects and encourages different things from girls vs. boys and men vs. women. Before 1928, women in the United States were not allowed to vote. Similarly, historically, women have been less likely to be admitted to universities, even when their qualifications were equal to those of male applicants, and until 1969, many leading private colleges and universities in the United States did not admit women, no matter how well qualified they were.

To the surprise of many, it proved impossible during the 1970s and 1980s to get a sufficient number of states to ratify a constitutional amendment guaranteeing equal rights for women in the United States. When the Civil Rights Act of 1964 was passed, it included some provisions for women. These provisions were added by southern senators in an attempt to kill the legislation. They assumed that those supporting extending rights to racial groups other than whites would be so opposed to extending these rights to women that the bill would not pass. In 1984, when a woman ran as a major party candidate for vice president, samples of likely voters, both male and female, indicated they would be less likely to support a fictitious woman as a candidate than a fictitious man of equivalent accomplishment and qualifications. Since then, all major party presidential and vice-presidential candidates have been male.

On the other hand, during the past half century, there has been some legislation and some effort to abolish various inequities, and these have led to some changes in the social roles and economic and political status of women. During the same period, however, scientists studying the processes that determine masculine and feminine development in other species have concluded that biological factors,

particularly the gonadal hormones androgen and estrogen, have powerful influences on the development of brain regions that show sex differences, as well as on behaviors that show sex differences.

These scientific findings have been interpreted by several popular writers to explain differences in the roles, status, and income of men and women. Some even have proposed that these hormonal or other biological influences answer questions such as "Why Men Don't Iron" (Moir and Moir, 2000). Similarly, a generation of those seeking success in romantic relationships has been led to believe that innate differences between the sexes make it useful to view men and women as coming from different planets (Gray, 1993).

In some cases these popular writers have been joined by scientists with sound academic credentials in espousing the view that inherent differences between men and women account for their different behavior and status. For example, a psychologist from a major Canadian university, writing in *Scientific American* in 1992, and subsequently in a book, *Sex and Cognition*, stated that sex differences in cognitive abilities are large, are caused by gonadal hormones, and render expectations of equal ratios of men and women in fields like engineering, mathematics, and science unreasonable (Kimura, 1992; 1999). The jacket cover of the book depicted men and women as being as different as apples and oranges. Similarly, a neuroscientist from a leading university in the United States, also writing in the 1990s, suggested that the ability of men to exhibit maternal behaviors, in the sense of devoting time and effort to their children's welfare, may be limited by their fetal exposure to androgen (LeVay, 1993, pp. 57–61). One goal of this book will be to evaluate such suggestions by looking directly at the research on which they are based. The book will thus attempt to answer the question of whether biological factors contribute to behavioral sex differences, and, if so, whether these contributions limit the potential of males or females or explain sex differences in personality, cognitive abilities, social roles, occupational status, or income.

What Is a Sex Difference?

To discuss the causes of sex differences in human psychology or human behavior, it is necessary to know what a sex difference is. For purposes of this book, *a characteristic that shows a sex difference is one*

that differs on the average for males and females of a given species. Thus, a human characteristic is considered to show a sex difference if it differs for a group of boys or men in comparison to a group of girls or women.

The term *sexually dimorphic* is also used to describe behaviors or other characteristics that differ for males versus females, and in this book, the term *sexual dimorphism* will be used interchangeably with the term *sex difference.* Literally, the term dimorphic means "two forms." However, most behavioral sex differences are matters of degree, not kind, and, when applied to behavior, the term *sexually dimorphic* does not imply such dramatic differences. Like the term *sex difference,* it is used to describe two overlapping distributions for males and females, with average differences between the two groups.

Some authors try to distinguish between gender differences and sex differences, with gender differences being socially determined and sex differences biologically based. Given our limited knowledge of what is socially or biologically determined, I believe it is impossible to make this distinction. In addition, it is likely that many behavioral sex differences result from complex interactions among different types of influences, some generally considered biological, others social. Finally, the distinction between biological and social influences is in some senses false. All our behavior is controlled by our brain and, in this sense, is biologically based. For these reasons, the terms *sex difference* and *gender difference* as used in this book will not have different causal implications. Other authors also have cited similar reasons for not using gender to denote culturally based differences and sex to denote differences that are biologically rooted (see, for example, Breedlove, 1994; Halpern, 1987; and Maccoby, 1988) and the title of this book reflects the perspective that the two cannot be separated.

