

Associations between Birth Order and Personality Traits: Evidence from Self-Reports and Observer Ratings

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Sulloway (1996) proposed that personality traits developed in childhood mediate the association of birth order with scientific radicalism. Birth-order effects on traits within the five-factor model of personality were examined in three studies. Self-reports on brief measures of Neuroticism, Extraversion, and Openness in a national sample ($N = 9664$) were unrelated to birth order. Self-reports on the 30 facet scales of the Revised NEO Personality Inventory (NEO-PI-R) in an adult sample ($N = 612$) showed only small effects for Altruism and Tender-Mindedness. Peer ratings ($N = 166$) supported the hypotheses that laterborn children would be higher in facets of Openness and Agreeableness, but spouse ratings ($N = 88$) did not replicate those findings. Birth order may have subtle effects on perceived personality, but it is unlikely that this effect mediates associations with scientific radicalism.

Sulloway's (1996) *Born to Rebel* provides a fascinating synthesis of evolutionary theory, personality psychology, and the history of scientific revolutions. In brief, his argument is that, consistent with evolutionary trends in many species, children in human families compete for parental resources by creating distinctive niches. Firstborn children, whose position is already established, tend to be responsible, competitive, and conventional; laterborn children must distinguish themselves by being playful, cooperative, and especially rebellious. As adults, those laterborns who become scientists are

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attracted toward unconventional ideas and lead radical scientific revolutions, such as Darwinian evolution and psychoanalysis.

In some respects, Sulloway's theory fits well with contemporary knowledge about personality. Birth order (except perhaps for twins) is a variable that distinguishes children in a family, and studies of the behavior genetics of personality (Loehlin, 1992) consistently point to the importance of such nonshared environmental influences. Similarly, the notion that scientific innovation is associated with personality, especially traits in the domain of Openness to Experience such as unconventionality, is also plausible (MacKinnon, 1962; McCrae, 1987, 1994).

But in at least two other respects, Sulloway's theory appears to be inconsistent with recent research findings. First, it assumes that personality characteristics developed in childhood¹ are retained into adulthood. But longitudinal studies (e.g., Block, 1993; Siegler et al., 1990) show that in addition to some continuity, there is change in rank-ordering of personality traits between early childhood and adulthood; children who are rebellious at age 4 or age 11 may have become conventional by age 30. Second, and more crucially, influential previous reviews of birth order and personality have reported little association.

Birth order has been a standard variable in psychological research for decades, but attempts to link it to personality traits have usually shown weak and inconsistent results. Although firstborns are usually described as being higher in conformity and need for achievement (Forer, 1977), these effects may be artifacts of differences in social class and sibship size. Schooler's (1972) review concluded that few reliable effects were to be found in adequately controlled studies, a conclusion echoed by later reviews by Ernst and Angst (1983) and Dunn and Plomin (1990). After examining most of the published research on the topic prior to 1981—over 1000 studies—Ernst and Angst concluded that “[birth] order does not appear to be a very strong influence in molding personality in a definable way” (p. 187).

Hoffman's (1991) investigation of the family environment as a source of differences in sibling personality may offer an explanation for the small magnitude of birth-order effects. She noted that personality outcomes are affected by a multiplicity of interacting environmental influences (including parental intervention, peer relationships and family sibship size) and any single influence is unlikely to explain much variance.

Sulloway (1996) also argued that birth-order effects might be subtle, and thus might only be detected in very large samples or in meta-analyses guided by methodological and conceptual principles. He therefore conducted a re-

¹ Although presumably strongest in early childhood, Sulloway (personal communication, April 10, 1998) points out that birth-order influences on personality may continue to operate until mid-adulthood.

analysis of the studies examined in Ernst and Angst (1983; see Sulloway, 1996, pp. 72–75). To avoid possible confounds, Sulloway first excluded all birth-order studies that lacked controls for social class and sibship size. To make conceptual sense of the results, he classified the remaining studies on the basis of the personality traits assessed, using categories corresponding to the dimensions of the five-factor model of personality (McCrae & John, 1992). The five-factor model is a widely used hierarchical model of personality structure that describes most traits in terms of five broad factors: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C).

