

The SAGE Encyclopedia of Lifespan Human Development

Sex Differences

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Sex differences refer to average differences between males and females. Sex differences so defined are compatible with within-sex variations, meaning that individual male and female scores can overlap. The finding of a sex difference per se is descriptive and does not inform about its cause. The term “gender” (often defined as the socially constructed aspects of being male or female) has been contrasted with “sex” (the biological aspects of being male or female). However, multiple influences interact, and it is often difficult to disentangle the various influences that make males and females different, so there is no clear-cut boundary between “sex” and “gender” differences. The terms are thus sometimes used interchangeably, although “sex differences” are more often associated with sexuality and clearly biological phenomena, whereas “gender differences” are more often associated with identity, roles and stereotypes. This entry first explains key concepts in understanding psychological (as opposed to physiological) sex differences. It then reviews empirical studies of sex differences, and finally overviews the major theories of sex differences.

Key Concepts

Analyses of sex differences often focus on differences in the average scores of males and females. In scientific studies, whether a sex difference should be judged as present (statistically significant) or absent is usually indicated by the p -value, which indicates how likely the difference found is due to chance. The magnitude of a sex difference is called the effect size, most commonly indicated by Cohen’s d . A somewhat arbitrary but common rule of thumb to interpret d is that 0.2 = small, 0.5 = moderate, and 0.8 = large.

Besides the “averages”, another approach to understand sex differences is to look at differences in the patterns of score distribution (e.g., percent of males vs. females scoring above 95th percentile). Different conclusions about sex differences may be reached depending on the choice of analysis. For example, when average scores of mathematical ability show little sex difference, there still tends to be an over-representation of males in the upper end of the distribution.

Findings from individual studies do not always converge on the presence/absence and magnitude of sex differences. Since the 1980s, meta-analyses (quantitative studies combining many individual studies addressing the same question) have been conducted to help find more reliable and general patterns across studies. Additionally, meta-analyses have

shown that sex differences are moderated by factors such as the age of the participants, method of testing, period of publication, and the testing situation.

Empirical Findings on Sex Differences

Sex differences are found throughout the lifespan. A qualitative review by Eleanor Maccoby and Carol Jacklin in 1974 concluded that some psychological sex differences are smaller than once thought whereas some are large and consistent with common perceptions. Meta-analyses generally converge on these conclusions. Phenomena that show the largest sex differences include certain aspects of sexuality (e.g., sexual orientation, attitudes about casual sex) and gender identity (the idea of oneself being male or female). Behaviors that show large to moderate sex differences include occupational preferences, physical aggression, specific aspects of spatial-visual abilities (e.g., mental rotation—the ability to mentally visualize how objects look when rotated; targeting accuracy), and specific aspects of language ability (e.g., reading). Childhood play behavior (e.g., toy and activity preferences, preference for gender of peers, rough and tumble play) has not been meta-analyzed but nevertheless show one of the largest behavioral sex differences.

By contrast, some sex differences are small and less consistently found. These include general mathematics ability, verbal ability, some aspects of spatial-visual abilities (e.g., the ability to mentally visualize objects other than mental rotation), and certain aspects of personality (e.g., conscientiousness, self-esteem, moral reasoning).

Effects of Age and Method on Sex Differences

Particularly pertinent to the lifespan developmental perspective is the finding that sex differences change with age, with some becoming larger and some becoming smaller as people grow older. For example, the sex difference in mathematical ability appears to grow larger and become apparent in high school (although the sex difference has been declining over the years). In the first years of life, girls tend to have better vocabulary than boys, but this sex difference disappears by preschool age. The male advantage in mental rotation ability is not consistently found in children below 7 years of age, but becomes one of the most robust visual-spatial sex differences in adolescence and adulthood. Likewise, the sex difference in smiling is absent in children, but in adults women smile more. Due to young children's limited cognitive and behavioral capacities, the methodology used to assess the same phenomenon sometimes differs systematically across age groups. It is therefore possible that some age differences are due to differences in methodology. For example, although some paper-and-pencil tests found no sex difference in mental rotation in older children, a male advantage has been uncovered in preschoolers and even infants using simplified and untimed tests.