Thus, the terms *sex difference, sexual dimorphism* and *gender difference* will be used interchangeably to describe characteristics, particularly psychological characteristics, that differ on the average for males and females. This concept of a sex difference as an average difference between the sexes, rather than an absolute one, should be familiar. When we say that there is a sex difference in height, we do not mean that all men are tall and all women are short. Instead, we mean that, on average, men are taller than women. Height is a good example because it is a familiar sex difference, and when I discuss sex dif-

ferences in different behaviors or psychological characteristics, I will use height as a reference for understanding their magnitude. It bears noting, even at this early stage in the discussion, however, that most psychological sex differences appear to be smaller than the sex difference in height.

Measuring the Sexes

To study sex differences and their causes, it must first be possible to measure them reliably. Measuring sex differences in psychological characteristics is more difficult than measuring sex differences in height. Although they are often inferred from observable behavior, psychological characteristics cannot be seen directly. In addition, although everyone uses essentially the same ruler in the same way to measure a person's height, there is sometimes no general agreement on the measuring instruments and methods that are most appropriate for assessing psychological or behavioral sex differences.

Research on psychological sex differences is also difficult because, unlike most research domains, individuals have their own perspectives and opinions about sex differences, whether or not they are studying them scientifically. This contrasts with subject areas like nuclear physics or linguistics, where most people do not hold strong beliefs or opinions. Widely held or strong opinions, not necessarily based on evidence, have been called *stereotypes*. Because they can be held by scientists as well as others, they make research on sex differences more difficult than research in areas that are not prone to stereotypes.

Eleanor Maccoby and Carol Jacklin described these and other problems associated with studying sex differences in their landmark book, *The Psychology of Sex Differences* (Maccoby and Jacklin, 1974). They also attempted to separate stereotype from fact in evaluating which human behaviors or psychological characteristics show sex differences and which do not. Many of the problems they outlined persist today. Among these are: (*1*) over-reporting of significant differences or positive results; (*2*) influences of stereotypes about sex differences on the perceptions of researchers and research participants; (*3*) situational specificity of sex differences; and (*4*) disagreement in results when data are obtained in different ways.

Overreporting of positive results

This concern refers to the tendency to publish studies where a sex difference is seen, but not to publish similar studies where no sex difference emerges. The statistical decision rule used most commonly in psychological research leads to the conclusion that two groups (e.g., males and females) differ if there is less than a 5% (or 1 in 20) probability that an observed behavioral difference resulted by chance. Because of this, 5% of observed sex differences can be expected to be chance results, or spurious. Although this 5% rule is used in other areas of psychological research, it creates particular problems for characteristics, such as sex, that are easily assessed, routinely evaluated, and not always reported. Because it is more interesting to find a difference than to find no difference, the 19 failures to observe a difference between men and women go unreported, whereas the 1 in 20 finding of a difference is likely to be published. Thus, in research on sex differences it is especially important to have a number of reports suggesting the same conclusion before being confident that a sex difference in a characteristic truly exists.

Stereotypical distortions of perception

This problem refers to tendencies to see the world through the prism of personal beliefs, assumptions and experiences. For instance, one way to assess children's behavior is to interview someone close to them (e.g., their mother or teacher). However, a mother of a girl, when asked if her child is feminine or masculine, might reply that she is feminine simply because she is a girl and girls should be feminine. Similarly, a mother of a son and a daughter, when asked if her children's play styles are rough, might respond in two different contexts. She might think her daughter is rough for a girl and so respond "yes," and she might think her son is not very rough for a boy and respond, "no." However, applying the same scale to the boy and girl could reveal the play of the boy to be rougher than that of the girl. Less familiar observers are not immune to these problems of context. People in general often see what they expect to see. Teachers may report, for example, that boys in their class play rough because this is what they expect boys to do. Observers also sometimes give undue weight to the unexpected and might overemphasize one observation of a boy playing with a doll in evaluating his masculinity.

Thus, this problem of context can lead to either overreporting or underreporting of sex differences.

