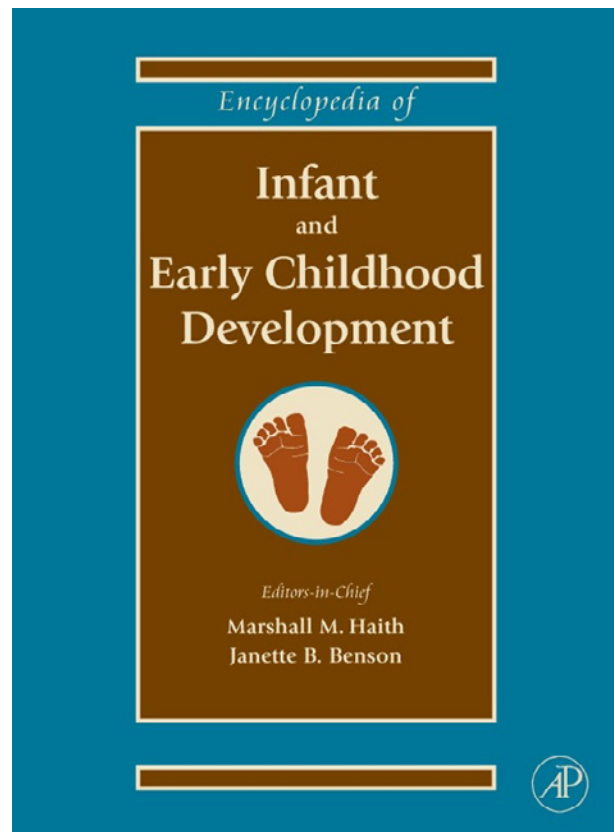


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Birth Order

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Glossary

Between-family research – Involves the comparison of individuals from different families. Therefore, when birth orders are compared, the large genetic differences between families are not controlled and add much extraneous variance.

Big five personality traits – Factor analyses of comprehensive personality questionnaires typically yield five super-factors. They are named extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. This simple taxonomy of personality has proved useful in describing birth-order effects.

Birth order – The numerical sequence of a child's arrival into a family. Environmental theories focus on the functional order (actual rearing order) whereas biological theories include all births.

Intellectual achievement – This term subsumes scholastic performance (e.g., GPA, number of years of attained education) and performance on scholastic-related tests (e.g., standardized intelligence tests, SATs).

Self-fulfilling prophecy – The dynamic process whereby an expectation about birth order difference becomes a reality.

Social development – In this article, the term social development is simplified to refer to age changes in personality and political attitudes.

Teaching effect – The long-term intellectual advantage conferred by the opportunity to help one's younger siblings.

Within-family research – Within-family research involves data collected on at least one sibling as well as the target individual. In many studies, one family member reports on the whole set of siblings including himself or herself. It does not seem to matter which family member does the reporting because family members tend to corroborate each other's judgments.

Introduction

The notion that birth order has an influence on child development has undergone several cycles of popularity and disrepute. This uneven history applies to

birth-order effects on social development as well as intellectual development, although the two literatures have unfolded quite independently. In this article, a brief history of this cycling of popularity in each of these literatures is provided followed by elaboration on the major theories and research.

Most discussions of the topic focus on differences between firstborn and laterborn children. This simplification results in part from a reluctance on the part of researchers to differentiate among birth orders with small frequencies. While there are sufficient numbers of first- and secondborns in most samples, the frequencies are small for thirdborns and higher. Hence all laterborns are lumped together for analysis purposes. This article will follow suit in focusing almost entirely on the firstborn vs. laterborn differences – with the exception of some notable findings regarding middle-borns and lastborns.

A Brief History

Social Development

Alfred Adler, the second born of six children, was weak, sickly, and continually tormented by his older brother. In early childhood, Alfred envied his brother and felt that they were always in competition. But he worked hard to overcome his handicaps and became a popular member of the community. His success was such that his older brother grew to resent him.