Sulloway (1996, p. 73) offered specific hypotheses about the directions of associations. Firstborns were hypothesized to be higher than laterborns in N, E, and C and lower in O and A. As he interpreted the studies, 72 of the 196 studies found statistically significant support for these hypotheses, and 110 studies showed no significant difference between birth-order groups.² Only 14 studies produced significant results contrary to his hypotheses; 6 of these concerned E. Sulloway explained this anomaly by arguing that some E-related traits (e.g., sociability) are higher in laterborns, whereas other E-related traits (e.g., assertiveness) are higher in firstborns.

These findings, particularly the relatively consistent findings with respect to O and C, would seem to resolve the long debate over the existence of birth-order effects: Though small, they do occur. Although he did not formally calculate effect sizes, Sulloway estimated that maximum absolute correlations would be .40 for O, .35 for C, .30 for A, .20 for N, and .10 for E (see Sulloway, 1996, p. 473, Note 76).

But many of the studies reviewed by Sulloway involved children, whose personality characteristics might or might not be retained in adulthood. Further, Sulloway's conclusions depend on the accuracy of his classification of scales and other outcome variables in terms of five-factor model domains. More direct tests require measures known to be valid indicators of the five factors. Two such studies have recently been reported.

Phillips (1998) administered the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992a) to a sample of 177 college students. The NEO-PI-R is the most widely used measure of the five-factor model; in addition to the five factors, it provides scores on six specific traits, or facets, that define each of the five factors. Phillips reported that firstborns (including only children) did not differ significantly from laterborns on any of the five factors. Analysis of the 30 facet scales showed that, contrary to hypothesis, laterborns scored higher on C6: Deliberation; no other significant effects were found.

Parker (1998) used a short form of the NEO-PI-R to assess personality

² For critiques of Sulloway's meta-analysis see Harris (1998) and Townsend (1997).

in a sample of 593 academically gifted sixth graders—an atypical group, but one perhaps comparable in intelligence to the adult scientists studied by Sulloway. Parker's study included controls for socioeconomic status and sibship size and analyzed only children, oldest, middle, and youngest children separately. He found no association between birth order and any of the five factors.

However, Sulloway (1996) has argued that the self-report questionnaires used in these studies may not be optimal for the assessment of birth-order effects. Sulloway's (in press) own study of 660 business leaders failed to find birth-order effects in simple self-ratings on a series of traits—firstborns, for example, did not consistently describe themselves as being conventional. But when asked to compare themselves to their rating of their siblings on the same traits, respondents showed the predicted pattern of results—firstborns perceived themselves as being more conventional than their siblings.

Although some readers of *Born to Rebel* assumed that it implied that relatively large birth-order effects would be found when self-report measures of personality were employed, Sulloway in fact has much lower expectations, predicting correlations of .10, .09, .08, .05, and .04 for O, C, A, N, and E, respectively (F. J. Sulloway, personal communication, September 8, 1997). With these much more modest values, the Phillips (1998) study had less than a 37% chance of detecting even the largest predicted effect. The Parker (1998) study, however, could probably have detected the O effect if it had been present (power = .79), but not the predicted E effect (power = .25).

More recently, Sulloway has placed greater emphasis on distinctions between traits within each of the five factors. In addition to the distinction within E of sociability (a laterborn trait) from dominance (a firstborn trait), he has also pointed to the need to distinguish intellectual aspects of O from radical thinking and unconventionality (Sulloway, in press). Adequate tests of his current position require instruments, like the NEO-PI-R, that assess these traits separately.