Situational specificity

This term refers to the possibility that sex differences in a characteristic can differ from one situation to another. In examining research on achievement motivation, Maccoby and Jacklin (1974) concluded that in certain situations, girls show more achievement motivation than boys, whereas in other situations, the achievement motivation of boys exceeds that of girls or the sexes appear equal. Teacher evaluations suggest higher achievement motivation in girls than in boys, and girls do better in school. However, a large body of data obtained using the Thematic Apperception Test (TAT) suggests a more complicated picture. The TAT is a projective measure in which subjects are asked to make up stories based on pictures of people in various situations. The stories are then coded for content such as themes of achievement motivation. Under neutral conditions, studies using the TAT suggest that girls and women have higher achievement motivation than boys and men. However, when achievement is made salient, for instance, by preceding the TAT with a competitive intellectual task, boys increase their achievement motivation, and the sex difference disappears, or reverses, with boys then showing more achievement motivation than girls.

Disagreement for data obtained in different ways

This problem refers to situations where different methodologies intended to answer the same question produce conflicting results. Maccoby and Jacklin's (1974) review of sex differences in anxiety and fearfulness provides an example. On self-report measures, girls and women indicate more anxiety and fearfulness than do boys and men. Teacher ratings of anxiety and fearfulness, however, based on behavioral observations, suggest no sex difference. Several explanations of this discrepancy could be put forward. For instance, the sexes may be equally fearful and anxious, with boys and men simply more reluctant to admit it. Alternatively, teachers may notice fear and anxiety in boys more than in girls, or girls may experience more fear and anxiety, but not show it in a way that can be seen by their teachers. A third possibility relates to definitions of anxiety and fear-

fulness; some subcategories of these psychological constructs may show sex differences while others do not. This would accord with information on anxiety disorders, some of which are more common in women (e.g., generalized anxiety disorders), whereas others are not (e.g., social phobias) (American Psychiatric Association, 2000). Regardless, the situation is such that today, as at the time that Maccoby and Jacklin were writing, the available data do not allow firm conclusions regarding sex differences for fear and anxiety in general.

Despite these kinds of problems, Maccoby and Jacklin found adequate evidence supporting sex differences in some areas, notably physical aggression, juvenile play behavior, and several specific cognitive abilities, including visuospatial ability, mathematical ability, and verbal ability. It has now been almost 30 years since publication of Maccoby and Jacklin's book. Although their conclusions regarding problems involved in studying sex differences remain largely valid, subsequent research has refined some of their conclusions regarding the nature of psychological sex differences. For instance, Maccoby and Jacklin's review suggested there were sex differences in verbal ability, spatial ability, and mathematical ability; it now appears that sex differences exist only in specific subcategories of these abilities. Also, although the review concluded that sex differences in visuospatial ability manifest only in adolescence and adulthood, more recent work indicates that this is not the case. The apparent lack of a sex difference in young children resulted from the use of different types of tasks in different age groups. Disembedding tasks were the primary measures used with children, and these tasks show small-to-negligible sex differences in all age groups (Linn and Petersen, 1985; Voyer et al., 1995). The types of tasks that show the largest sex differences—mental rotations tasks—do so as early as the ability has been measured, in children as young as 4 years of age (Linn and Petersen, 1985; Voyer et al., 1995).

Additions also could be made to Maccoby and Jacklin's list of clearly established sex differences. For instance, they did not include sexual orientation or core gender identity, perhaps because sex differences in these areas are so obvious. In addition, meta-analyses conducted more recently support the existence of sex differences in personality traits, such as nurturance/tender-mindedness (higher in women) and dominance/assertiveness (higher in men) (Feingold, 1994), and in activity level in children (higher in boys) (Eaton and Enns, 1986).

How Large Are Psychological Sex Differences?

Sex differences in core gender identity and sexual orientation

The largest psychological sex differences in human beings are those in *core gender identity* (the sense of oneself as male or female, also sometimes called simply *gender identity*) and sexual orientation (erotic attraction to and interest in sexual partners of the same versus other sex). The vast majority of people have a core gender identity consistent with their genetic sex and a sexual orientation toward the sex other than their own. However, this is not true for everyone.

In regard to core gender identity, the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-IV-TR) suggests that about 1 in 30,000 men and 1 in 100,000 women seek sex reassignment surgery (American Psychiatric Association, 2000). The number of individuals with gender identity disorder or "a strong and persistent cross-gender identification, which is the desire to be, or insistence that one is, of the other sex" would be somewhat higher, since not everyone with gender identity disorder would seek surgery (American Psychiatric Association, 2000, p. 576). Although precise figures on the prevalence of gender identity disorder are not available, some information has come from the Netherlands, where medical and psychological help are readily available for gender-related problems; there, about 1 in 20,000 men and 1 in 50,000 women appear to experience gender identity disorder (Gooren, 1990).