Undoubtedly, these family dynamics played a role in Adler's seminal writings about the psychology of birth order. His ideas, published largely in the 1920s, anticipated many of the later perspectives on the subject. He suggested, for example, that firstborns are typically given more family responsibilities than laterborns and are expected to set an example. Consequently, they often become authoritarian and construe power as their natural right. This attitude can eventuate in an insecurity around the possibility of being 'de-throned' by laterborns.

Adler went further to write that achievement expectations are high for firstborns and they attempt to live up to them. Laterborns, in contrast, try to compensate for their inferiority in size and power by turning to alternative notions of achievement. For example, the laterborns might turn to more social or creative endeavors. Thus Adler's writings addressed both of the two primary domains, intellectual and personality development.

It was not until the 1960s that mainstream researchers raised the legitimacy of studying birth-order effects in personality development. Stanley Schachter, for example, conducted a series of archival and laboratory studies of birth-order differences. Other prominent psychologists (e.g., Robert Sears, Phillip Zimbardo, Edward Ziegler, and Mary Rothbart) all added to the body of research on birth order as well as its credibility. During this period, sociologists and economists also contributed both theory and data to the birth-order literature.

Although popular right up to the 1970s, the credibility of birth-order effects on personality faltered badly in 1983 with the publication of a comprehensive review by Ernst and Angst. The scope of their review was impressive: virtually every published study was included. After adding a variety of controls, including gender and family size, the authors concluded that associations between birth order and personality traits were minimal.

The reputation of birth-order effects remained in quiet disrepute until the 1996 publication of Frank Sulloway's book, *Born to Rebel*. In applying a bold new theoretical perspective, Sulloway revitalized the view that personality and social attitudes differ systematically across birth order.

Sulloway's treatment was persuasive, in part, because he offered two complementary forms of evidence. One was a catalog of captivating stories about the family life of historical figures. The second form of evidence was a meta-analysis of the large number of studies on personality and birth order. To great advantage, he organized the studies within the influential 'Big Five' or Five Factor Model of personality. That model is now generally accepted as the best organizational system (taxonomy) of personality traits.

Using that organizational system, Sulloway's meta-analysis of the apparently chaotic literature exposed a clear pattern. In particular, firstborns were more conscientious and socially conservative but less agreeable and open to experience than laterborns. These claims form the hub of debates that continue to swirl around birth-order effects on social development. Follow-up studies from other quarters have varied from highly supportive to highly critical of Sulloway's claims.

Intellectual Development

Scholarly interest in the relation between birth order and achievement can be traced to 1874 when Francis Galton published *English Men of Science: Their Nature and Nurture*. The book chronicled the lives of 180 eminent men from various scientific fields. Galton found that 48% of them were eldest sons, far higher than would be expected by chance. Anticipating later arguments, Galton provided three speculations on how the birth-order difference might come about. First was the impact of the primogeniture tradition: firstborn sons were given priority in the

inheritance of family wealth. Accordingly, they would be more likely have the financial resources to continue their education. Second, firstborns were more likely to be treated as companions by parents and be assigned more mature responsibilities than their younger siblings. Galton's third speculation was that, in families with limited financial resources, firstborns received more attention and better nourishment than other siblings.

The latter two notions remain central to current debates regarding birth-order effects. Although the primogeniture tradition has waned, recent surveys by anthropologists confirm that firstborns occupy special status in every human society. Other things being equal, they are awarded more respect and given priority in legal, religious, and social matters, even when all siblings are grown to maturity.

Almost a century of sporadic studies of intellectual development yielded inconsistent associations with birth order, partly because the sample sizes were insufficient. It was not until Robert Zajonc's research in the 1960s that massive data sets were given theoretical scrutiny in major psychology journals.

Zajonc's analyses provided persuasive evidence that the intellectual achievement of firstborns tends to surpass that of other birth orders. This advantage applies across a wide range of measures including school grades, intelligence quotient (IQ) scores, and SATs. Partly due to his credibility as a hard-nosed scientist, Zajonc's theoretical and empirical analyses were taken seriously: much of his research and follow-up studies were published in medical, economics, and hard-science journals. As detailed below, his work provoked an avid interest that continues to this day.