Effects of Situation and Culture on Sex Differences

Sex differences can also be moderated by the test situation. For instance, although men are often found to be more aggressive, this sex difference becomes smaller when the participants think that they are not being observed. Similarly, men are more helpful when the situation involves danger and if they think that they are being observed; women smile more than men, but this sex difference is reduced if participants think that no one is watching. Sex differences in children are also affected by the situation. For example, children's play preferences become more sex-typed when playing in same-sex groups as opposed to when playing alone or in mixed-sex groups. Culture also moderates sex differences, although the moderation is more often on their magnitudes than their directions.

Similarity versus Differences between the Sexes

The complication in findings on sex differences means that the findings are open to interpretation. In a review of meta-analyses of sex differences, Janet Hyde concluded that most psychological gender differences are negligible to small ($d < 0.35$), a few are moderate ($0.36 < d < 0.65$), and very few are large ($d = 0.66-1.00$) or very large ($d > 1.00$). These findings are taken to support the "gender similarity hypothesis", which stresses that males and females are more similar than different. Some researchers hold different views. For example, Richard Lippa advanced the "gender reality hypothesis", which concludes that many psychological gender differences are negligible to small, some are moderate, and some are large. Controversy also exists concerning whether statistically small sex differences always have small practical significance, and whether statistically large sex differences always have great practical significance.

Recent Trends in Research on Sex Differences

Some sex differences, such as those in reading and play preferences, are known to be present as early as preschool age. Since the 2000s, an increasing number of studies has explored sex differences at even earlier points in life in search for their developmental origins. These studies found that some sex differences emerge surprisingly early. One notable example is that of a male advantage in mental rotation at 3 and 5 months of age. Other studies, however, found that some sex differences that are obvious at older ages are not present in infants. For example, boys and girls do not differ in their preferences for the colors pink and blue until about 2 years of age. An early age of emergence and stability across ages are often taken to infer biological causes, although researchers also acknowledge that learning can occur in infancy.

Major Theories of Sex Development

The socialization perspective explains sex differences as the result of imitating same-sex models and being reinforced for gender-typical behavior and punished for gender-atypical behavior. Traditionally, parents have been thought of as the primary socialization agents, but others such as peers are also important.

Cognitive theories focus on the active role of children in internalizing gender-typed behavior. For example, from infancy through the preschool years, children develop gender constancy (the ability to label gender and understand the invariance of gender) and become more or less gender-typed as a result of this knowledge. Children also gradually learn gender stereotypes and incorporate them into their gender schema, which guide them to think and behave in gender-typical ways.

Studies taking the biological perspective have shown that sex hormones, particularly testosterone before birth, contribute to differences between and within sex. Evidence points to potentially significant effects of early postnatal and pubertal hormones. There also are genetic effects on sex development, although they are sometimes overridden by hormonal effects. A more distal biological evolutionary account explains sex differences as the result of gender role division, sexual selection, and adaptation to the environment. Numerous sex differences in brain structure and function have been reported. However, the explanatory power of the brain for sex differences is limited because brain differences partly reflect differences in experience.

All theories of sex differences have received some support, although the extent depends on the behavior in question, methodology and sample. Sex differences can appear without requiring gender socialization and cognition. For instance, many animals show sex-typed behavior even though there is no evidence that they have experienced socialization pressure to do so. Additionally, children's play preferences are sex-typed before they understand gender concepts well. However, gender socialization and cognition are powerful modifiers of pre-existing tendencies. For example, merely changing the gender label can enlarge or reduce sex differences in children's interests in toys. The dichotomous view of nature *versus* nurture is outdated. Instead, sex differences are now seen as the product of a complex interplay of multiple factors.

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See also Gender; Gender Development; Gender Identity Development; Gender Socialization; Sexual Development; Testosterone

Further Readings

- Blakemore, J. E., Berenbaum, S. A., & Liben, L. S. (2009). *Gender Development*. New York: Psychology Press.
- Hines, M. (2011). Gender development and the human brain. *Annual Review of Neuroscience*, 34, 69-88.
- Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, 60, 581–592.
- Lippa, R. A. (2005). *Gender, nature, and nurture* (2nd ed.). Mahwah, NJ: Erlbaum.
- Miller, D. I., & Halpern, D. F. (2014). The new science of cognitive sex differences. *Trends in Cognitive Sciences*, 18, 37-45.