In regard to sexual orientation, Kinsey's data (Kinsey et al., 1948; 1953) suggest that approximately 90% of men are heterosexual, having their primary sexual interest in women, and that approximately 95% of women are heterosexual, having their primary sexual interest in men. More recent estimates for men suggest that 2% to 6% of men have had homosexual relations or contacts (Billy et al., 1993; Binson et al., 1995; Analyse des Comportements Sexuels en France, 1992; Johnson et al., 1992). Similar recent figures are not available for women. Differences in percentages from one study to another may relate to many factors, including sampling procedures, assessment techniques, definitions of homosexuality versus heterosexuality, focus on behavior versus interest, and the context in which questions are asked. For instance, a focus on behavior is likely to produce lower estimates of homosexuality than a focus on interests. Similarly, asking questions about sexual orientation in the context of ac-

quired immune deficiency syndrome (AIDS), as has been typical in more recent studies, may produce lower estimates of homosexuality than asking the same questions in other contexts.

Thus, sex differences in core gender identity and sexual orientation are dramatic. Nevertheless, there is some overlap between the sexes. A small percentage of men (perhaps .005%) resemble women in that their core gender identity is female, and a small percentage of women (perhaps .002%) resemble men in that their core gender identity is male. Also, a somewhat larger, but still relatively small, percentage of men (perhaps 2% to 6%) resemble women in their sexual orientation in that they are sexually attracted to men, and a similarly small percentage of women resemble men in their sexual orientation in that they are sexually attracted to women.

Other psychological sex differences are smaller than the rather dramatic differences in core gender identity and sexual orientation. To provide an understanding of the size of the sex differences, it is useful to compare them to one another and to the familiar sex difference in height, using an effect size statistic. The statistic "d", defined as the difference in means between two groups (in this case, males and females), divided by the pooled standard deviation or the average of the standard deviations for the two groups (a measure of within group variability), is often used for this purpose. It provides a standardized estimate of the size of sex differences in various characteristics by expressing them in standard deviation units.

Data on height provide an example of how "d" can be used. National samples studying human growth indicate that the sex difference in height at age 18 and into adulthood in the United States and the United Kingdom has a "d" value of approximately 2.0 (International Committeee on Radiological Protection, 1975; Tanner et al., 1966). This would be considered extremely large for a psychological sex difference. In general, for psychological or behavioral research, "d" values of 0.8 or greater are considered large, those of about 0.5 are considered moderate, those of about 0.2 are considered small, and those below 0.2 are considered negligible (Cohen, 1988).

Throughout this book, the effect size statistic, "d," will be used, where possible, to describe the size of sex differences. However, "d" can not be used to describe the size of sex differences in all characteristics. Notably, because its calculation is based on quantitative data, it is not typically applied to sex differences in gender identity

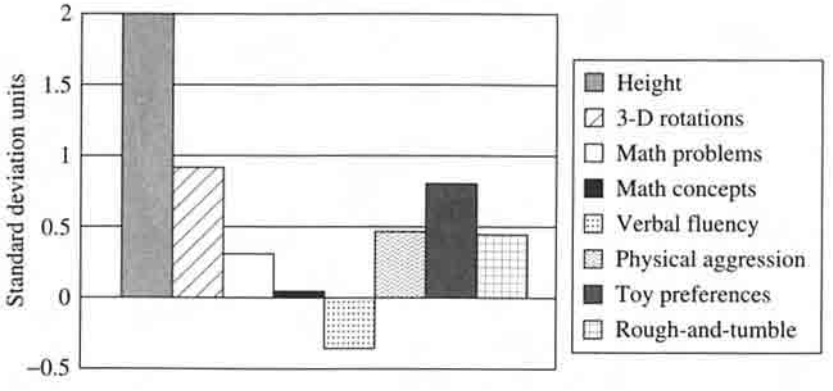


Figure 1–1. Magnitudes of some well-known sex differences in human behavior compared to the magnitude of the sex difference in height. The sex difference in height among men and women in the United States and United Kingdom is more than twice as large as the sex differences in many psychological traits, including specific cognitive abilities, physical aggression, and aspects of childhood play behavior. (For toy preferences, higher scores reflect more male-typical preferences.)

and sexual orientation because they are usually measured qualitatively, rather than quantitatively. However, in small data sets where they have been quantified, the sex difference in core gender identity appears to have a magnitude of about 11 standard deviations ($d = 11.0$) and that in sexual orientation appears to have a magnitude of about 6 standard deviation units ($d = 6.0$) (Hines et al., 2003a; Hines et al., submitted a). (Fig. 1–1 compares the sizes of some other smaller sex differences in human behavior to the sex difference in height.)