Theories of Birth-Order Differences

As noted above, the literatures on social and intellectual development have only minimal overlap. The various theories of birth order have developed primarily in the context of one field or the other. In reviewing the five most important theories, however, this article will attempt to draw out implications for both social and intellectual development.

Confluence Model

Proposed by Zajonc, this theory explains the firstborn advantage in terms of the intellectual environment evolving within the family. With only two propositions, the theory was able to explain birth-order effects as well as intellectual deficits deriving from five other family constellation effects: family size, close child spacing, multiple births, and being lastborn or an only child.

The first proposition of the model is simply that intellectual stimulation of children has enduring benefits

for their later intellectual success. Only firstborns have a period of time where they receive 100% of their parents' attention. For secondborns, the maximum quality time involves sharing the parents' attention with the firstborn. With each successive child, the available parental attention gets watered down even further. In addition, the linguistic environment becomes increasingly less mature as more children enter the family. The second proposition of the confluence model was that lastborns miss out on the intellectual stimulation involved in teaching younger siblings. We consider that second proposition in the section below on lastborns.

Zajonc's first proposition does not seem radical or especially controversial: in retrospect, it seems more like commonsense. But he spelled out the various consequences and quantified them in a simple but persuasive arithmetic formula. To represent the quality of the intellectual atmosphere at any point in a child's development, one simply has to calculate the current mean mental age in the family. Integrated over the childhood years, this mean is higher for firstborns: they receive the most intellectual stimulation because they spend a larger portion of their time in a high-quality atmosphere. This stimulation stays with them in the form of superior cognitive abilities.

Intellectual deficits due to family size also follow from this watering-down mechanism. Increasing the spacing between children helps modulate this watering down effect by allowing the mental ages of the older children to increase before adding the new contributor of zero mental age. Finally, the extra deficit seen in children of multiple births follows from the extra drop in average mental age due to the addition of several zeros to the equation.

Although they are seldom spelled out, implications for social development can also be derived from the Confluence Model. Differential parental attention, even out of practical necessity, should affect the nature of the parent-child relationship across the birth order. Firstborns should be more attuned to their parents' aspirations for their children, more needy of their parents' approval, and expect to maintain the special status they enjoyed as children in future social settings. Together, these sequelae could eventuate in the different personality trait and value profiles typically found across the birth orders.

Resource Dilution Model

This theory, originally proposed by the economist Judith Blake and extended by the sociologist, Downey, goes beyond the Confluence Model to argue for a more comprehensive decrease in resources for each successive child. In particular, there is a progressive watering down of financial and educational sources such as books, travel, and tuition. Differences in such concrete parental resources across birth orders can culminate in different scores on IQ tests.

For example, parents with limited incomes may not be able to afford to send all their children to college. Any limitation in the opportunity for higher education will certainly diminish the likelihood of intellectual achievement. In combination with the decrease in parental attention, these other drawbacks handicap laterborns relative to firstborns. As noted for the Confluence Model, any special status, even if endowed arbitrarily by financial practicalities, may have implications for social development.

Writers adhering to the Resource Dilution Model seldom allude to differences in social development across the birth order. Nonetheless, it seems reasonable to speculate that the differential allotment of financial resources could influence personality. The model is consistent with a small number of studies suggesting that firstborns feel more entitled to special treatment and that laterborns experience more resentment and jealousy.

Parental Feedback Theory

This theory suggests that parents adjust their parenting style as they move from the firstborn to laterborns. This adjustment is not out of financial or attentional necessity, but out of increasing comfort and decreasing anxieties. The result is that parents are less demanding of laterborns, especially with regard to their school performance. Beyond the firstborn, parents may allocate their love and approval in a manner that is less contingent on the child's achievement.

