

Settling the debate on birth order and personality

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Birth order is one of the most pervasive human experiences, which is universally thought to determine how intelligent, nice, responsible, sociable, emotionally stable, and open to new experiences we are (1). The debate over the effects of birth order on personality has spawned continuous interest for more than 100 y, both from the general public and from scientists. And yet, despite a consistent stream of research, results remained inconclusive and controversial. In the last year, two definitive papers have emerged to show that birth order has little or no substantive effect on personality. In the first paper, a huge sample was used to test the relation between birth order and personality in a between-family design, and the average effect was equal to a correlation of 0.02 (2). Now, in PNAS, Rohrer, Egloff, and Schmukle (3) investigate the link between birth order and personality in three large samples from Great Britain, the United States, and Germany, using both between- and within-family designs. The results show that birth order has null effects on personality across the board, with the exception of intelligence and self-reported intellect, where firstborns have slightly higher scores. When combined, the two studies provide definitive evidence that birth order has little or no substantive relation to personality trait development and a minuscule relation to the development of intelligence.

In the wake of these findings, one may ask why previous findings were inconclusive. To address this question, it is essential to understand the current state of research on birth order and personality, as well as the vital methodological contributions of the Rohrer et al. report (3).

Why Were Previous Studies of Birth Order Inconclusive?

Over the past two decades, hundreds of studies have produced widely ranging estimates of the effects of birth order on personality traits, falling anywhere between a correlation of 0.40 (1) and 0 (4). One possible explanation for these inconsistent findings

is the pervasive use of underpowered study designs using nonrepresentative population samples. Regarding the link between birth order and intelligence, the results are much more consistent, possibly because of the large representative samples used (5, 6). The Rohrer et al. (3) study addresses the power issues by using three large representative samples from three different countries. This is notable, because only one previous study (2) had tested the effect of birth order on

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personality in a large representative sample (in a between-family context). The Rohrer et al. (3) study replicates the latter findings, and extends them significantly by investigating cross-national patterns and by being the first study to ever explore within-family effects simultaneously with between-family effects in large representative samples. This study also replicates results on birth order and intelligence that have been previously found in large samples in both between- and within-family designs.

A second reason for the lack of consensus has to do with changing standards on what would be deemed the optimal method for testing birth-order effects on personality. Recently, some have argued that between-family designs were inadequate and that only within-family comparisons were up to the task of testing and revealing the role of birth order on personality. A between-family study design compares the personality traits and intelligence of a cross-section of unrelated people who have different birth ranks. In contrast, a

within-family design compares the personality traits and intelligence of first- and laterborn siblings from the same family. Between-family designs have been criticized primarily for not being able to adequately control for between-family differences in sibship size, genetic differences, and specific family practices (7). Ignoring these sources of variance is likely to produce biased estimates of birth-order effects. For example, sibship size, which represents the total number of siblings present in the family, is an important confound because firstborns (vs. laterborns) are more likely to be “found” in low sibships. Because wealthier more educated parents tend to have fewer children, firstborns tend to be overrepresented among families of a high socioeconomic status, the latter being related to personality and intelligence (8). Thus, any serious attempt at testing the effects of birth order on personality in a between-family design should statistically control for sibship size, which the study by Rohrer et al. (3) does.

The second criticism brought to between-family designs is that they do not reflect the within-family dynamics put forward by the evolutionary niche-finding model, whereby each child is trying to find a niche that has not yet been filled, to receive maximum investment from the parents (9). The study by Rohrer et al. (3) also addresses this issue by supplementing their between-family design with a within-family design (using a subsample of siblings from the same datasets).

Although within-family designs of birth order may be considered superior to between-family designs because they can adequately control for some confounding factors and because they reflect the within-family dynamics put forward by the evolutionary model (7), they also pose some problems. First, within-family designs, as they are currently used, tend to introduce a perfect age confound (10). Specifically, studies so far have tested all siblings at the same time, which means the firstborn was always older than the laterborns at the time of assessment. Given

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what we know about personality development and maturation (11), it is very possible that the firstborn only appears to be more conscientious, for example, because of being older. The study by Rohrer et al. (3) is the first study to date to ever address this issue when employing a within-family design by using age-adjusted *t*-scores.