Sex differences in cognition (general intelligence and specific abilities)

Perhaps the greatest amount of information is available on sex differences in cognitive abilities. Most standardized measures of general intelligence show negligible sex differences. However, some subtests that comprise these measures show small to moderate sex differences (Jensen and Reynolds, 1983; Kaufman and Doppelt, 1976; Kaufman et al., 1988; Matarazzo et al., 1986). For instance, for the Wechsler intelligence scales, there is a small-to-moderate sex difference favoring females on the digit symbol/coding subtest, and there

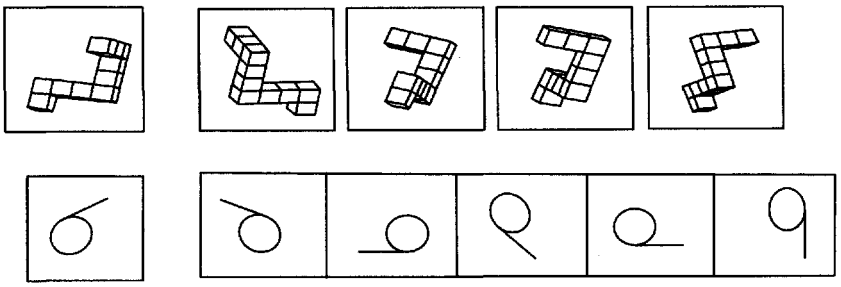


Figure 1–2. Sex differences in mental rotations performance. Meta-analyses suggest that three-dimensional tasks (top) show large sex differences (d = 0.9), and two-dimensional tasks (bottom) show smaller sex differences (d = 0.3). In both tasks, the goal is to determine which of the figures on the right are rotated versions of the single sample figure on the left (same), as opposed to mirror images or rotated mirror images (different). In the example at the top, the first and third figures are the same as the sample. In the example at the bottom, the second and fifth figures are the same as the sample. (Sample item, top, redrawn from Peters et al., 1995, © 1995, by permission of the authors and Elsevier.)

are small sex differences favoring males on the information and block design subtests.

The best known cognitive sex differences may be those on measures of visuospatial abilities. Meta-analyses, which combine the results of many studies to get stable estimates of effect sizes, suggest that sex differences in visuospatial abilities range from negligible to large, depending on the specific ability assessed. The largest sex difference favoring males is seen on measures of mental rotations, or the ability to rotate stimuli rapidly and accurately within the mind (see Fig. 1–2). Effect sizes for mental rotations performance range from small on two-dimensional tasks (0.26) to large on a three-dimensional task (0.94) (Linn and Petersen, 1985; Voyer et al., 1995). (In the text of this book, effect sizes will be calculated by subtracting the mean for women or girls from the mean for men or boys. Thus, positive values will indicate higher scores in males and negative values will indicate higher scores in females.) The sex difference in mental rotations ability is present in childhood, but may increase with age (Voyer et al., 1995). It is difficult to be certain because the same tasks typically cannot be used with both children and adults.

A second type of visuospatial task is called spatial perception (Linn and Petersen, 1985). This is exemplified by the Rod and Frame Test, which requires accurate orientation of a vertical rod