In one of the few experimental studies examining the transmission of birth-order effects, Irma Hilton observed how mothers treated children in a laboratory setting. In the waiting-room, firstborn children were observed to remain physically closer to their mother, often holding on for security. After the children returned from a putative 'testing session', mothers were told that their child had performed extremely well or extremely poorly – based strictly on random assignment. Observation via a one-way mirror revealed that mothers of firstborns gave contingent feedback: if told their child performed well, mothers coddled and praised the child. If told their child performed poorly, mothers berated the child. Laterborns, however, received noncontingent treatment: mothers responded to the child as they had before the testing session – regardless of performance feedback.

It is easy to see how such differential treatment could set off rather different developmental trajectories for firstborns and laterborns. In firstborns, superior intellectual achievement should be accompanied by a number of personality traits: they should possess higher achievement motivation, a greater concern with approval from parents and subsequent authorities. In turn, such qualities may well diminish their popularity among peers. The need for approval from authorities should also engender more conservative political attitudes in firstborns.

Family Niche Theory

In Frank Sulloway's theory, parents play only indirect roles. Instead, birth-order effects unfold during the inevitable competition among siblings as they struggle for a family niche. Firstborns, having the first choice of niche, attempt to please their parents in traditional fashion, namely, by good performance at school and by generally responsible behavior. But, as other siblings arrive, firstborns must deal with threats to their natural priority in the sibling status hierarchy. The resulting adult character is conscientious and conservative.

Laterborns must contest the higher status of firstborns, while seeking alternative ways of distinguishing themselves in the eyes of the parents. Accordingly, they develop an adult character marked by an empathic interpersonal style, a striving for uniqueness, and political views that are both egalitarian and antiauthoritarian. In short, they are 'born to rebel'. This attempt to address birth-order differences in political orientation is unique to Family Niche Theory.

Although designed to explain birth-order differences in personality, the Family Niche Theory is not without implications for intellectual development. In fact, it makes predictions about two aspects of intellectual life – achievement and creativity. Firstborns strive to achieve via traditional academic means – conscientious striving, to be specific. This development begins with their attempt to please their parents via school success. Although traditionally distinguished as ability vs. motivation, the tight overlap between intelligence and conscientiousness has become more evident in recent work. Laterborns, in contrast, seek out creativity, even radical revolution, in their intellectual lives.

Prenatal Hypomasculinization Theory

Drawing on earlier work by Maccoby and others, Jeremy Beer and John Horn have developed a biologically based theory suggesting that the birth orders already differ at birth. The argument does not postulate an average genetic difference in the birth orders but a difference in their exposure to hormones. Previously called the 'tired mother' syndrome, the notion is that, with each succeeding male child birth, mothers expose their babies to lower levels of masculinizing hormones.

Beer and Horn derived their theory from recent findings indicating that the likelihood of male homosexuality increases with the number of older brothers. The common mechanism, they argue, is the progressive immunization of mothers to the hormones that masculinize the male fetus. Thus male children with older brothers are 'hypomasculinized' in both their sexual orientation and their personality characteristics.

According to Beer and Horn, this process eventuates in certain parallels between sex differences and birth-order

effects. For example, males and firstborns should exhibit higher levels of competitive achievement whereas females and laterborns should exhibit more cooperation and flexibility. Firstborns should also be more disagreeable, and show more masculine interests. This hypothesized pattern of birth-order differences is consistent with the empirical evidence cited by Sulloway, Zajonc, and others.

To date, however, there is little direct evidence to support Beer and Horn's hypomasculinization theory. Yet the possibility that firstborns and laterborns already differ at birth is intriguing and should trigger further research on biological differences across birth orders.