The second criticism brought to within-family studies of birth order and personality is that they may suffer from demand effects or social stereotypes that may inflate the correlations (12). This problem is enhanced by the fact that the existing within-family research on birth order and personality has been limited by its use of a single rater from each family (4). Specifically, the single rater compares oneself against one's siblings, thus increasing the likelihood of perceiving a contrast. The study by Rohrer et al. (3) addresses this issue by using independent self-reports collected from each sibling. This is only the second study to ever use independent ratings in the within-family context, and the first to do so while using large representative samples.

Finally, Rohrer et al. (3) tested the robustness of their findings by conducting additional analyses. One important finding was that the results did not differ by gender, which is relevant because previous theories proposed that stronger effects may emerge among pairs of male siblings (13). Another important finding is that limiting the data to an age gap between siblings no larger than 5 y also did not change the results. This is important because previous theory (1) suggested that large age gaps make the effects disappear because there is no sibling competition within the family, but that strong effects should appear for age gaps smaller than 5 y. Rohrer et al. (3) did not find support for this idea, and their study is unique in its ability to test this hypothesis in a large sample.

In sum, by using large representative samples from three different countries, by assessing personality traits and intelligence in the same study, by using both between- and within-family designs, by using independent self-reports of personality in the within-family context, by taking into account important confounds (such as sibship size in the between-family context and age in the within-family context), and by testing the robustness of the findings in multiple additional analyses, this is the most methodologically sound birth order study to date (3). When combined with the prior study by Damian and Roberts (2), which was the largest test of birth order and personality relations, the conclusion is ines-

capable. Birth order is not an important factor for personality development.

Why Has Birth Order Persisted and Why Might it Still Persist as a Zombie Theory?

If science is truly self-correcting, we feel that the Rohrer et al. (3) study, when combined with the Damian and Roberts (2) study, should be the standard against which any new studies on birth order and personality are considered. The largest, most methodologically sophisticated studies in existence show little or no functional relation between birth order and personality. Newer data will have to provide evidence for much larger effects in equally large samples to counter the weight of the evidence.

We are not optimistic that opinions on the effect of birth order will change quickly for a variety of reasons. First, change in science happens slowly. It may take a few years for researchers to digest these findings. Second, some researchers will point out that some of the effects, though quite small in size, were still statistically significant. Although technically correct, this position fails theoretically because the idea of a birth-order effect on personality has always been proposed under the assumption that it could be seen within any given family. We know from past research that it is difficult for observers to detect personality differences that are smaller than one standard deviation in size (14). The largest birth-order effects we could find were on the order of a 10th of a standard deviation, with the average effect being equivalent to a 25th of a standard deviation. Even if the difference turns out to be statistically significant, it fails to reach a level that parents, relatives, siblings, or friends could notice. In that way, birth-order theory fails

despite the statistically significant effects demonstrated in these large studies.

Third, and possibly most interestingly, birth order is an idea that will probably never go away entirely because of its perfect confounding with age. This means that almost everyone has direct experience in which they see older children, who are firstborn, acting and behaving differently than younger children, who are laterborn. Because people are susceptible to weighing anecdotal information more heavily than data-driven findings (15), there will always be a tendency to think that birth-order effects exist because they will be confused with age differences. The interesting aspect of this perfect confound is that this is one circumstance where personal experience will be wrong and the truth can only be discovered through good scientific reasoning and investigation. The problem in this case is that data-driven findings are seldom as compelling as personal experience.

In conclusion, scientific evidence strongly suggests that birth order has little or no substantive relation to personality trait development and a minuscule relation to the development of intelligence. We commend Rohrer et al. (3) for conducting the most thorough and methodologically sophisticated examination of the relation between birth order and personality to date. We hope, that the cumulative evidence on birth order and personality is now compelling enough that the idea does not simply become undead (16), but is clearly laid to rest as a viable explanation for the fascinating differences we see across people and siblings in the typical ways in which they feel, think, and behave.

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