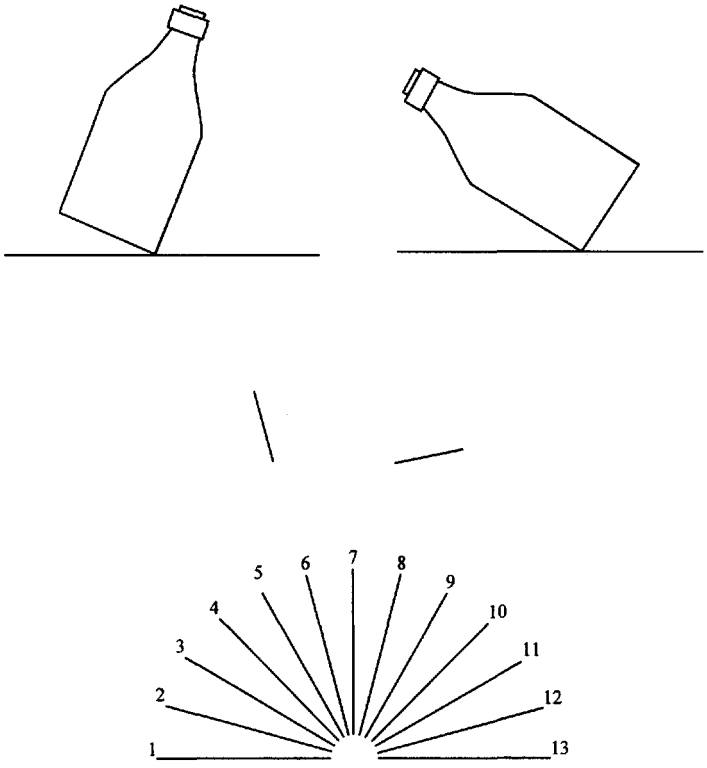


Figure 1–3. Sex differences in spatial perception. A water-level task (top) and a judgement-of-line-orientation task (bottom). Meta-analyses suggest that spatial perception tasks generally show sex differences of moderate size (d = 0.5), favoring males. On the water-level task, the participant must draw the level of the water in the tilted container. On the judgement-of-line-orientation task, the participant must indicate which lines in the array at the bottom match the orientation of the two lines shown above it. In the top example, the water level will be horizontal to the table on which the bottle perches. In the bottom example, lines 6 and 12 are correct. (Sample item at top courtesy of Lynn Liben; sample item at bottom courtesy of Marcia Collaer.)

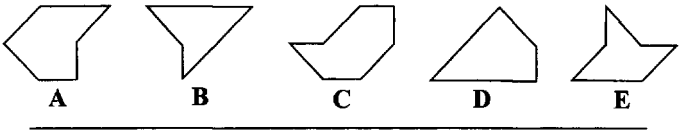
viewed within a tilted frame, by the Water Level Test in which a horizontal line must be drawn or identified within a tilted bottle, and by the Judgment of Line Orientation task in which the angles of a pair of lines must be matched to possibilities presented in a semicircular array (see Fig. 1–3). Spatial perception tasks show sex differences across the life span. Again, the sex differences appear larger in adults (d = 0.48 to 0.64) than in younger people (d = 0.33 to 0.43). In this case, although the same tests have been used in children and adults,

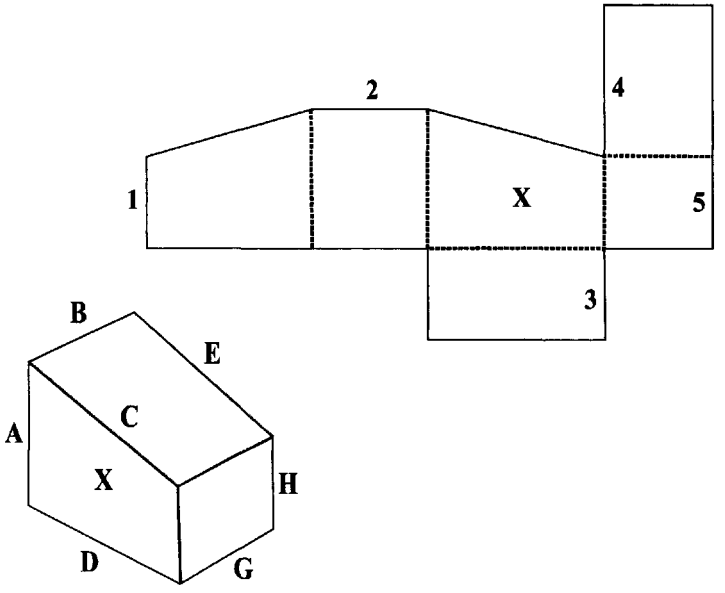
their suitability for children has been questioned. They may be too difficult at younger ages, with low scores masking sex differences (Voyer et al., 1995).