Contrasting Mechanisms

Even among those writers who accept that children of different birth orders do differ in systematic ways, the disagreement over explanatory mechanisms is striking. According to the Prenatal Hypomasculinization Theory, the differences are already set at birth. For the Parental Feedback Theory, it is a change in parents' comfort level that is responsible for birth-order differences. For the Resource Dilution Theory, it is the diminishing availability of resources that aid education. For the Confluence Model, it is the devolving quantity and quality of intellectual stimulation. For the Family Niche Theory, birth-order effects are propagated by accompanying differences in age, size, knowledge, and status in the family: The oldest child will always be the oldest. Size, knowledge, and maturity differences will eventually even out but status differences can remain well into adulthood.

Of course, people spend most of their lives outside the purview of the family home and its unique interpersonal dynamics. Not surprisingly, then environmental theories typically suggest that birth-order forces on social and intellectual achievement should diminish with time. Even if accepting that the power of such differences eventually wanes, most psychologists – and lay observers, for that matter – believe that early environmental factors have a unique and enduring impact.

Modern Data: The Importance of Research Design

Each of the above theories has some intuitive appeal. But there remain serious questions about the data supporting the very existence of birth-order differences. As with many developmental debates, the key claims are not testable via laboratory-controlled experiments. Under contemporary mores, we cannot – or, rather, will not – randomly assign babies to different birth orders. Instead, social scientists can offer only correlational data and hope to clarify the developmental processes via statistical arguments.

The most persuasive birth-order studies entail a large sample of participants evaluated in an efficient experimental design that includes multiple control provisions to handle potentially contaminating variables. One critical design issue is whether the data are collected within families or between families. Within-family studies involve a comparison of the siblings within each family. If firstborn Jason and secondborn Mark are raised entirely in the same family setting, then they are matched (in large part) on factors such as family socioeconomic status (SES), parents' child-rearing strategies, parents' personalities, family events, and many other environmental factors. Of special importance, the researcher need not be concerned with genetic differences because, on average, they do not differ among offspring of the same parents. All of these controls make for a fair comparison of Jason and Mark with respect to birth order.

In between-family studies, however, none of those controls are in place. If chosen randomly from a classroom, subject pool, street interview, or telephone survey, Jason and Mark are bound to differ on a host of environmental and genetic factors. Because those variables contribute their own (often larger) sources of variation, any birth-order differences will tend to be obscured.

Because birth-order effects are relatively small, large sample sizes are of special importance for teasing out the differences. In the case of within-family research, it is difficult to take seriously any study comprising fewer than several hundred families. For between-family studies, even larger samples are required. Because so many other factors add noise to the measurement, birth-order differences do not become apparent with fewer than 500 participants from a relatively homogeneous sample.

Debates over these methodological issues have created comparable levels of controversy in the research literatures on social and intellectual development. Yet the controversies have played out in rather different fashion in the two literatures.

Intellectual Development

In virtually every cross-sectional survey, a consistent advantage for firstborns continues to appear. Firstborns are over-represented among university students, among Nobel Prize winners, and on virtually any other concrete measure of intellectual achievement (e.g., IQ tests, SATs). Such birth-order differences, first communicated in a scientifically persuasive fashion by Zajonc and colleagues, continue to emerge in modern samples.

For the most part, however, such clearcut birth-order effects were observed in between-family (i.e., cross-sectional) data. A variety of confounds (e.g., SES, family size) make such results ambiguous. As Joseph Rodgers and others have demonstrated, when such confounds are

removed, birth-order effects on measures of intellectual achievement often disappear. Unfortunately, when such important variables are statistically confounded, it is difficult to distinguish which variables are genuine effects and which variables should be controlled. By removing the effects of variables that may have similar causal mechanisms to birth-order effects, such analyses may be 'throwing out the baby with the bathwater'.

As of the writing of this article, the empirical pendulum seems to have swung back to favor the claims made by Zajonc and others. Several Norwegian researchers have recently analyzed data from virtually the entire population of their country. In 650 000 families, firstborn children showed a clear advantage in IQ, educational attainment, and later adult income.

Apart from the largest sample size, this research has the most rigorous controls, including family size and SES. The fact that education is free in Norway helps mitigate the counter-argument that family finances play a determining role. So does the finding that the birth-order effects were actually stronger for children with highly educated mothers.