The present article reports three sets of analyses of archival data. The first uses brief measures of N, E, and O in a large and representative national sample; the second uses the full NEO-PI-R in a sample of older men and women; and the third uses observer ratings on the NEO-PI-R to assess personality. Sulloway's hypotheses will be evaluated in each sample.

STUDY 1

Method

Respondents. The National Health and Nutrition Examination Survey I (NHANES I) was administered between April 1971 and October 1975 to a multistage, stratified probability sample of the noninstitutionalized civilian American population between the ages of 1 and 74 years (National Center for Health Statistics, 1973, 1978). Approximately 10 years later the NHANES I Epidemiologic Follow-up Study (NHEFS; Cornoni-Huntley et al., 1983) was con-

ducted to reassess the 14,407 adults who were over age 24 at the time of the initial assessment. Because of death, loss to follow-up, and missing data, the final sample consisted of 9664 respondents.

Age at follow-up ranged from 32 to 86 years ($M = 56.2$, $SD = 14.5$), and the mean years of education was 11.3 ($SD = 3.2$ years). The majority of the sample, 86.2%, were White; 62.8% were women. Marital status was classified as follows: 68.6% married, 15.3% widowed, 8.3% divorced, 2.7% separated, 5.0% never married, and five (5) cases unknown.

Birth-order assessment. All participants in the NHEFS answered a survey that included two questions about birth order: "How many brothers and sisters living or deceased do you have?" (sibship size) and "How many of these brothers and sisters were born before you?" Responses to these two questions were cross tabulated to derive birth-order groups. Only children (5.6%) were defined as individuals who had no siblings; firstborns (25.2%) indicated that they had siblings but none born before them; middleborns (47.4%) indicated that they had siblings, some born before them; and lastborns (21.8%) indicated that all their brothers and sisters were born before them.

Sulloway (1996, pp. 22, 23) argued that functional birth order, not biological birth order, is crucial for personality development. A child raised alone by grandparents is functionally an only child regardless of the number of biological siblings; similarly, a secondborn child whose older sibling died in infancy is functionally a firstborn. The questions asked in the NHEFS do not allow a direct assessment of functional birth order, and thus the classification scheme used here is only approximate as a test of Sulloway's hypotheses.

Personality assessment. Five items from the General Well-Being schedule (GWB; Dupuy, 1978) were chosen on theoretical grounds to represent the personality dimension of Neuroticism (N). The items measure perceptions of stress, anxiety, emotional instability, and depression. The 5-item GWB-N scale correlated .48 with the longer 48-item NEO-PI N scale (Costa & McCrae, 1986).

Brief scales to measure Extraversion (8 items) and Openness to Experience (6 items) were created by selecting items from the NEO Personality Inventory (Costa & McCrae, 1985). The NHEFS versions of the E and O scales correlated .84 and .77 with the full NEO-PI E and O scales, respectively (Costa & McCrae, 1986).

Results and Discussion

Preliminary analyses showed that there were some significant differences among the four birth-order groups in terms of demographic variables. Middleborns had larger sibships, were 3 years older, and had fewer years of education than the other three groups. Middleborns were also somewhat less likely to be White. There were no differences in marital status or gender.

One-way ANCOVAs controlling for the covariates of sibship size, age, years of education, race, gender, and marital status showed no statistically significant differences among the four birth-order groups on N ($F(3,9654) = 0.42$), E ($F(3,9654) = 2.43$), or O scales ($F(3,9654) = 1.38$).

Data from the nationally representative NHEFS sample thus do not support the hypotheses of Sulloway (1996) that birth order is associated with personality. This failure cannot be attributed to common confounds, because statistical controls for age, education, and sibship size were used. It certainly cannot be attributed to a lack of statistical power in this very large sample: Power for detecting even effects as small as $r = .04$ exceed .99 (Buchner, Faul, & Erdfelder, 1996). It cannot be due to differences within firstborns

between only children and others, because these two groups were analyzed separately.