A third category of visuospatial abilities has been called spatial visualization. Tasks measuring spatial visualization involve complicated, multistep manipulations of spatial information and have multiple solution strategies (Linn and Petersen, 1985). This group of tasks is diverse and probably taps a number of separate abilities (Voyer et al., 1995). It includes measures such as Embedded Figures and Hidden Figures, which require identifying simple figures within complicated designs, the Block Design Subtest of the Wechsler scales, which requires constructing shapes from three-dimensional blocks, and the Spatial Relations Subtest of the Differential Aptitude Tests and the Surface Development Test, which require imagining what unfolded shapes would look like when folded (see Fig. 1–4). Spatial visualization tasks show negligible sex differences ($d = 0.13$ to 0.19).

A second area where sex differences have been widely discussed is mathematical ability. Like sex differences in visuospatial abilities, those in mathematical abilities vary with age and with the specific type of ability assessed. In addition, they vary with the selectivity of the population studied. Meta-analytic results (Hyde et al., 1990) indicate that the overall sex difference in mathematical ability is negligible, but in the direction of favoring females ($d = -0.05$). However, there are small sex differences favoring males on tests of problem solving, particularly in older, highly selected samples, such as college students ($d = 0.32$). Some standardized tests of mathematical ability, typically used with highly selected samples, also show sex differences favoring males. These tests include the Scholastic Aptitude Test (SAT) and the Graduate Record Exam (GRE) ($d = 0.38$ to 0.77), tests which are used in the United States to select students for admission to programs of study for bachelor's and doctoral degrees, respectively. In contrast, tests of computational skill show small sex differences favoring females, particularly in childhood ($d = -0.20$ to

Figure 1–4. Sex differences in spatial visualization: The Hidden Figures Test (top) and the Surface Development Test (bottom). Meta-analyses suggest that spatial visualization tasks generally show negligible sex differences ($d < .20$). On the Hidden Figures Test (top two rows), participants must find simple shapes (**A–E**) in a series of complicated drawings such as I and II. On the Surface Development Test (bottom), participants indicate which letters would be adjacent to which num-





bers when the shape (marked with numbers) is folded to form the box (marked with letters). In the hidden figures example, figure **A** can be found in the pattern on the left, (**I**) and figure **D** can be found in the pattern on the right (**II**). In the surface development example, **1** will meet **H**, **2** will meet **B**, **3** will meet **G**, **4** will meet **C**, and **5** will meet **H**. (Sample items redrawn from Ekstrom et al., 1976, by permission of Educational Testing Service, the copyright owner.)

–0.22), while no sex differences are apparent in computational skills in older students (d = 0.00) or in understanding of mathematical concepts in any age range (d = –0.06 to 0.07).

Much as males are thought to excel on visuospatial and mathematical tasks, females are thought to excel on verbal tasks. Again, the validity of this belief appears to vary with the type of task. Meta-analytic results (Hyde and Linn, 1988) indicate a negligible overall female advantage in verbal ability (d = –0.11), and this sex difference is roughly stable from childhood into adulthood. However, the size of the verbal sex difference ranges from a negligible male advantage (d = 0.16) for measures involving analogies to a small female advantage (d = –0.33) for measures of speech or verbal production. Other verbal abilities show essentially no sex differences (d = –0.02 for vocabulary, d = –0.03 for reading comprehension, and d = 0.03 for the verbal subtest of the SAT). In addition, however, some specific measures of verbal fluency may show larger sex differences favoring females than would be suggested by the meta-analysis. Large studies not included in the meta-analytic work found moderate sex differences (mean d = 0.53) in subjects aged 6 to 18 on a measure of verbal fluency that requires writing as many words as possible that begin with specified letters (Kolb and Whishaw, 1985; Spreen and Strauss, 1991).

Sex differences in aggression

Boys and men are more aggressive than girls and women in several contexts. This sex difference is also seen in many cultures. Findings have suggested greater aggression in males than in females, including more aggression in fantasy, more verbal insults, greater imitation of models acting aggressively, administration of what appears to the subject to be more painful stimuli to others in experimental situations where this is requested, and greater self-report of aggression on paper-and-pencil questionnaires (Maccoby and Jacklin, 1974). Meta-analytic results also support the conclusion that males are more aggressive than females, and suggest the sex difference is of moderate size (d = 0.50) (Hyde, 1984). It may be larger in young children (age 6 years or younger) than in adults (d = 0.58 vs. d = 0.27) (Hyde, 1984), but again, this could be because different measures are used for participants of different ages.