Social Development

In studies of personality and social attitudes, as well, the empirical debate about birth order is characterized by inconsistency. Sulloway and others have offered large data sets to support the idea that firstborns are more conforming and conscientious whereas laterborns are more agreeable, open to experience, and politically liberal. In response, other reputable scientists have disputed the size and importance of such birth-order differences.

Again the debate may turn on the choice of within-family vs. between-family designs. In this case, however, the advocate and skeptic views are reversed. Birth-order effects are evident in within-family designs whereas minimal results emerge from between-family designs. The within-family design is typified by the method used in a 1999 article by Paulhus and colleagues. They asked a variety of large samples to report on their own families. In one study, for example, participants were asked to rate themselves and their siblings on the Big Five personality traits and on political attitudes. Results firmly supported Sulloway's predictions.

Most recently, Healey and Ellis outlined the conditions that yield the clearest birth-order effects in personality: (1) when firstborns are compared with secondborns, (2) when the age difference is 2–4 years, and (3) when children reared apart are excluded. Again, these within-family patterns confirmed predictions from Sulloway's Family Niche Theory.

With respect to between-family studies, a prototypical example is the study conducted in 1998 by Tyrone

Jefferson and colleagues. Their data came from large archival samples that included both personality and birth-order data. On self-report measures, they found no significant birth-order effects on personality. On peer-ratings, the only significant finding was the usual conscientiousness advantage for firstborns. Few other studies can boast the feature of peer-raters: they provide a more objective perspective from outside of the family.

These conflicting results may have a simple resolution. Studies with weak or null birth-order effects always involve a comparison of individuals from different families. But, as noted above, families differ on a wealth of influential variables and a full range of appropriate controls is seldom available. Within-family data provide a natural control procedure for all between-family differences, including their largest contributor – genetics.

Most readers will be aware of the recent confirmation of substantial genetic effects on both intellect and personality. This consensus is helpful in understanding the conflicting conclusions drawn from within- vs. between-family studies: within-family designs remove a large component from the equation, namely, mean genetic differences between families. Accordingly, birth-order differences emerge more clearly in within-family studies.

The burgeoning behavioral genetics literature also supports birth-order claims in another way. Second to genetics, the primary source of variance is personality, values, and, even political orientation is within-family environmental variance. In other words, there are family dynamics at work making siblings more different than expected by random genetic effects. Sibling rivalry and differential parental treatment of different birth orders are likely to be part of these within-family dynamics.

Stereotype Effects

To repeat, within-family studies of personality inevitably show clear birth-order effects. Whether one asks the firstborn or laterborns, there is agreement on who is more conscientious. Moreover, this agreement seems to last a lifetime.

Yet some critics dismiss the importance of that within-family consensus, arguing instead that putative birth-order effects derive entirely from within-family stereotypes. As children grow up with siblings of different ages, real differences in size, power, maturity, and knowledge govern the intersibling dynamics. When asked later to compare their siblings, say at the age of 30 years, all family members tend to concur on the traditional family story about how the children differ. Beyond that, these critics argue, the stereotypes have no impact on people's lives.

But research from the social and developmental psychology literature indicates that self- and other-stereotypes run deeper than that. In fact, adult samples show the same

pattern and size of birth-order effects as much younger samples, even when the adults have been living apart from their siblings for many years. The stability of these perceptions across the lifespan undermines the accusation that they are artifactual and makes a stereotype perspective difficult to distinguish from standard conceptions of personality.

Alternatively, is it possible that birth-order differences in that perceptions of one's siblings are a fiction inculcated by stereotypes acquired from other sources? It is hard to believe that, throughout their lives, siblings systematically ignore bona fide evidence of their brothers' and sisters' actual traits in favor of erroneous stereotypes. It seems far more reasonable to believe that such stereotypes flourish because they have (at least) a kernel of truth. Critics would have to argue further that initially false stereotypes can endure a lifetime without having any impact on personality. According to social psychological research, however, one should expect some reification due to self-fulfilling prophecies. Can the stereotypes, the self-perceptions, and the peer-perceptions all be faulty?