It is, however, possible that the failure to find associations may be due to the personality measures used. The measures of N, E, and O were very brief and doubtless less than optimal in terms of reliability and validity. For two of the factors, E and O, Sulloway has argued that different component traits may be differentially sensitive to birth order.

We therefore divided the 8 E items into two clusters: 5 from Warmth, Gregariousness, and Positive Emotions facets to represent *sociability*, and 3 from Assertiveness, Activity, and Excitement Seeking facets to represent *dominance* (cf. McCrae, Costa, del Pilar, Rolland, & Parker, 1998). ANCOVAs on these subscales, however, revealed no difference between firstborns and laterborns on either subscale. A further test of O was not possible because the radical unconventionality Sulloway attributes to laterborns is not well represented in the six items of the NHEFS O scale.

A better test of Sulloway's hypotheses would include more differentiated as well as more reliable measures of personality. In addition, of course, it would examine all five factors. In the second study, the full NEO-PI-R is used to assess personality at the level of facets as well as domains. We hypothesize that Openness to Actions and Values—facet scales that may provide more specific measures of Sulloway's conceptualization of radical unconventionality—will be particularly related to laterborn status.

STUDY 2

Although the NHEFS sample is large and representative, detailed psychological information on individual respondents is lacking. Data archives from an ongoing longitudinal study provide more accurate assessments of personality and some additional control data. In particular, Sulloway (in press) noted that some measures of Openness to Experience are related to IQ, a characteristic in which firstborns score slightly higher than laterborns. The prediction that firstborns should be lower in Openness may be obscured by birth-order differences in IQ. In Study 2 we control for IQ differences, as measured by Wechsler Adult Intelligence Scales (WAIS; Matarazzo, 1972) vocabulary scores, in examining the personality/birth order association.

Method

Respondents. A subsample of participants in the Baltimore Longitudinal Study of Aging (BLSA) provided data on birth order and personality. The BLSA sample is composed of a community-dwelling, generally healthy group of volunteers who have agreed to return to the Gerontology Research Center for medical and psychological testing at regular intervals (Shock et al., 1984). Complete data were available from 612 men and women.

Age at the time of the personality assessment ranged from 55 to 96 years, with a mean age of 76.0. Years of education ranged from 4 to 22, with a mean of 16.6. The majority of the sample, 95.9%, were white; 64.1% were men. Most (77.3%) were married.

Birth-order assessment. Participants in the study were required to fill out a short family history form as part of a battery of neuropsychological tests. Responses to questions about birth rank and total number of siblings were used to define birth-order categories. Among the 612 study participants, 64 were classified as only children, 186 as firstborns, 208 as middleborns, and 154 as lastborns. These categories were collapsed into firstborns ($N = 250$) and laterborns ($N = 362$).

Personality assessment. Participants were administered the Revised NEO-Personality Inventory (NEO-PI-R) at one of their regularly scheduled visits. The 240-item NEO-PI-R uses a 5-point Likert response scale ranging from *strongly disagree* to *strongly agree*. Data on the instrument's reliability, factor structure, longitudinal stability, and validity are presented elsewhere (Costa & McCrae, 1992).

Results and Discussion

With this sample size, power to detect the small effects predicted by Sulloway (personal communication, September 8, 1997) was 80% for O, 72% for C, and 63% for A. Power is probably inadequate for E and N domains, but might be sufficient for some facets of those domains, for which a priori estimates of effect size are not available.

Preliminary analyses showed that laterborns had fewer years of formal education and larger sibships than firstborns. No differences were found for age, gender, race, or marital status. One-way ANCOVAs controlling for age, gender, race, marital status, sibship size, years of education, and WAIS vocabulary scores compared firstborns and laterborns on the five domains of the NEO-PI-R. No significant differences were found.