Sex differences in play

Three aspects of childhood play behavior have been studied in particular in regard to sex differences. These are toy choices, the sex of preferred play partners, and social play, particularly rough-and-tumble play. No meta-analyses are available for these behaviors.

In regard to toy choices, questionnaire and observational data indicate that the average girl and boy enjoy different toys. Girls tend to prefer toys such as dolls and doll clothes, cosmetics and dress-up items, and household toys, such as tea sets. In contrast, boys tend to prefer toys such as vehicles (e.g., cars, trucks, airplanes) and weapons (e.g., guns, swords). Data from individual studies suggest that the size of the sex difference varies with the particular types of toys and with the age of the children studied. However, sex differences in toy choices are apparent as early as 12 months of age and can be large ($d > 0.80$). (see, e.g., Alexander and Hines, 1994; Berenbaum and Hines, 1992; Snow et al., 1983).

In regard to playmate preferences, girls tend to prefer girls as playmates, and boys tend to prefer boys. This sex difference appears to be substantial, with both sexes indicating that 80% to 90% of their playmates are of the same sex as themselves (Hines and Kaufman, 1994; Maccoby, 1980).

Finally, in regard to social play, boys show stronger preferences than girls for rough-and-tumble play or playful aggression, including playful fighting, chasing, wrestling, and rough play with one another and with objects. Individual studies, involving the observation of children at play, suggest these sex differences are moderate in size (DiPietro, 1981; Hines and Kaufman, 1994; Maccoby, 1988). Perhaps related to this preference for rough-and-tumble play, boys are also more physically active than girls (Eaton and Enns, 1986). This sex difference is seen when parents and teachers report on activity level, as well as in studies using motion recorders, which can measure limb movements across a period of days.

Sex differences in handedness and language lateralization

Most people, male and female, are right-handed. However, men are more likely than women to be left-handed, and they appear to be less strongly right-handed on inventories assessing the degree of hand

preference across a range of skilled manual tasks (Hines and Gorski, 1985; Seddon and McManus, 1991). Language lateralization, or the specialization of the two hemispheres of the cerebral cortex for language and speech, also appears to show a sex difference. As for handedness, most people, regardless of gender, show a similar pattern of language lateralization—left hemisphere dominance. In both men and women, damage to the left hemisphere, or disruption of its activity, is more likely to impair speech or language than similar damage or disruption of the right hemisphere. However, the impairment appears to be less severe in women, presumably because of less dramatic lateralization of language to this single hemisphere (McGlone, 1980). In the normally functioning brain, language lateralization can be assessed by introducing stimuli preferentially to one hemisphere or the other. These approaches also suggest that most people rely primarily on their left hemisphere for language-related tasks. Within this overall left hemisphere bias, however, there is a tendency for women to show less dramatic lateralization of language function (Hines and Gorski, 1985). The possibility that these sex differences in neural asymmetry relate to hormones has received a great deal of attention, in part because they show sex differences, but perhaps even more because of an influential theory proposing links between testosterone, neural asymmetry, immune function, and a variety of disorders, including migraine, myopia, and developmental delay (Geschwind and Galaburda, 1987). With additional research, however, it has become clear that the sex differences in both hand preferences and language lateralization are small to negligible (Bryden, 1988; Seddon and McManus, 1991; Smith and Hines, 2000; Voyer, 1996).

Better or Worse?

Certain characteristics, like high visuospatial or verbal ability or low aggression may seem more desirable than others. However, it is not clear that, on balance, either the typical male pattern of behavior or that of the typical female is preferable. In addition, as will be discussed in subsequent chapters, few, if any, individuals correspond to the modal male pattern or the modal female pattern. Variation within each sex is great, with both males and females near the top and bottom of the distributions for every characteristic. Even for sex-

ual orientation, which shows a particularly dramatic separation of the sexes, there are some men who are exclusively interested in men as sexual partners and show this preference for males as strongly as does any woman. Similarly, there are women whose preference is exclusively for other women. The situation for other sex-linked characteristics is similar. There are women with visuospatial ability in the highest ranges and men with verbal skills to match. In fact, although most of us appear to be either clearly male or clearly female, we are each complex mosaics of male and female characteristics. In addition, some people are born with an intersex appearance, that is, with external genitalia that are not clearly those of a typical female or those of a typical male. The next chapters will provide the background for understanding how these intersex conditions come about and how each of us—even those who appear unambiguously male or female physically—might come to be complicated psychological mixtures of male and female characteristics.

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