Critics such as Judith Rich Harris hold an intermediate position in conceding the reality of within-family personality differences, but caution that the differences remain just that – within the family. In other words, birth-order differences have no effect on life outside of the family home: only on home visits do the old familiar patterns emerge. Many readers will relate to that experience. Nonetheless, that experience may not be an insignificant portion of adulthood. Many children do go on to spend a significant amount of their adult life involved in continuing interactions with the family of origin.

Harris's notion of circumscribed personality differences is also compromised by a number of recent studies reporting on more concrete differences outside of the family. For example, firstborns show more dismissive attachment styles in later life whereas laterborns disproportionately choose occupations that involve social interaction.

To summarize, the stereotype critique is an attempt to explain away the robustness of within-family personality differences as shared fiction. Such counter-arguments must always be taken seriously, but in this writer's opinion, there is simply too much evidence for the reality of birth-order differences.

Further Complexities

Firstborns, Only-Children, and MiddleBorns

Most of this article has purposely simplified birth-order issues by limiting the discussion to a comparison of firstborn children to all laterborns. The primary reason was that, in most respects, differences among laterborns are not as apparent as is the contrast with firstborns. Yet there are a few issues where middleborns and lastborns do stand out.

The unique findings for lastborn children include both good news and bad news. As noted earlier, Zajonc found an extra decline in the intellectual achievement of lastborns – above and beyond the gradual decline due to successive birth order. A thirdborn child, for example, fares more poorly if no younger children are added to the family. This finding was confirmed in the recent large sample and tightly controlled Norwegian data (described above).

Zajonc explained this anomaly in terms of the so-called ‘teaching effect’. Firstborns (and older siblings in general) often have to answer questions posed by their younger siblings and assist with their homework. At the time, the older siblings may experience these tasks as onerous. Rather than a burden, Zajonc argued, this teaching opportunity actually benefits earlier-borns, perhaps by forcing them to engage more deeply with the material they are teaching. That claim is quite consistent with the tutoring research in educational psychology, which shows that teaching benefits the teacher at least as much as it benefits the student. A lack of such opportunities can thus explain why lastborn children show an extra deficit in intellectual achievement and why only, children do not achieve as highly as other firstborns.

The good news for lastborns lies in the personal popularity that ensues from their birth order. In surveys of comparative popularity, the lastborns are voted the ‘favorite child’ more often than any other birth order. This popularity may well reflect an inevitable tradeoff with personal achievement. Peers prefer others who are noncompetitive and more socially oriented than achievement oriented.

These arguments can also be applied to only-children. The fact that they are also lastborns, may explain why their academic achievement does not match up to that of other firstborns; the fact that they are also firstborns may explain why they are not as popular as other laterborns.

The tradeoff between the respect accorded to firstborns and the personal popularity of lastborns often leaves the middleborns feeling left out. Studies by Canadian researchers, Salmon, Daly, and Wilson has confirmed that, in various ways, the middleborns feel less attached to the parents. For example, they are less likely than either first- or lastborns to nominate their mothers as their favorite family member.

Gender

Compared to the prominent role that gender plays in many developmental issues, it has made surprisingly little difference in birth-order studies. The intellect and personality profiles that emerge for females are comparable to those emerging for males.

Certainly, over the long history of birth-order research, a number of statistical interactions have been reported where

gender was involved. When found, the results of a particular combination – say, firstborn males with secondborn females and thirdborn males – were not difficult to explain with a ‘just-so story’. But the fact that such interaction effects rarely replicate suggests that the original findings were due to chance. With larger families, the number of possible combinations escalates quickly. With increasing parity in male vs. female achievement, any such interactions with birth order may eventually vanish. For these reasons and others, recent research has paid little attention to possible gender differences in birth-order effects.