Oneway ANCOVAs with the same covariates were also performed on the 30 facet scales of the NEO-PI-R. Two significant differences emerged: As hypothesized, firstborns scored significantly lower than laterborns on A3: Altruism ($F(1,603) = 4.7, p < .05$) and A6: Tendermindedness ($F(1,603) = 7.4, p < .01$). Thus, firstborns described themselves as being more self-centered, hardheaded, and less moved by appeals to pity than laterborns. As Sulloway predicted, these effects were small, accounting for no more than 1% of the variance in personality scores.

STUDY 3

Previous research has suggested that method of personality measurement affects observed association with birth order (Sulloway, in press). Although self-reports are the most widely used and best validated source of personality data, and although correlations between self-reports and observer ratings are substantial (usually in the range .40-.60; McCrae & Costa, 1989), observer ratings do offer an alternative perspective on personality that should be evaluated (McCrae, 1994). In Study 3 we examine associations between birth order and personality traits as rated by peers and spouses. The samples are small and could be expected to yield significant results only if observer ratings are considerably more sensitive to birth-order effects than are self-reports.

Method

Targets. Participants in Study 3 were a subset of individuals in Study 2 whose personality had been rated in 1990 by from 1 to 4 peers ($N = 79$; Costa & McCrae, 1992) or over the period from 1986 to 1995 by their spouses ($N = 88$). The 62 women in these two overlapping samples ranged in age from 59 to 91; the 94 men, from 61 to 94. Birth order was established as in Study 2.

Measures and raters. The observer rating form of the NEO-PI-R (Form R) was used to assess personality. This instrument is a third-person version of the self-report NEO-PI-R and shows comparable factor structure, internal consistency, and longitudinal stability (Costa & McCrae, 1992a). In the case of the peer ratings, it was completed by friends, neighbors, or co-workers nominated by the participant; these raters had known the targets for many years in a variety of settings (Costa & McCrae, 1992b). We did not determine whether the raters knew the birth order of the targets. Spouse raters presumably did know the birth order of the targets, but birth order was not explicitly mentioned in rating instructions to either peers or spouses.

Results and Discussion

The 166 peer ratings of 79 targets were analyzed using the same set of covariates described for Study 2. ANCOVAs showed significant differences between firstborns and laterborns on E, O, and A domain scales and on facets measuring E1: Warmth, E2: Gregariousness, E6: Positive Emotions, O1: Fantasy, O4: Actions, O5: Ideas, O6: Values, A1: Trust, and A2: Straightforwardness. As Sulloway hypothesized, laterborns were higher in rated Openness to Experience and rated Agreeableness. Overall, laterborns were higher rather than lower in Extraversion, but the effect was attributable to differences in Warmth, Gregariousness, and Positive Emotions, facets of E related to sociability rather than dominance, and thus consistent with Sulloway's post hoc interpretation of his meta-analytic results. The largest of these effects (for E, O, Gregariousness, Positive Emotions, and Openness to Actions) accounted for from 5 to 9% of the variance in personality scores.

In an attempt to discover whether the differences seen between these peer rating results and the largely null results of Study 2 were due to method of measurement or to peculiarities of the sample, we reanalyzed the self-report data of the 79 targets. None of the domains or facets showed significant effects. The effects thus appear to be attributable to data source rather than target sample.

In a second test of observer ratings, the same set of analyses with the same covariates was conducted on the sample of 88 spouse ratings. In these analyses, however, firstborns did not differ from laterborns on any of the 5 domain or 30 facet scales. Spouse ratings do not replicate the significant effects seen in peer ratings.³

³ It has been suggested (D. Paulhus, personal communication, March 24, 1998) that true birth-order effects might be obscured by the use of covariates. However, when analyses in these three studies were repeated without covariates, the same pattern of small and mixed findings was found. As hypothesized, firstborns were higher in Neuroticism (but only in the

GENERAL DISCUSSION

Results of the present study provide the basis for a mixed evaluation of Sulloway's (1996) theory of the effects of birth order on personality. When assessed by self-reports from individuals in different families, personality shows little or no association with birth order, despite very large samples and statistical controls for the most common confounds. Only 2 of 30 facet scales (Altruism and Tender-Mindedness) showed significant differences, and although these were in the hypothesized direction, they were very small in magnitude. Consistent with most prior research, self-reported personality traits appear to be largely uninfluenced by birth order and the quest for an unoccupied niche in the family environment.