A couple of recent findings constitute exceptions to this rule. An interesting finding reported by Sulloway was that secondborn boys often develop with firstborn personalities if the firstborn is a girl. Perhaps boys do not see firstborn girls as competitors and react only to their brothers. Or parents may still place more value on the firstborn male child.

The lack of difference in the size of birth-order effects has played a role in evaluating the Prenatal Hypomascu- lization Theory. The credibility of that theory is weakened by the fact that its predicted larger effect size in males has not materialized in recent (tightly controlled) research.

Summary

The impact of birth order on social and intellectual development seems at once self-evident and empirically elusive. When found, the pattern is consistent: firstborns are the most intelligent, achieving, and conscientious, whereas laterborns are the most rebellious, liberal, and agreeable. In competition to explain these profiles are such diverse theories as Differential Parental Feedback, Resource Dilution, Family Niche, and Prenatal Hypomascu- lization.

The difficulty in confirming these birth-order differences is disconcerting. Although initially evident in most large-sample studies, the differences often disappear when key variables are controlled. The fact that significant reverse effects (e.g., firstborns less conscientious than laterborns) are rarely found, suggests that birth-order effects are at work, but that they are masked by certain research designs. Even statistical experts cannot seem to agree on how to tease apart birth-order effects from those of family size and SES.

The fact that birth-order differences are small to begin with makes them especially difficult to confirm. Indeed, all the contending theories predict small differences. In the case of IQ differences, for example, the expected firstborn vs. secondborn difference is only two IQ points. The effect sizes of birth order pale in comparison with sex differences, and most important, with temperament differences instilled by genetic and congenital factors.

As Jerome Kagan has pointed out, stereotypes about birth order are widespread and have a powerful intuitive appeal. But surely this wide appeal derives, at least in part, from some real commonality in human experience. Those of us with siblings have spent considerable time evaluating our relationships with them. The consensus within our families emerged long before we learned about birth-order stereotypes. The fact that most adults are eventually made aware of these stereotypes does not undo their validity. Even stereotypes can have a self-fulfilling effect as family members strive to live up to their expected roles.

At this point in the history of birth-order research, the informed reader must live with the fact that experts disagree and the continuing empirical debates are abstruse. Nonetheless, in this writer's opinion, the current weight of evidence favors the view that birth order does matter for both intellectual and social development.

See *also*: Attachment; Family Influences; Social and Emotional Development Theories; Temperament.

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Brain Development

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Glossary

Afferent – A neural projection carrying ascending information from the periphery to the nervous system or providing input from one brain region to another (e.g., thalamocortical afferent).

Architectonics – The arrangement of cells (e.g., cytoarchitectonics) or other attributes such as molecular markers (e.g., chemoarchitectonic) particularly in the cerebral cortex. A feature that contributes to the characterization of a neocortical area.

Broca aphasia – A syndrome characterized by nonfluent verbal language expression coupled with the sparing of language comprehension classically, but not necessarily, due to a lesion in Broca's area within the left inferior frontal lobe.

Cortico-cortical – Neuronal projections connecting regions within the cerebral cortex.

Efferent – A neural projection carrying information away from the nervous system to the periphery or carrying the output from one brain region to another.

Epigenetic – A factor that can change the activity of genes without changing their structure. Often used to refer to a factor that interacts with genetic factors to influence phenotypic expression.

Genetic – A factor or mechanism, particularly in development, that is largely the consequence of genes.

Glia – Non-neuronal cells of the nervous system that perform a variety of functions. These cells include: astrocytes, oligodendrocytes, radial glia, Schwann cells, satellite cells, and microglia.

Perinatal – The period at or around the time of birth.

Prenatal – The period occurring prior to birth.

Retinotopic organization – A term describing the topographic representation of the retinal surface in the regions of the brain devoted to processing visual information.

Somatotopic organization – A term describing the topographic representation of the body surface in regions of the brain devoted to processing somatic motor and sensory processing.