Analyses of peer-rated personality, however, suggest partial support for Sulloway's hypotheses. Predicted effects were seen for sociability-related aspects of Extraversion, for Openness to Experience, and for some aspects of Agreeableness. Laterborns are perceived by their friends and neighbors as being somewhat more sociable, innovative, and trusting than firstborns.

However, these results were not replicated when observer ratings were obtained from spouses instead of peers; nor was there support from any source for the hypotheses that firstborns are higher in Neuroticism, Assertiveness, and Conscientiousness. At best, results in the present study provide a rationale for additional research in larger samples using multiple methods of personality assessment.

Studies asking individuals to rank-order family members on characteristics such as conventionality and intellectual achievement are currently under way (Paulhus, Chen, & Trapnell, 1998). However, such studies may elicit responses in terms of shared stereotypes of birth-order effects: Firstborns may rank themselves higher in conventionality than their siblings because they *believe* firstborns are conventional. Alternatively, personality rankings may reflect actual behavior within the family context, without reflecting styles of thinking, feelings, and behaving outside family relationships. That is, Sulloway may be correct in saying that children seek out separate behavioral niches for themselves, such that laterborns are more likely to be sociable but unconventional—*when dealing with their siblings*. These behavioral patterns, however, may not characterize the individual in other contexts, including the general context that is the implicit basis for most personality descriptions (cf. Harris, 1998).

A better design might be to obtain noncomparative self-reports and observer ratings on a sample of siblings. This matched design would offer strong control for environmental differences (e.g., socioeconomic status)

peer-rating study) and lower in Agreeableness (but only in the BLSA self-report study). Contrary to hypothesis, firstborns were higher in Openness in the NHANES study. Firstborns were higher in Extraversion in the NHANES study, but lower in the peer rating study.

among sibling groups and yield more powerful tests of Sulloway's hypotheses.

Birth Order, Personality, and Self-Reports

If birth order were a powerful influence on personality, the failure of self-report inventories to detect it would imply a serious critique of self-report methods. Sulloway himself repeats an oft-made charge against self-reports and their vulnerability to social desirability biases: "How many firstborns are willing to describe themselves as 'callous' or 'unadventurous'?" (1996, p. 474).

It is therefore well to recall that there is vastly more evidence supporting the validity of self-reports than there is supporting effects of birth order. In addition to cross-observer correlations as high as .70 in large samples (e.g., McCrae, 1982), self-report data show impressive evidence of agreement across monozygotic twins (e.g., Jang, McCrae, Riemann, Angleitner, & Livesley, 1998) and across decades of the life span (Costa & McCrae, 1992b). Self-reports are clearly not perfect indicators of the underlying personality traits, but they are very good ones, and a failure to find birth-order effects in conventional self-reports must be taken seriously.

Indeed, these findings appear to point to a difficulty for the mediational role of personality in Sulloway's theory of scientific revolutions. His extensive historical research⁴ finds evidence for strong effects of birth order on behavior during times of radical scientific revolution, but the effects of birth order on personality traits are modest at best. Formal mediational models using multiple indicators of personality might be tested (Barron & Kenny, 1986), but informally, this pattern of findings suggests that there must be other ways in which birth order affects attitudes toward scientific revolutions, mechanisms not yet identified by Sulloway. It is very likely that scientific radicals like Darwin and Jung are high in Openness to Experience, and it may also be the case that they are laterborns, but birth order and personality appear to be largely independent predictors of creative lives.

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⁴ For a critical appraisal of Sulloway's historical research, see Townsend (1997).

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