Research Article

BIRTH ORDER EFFECTS ON PERSONALITY AND ACHIEVEMENT WITHIN FAMILIES

Delroy L. Paulhus,[1] Paul D. Trapnell,[2] and David Chen[1]

[1]*University of British Columbia, Vancouver, British Columbia, Canada, and* [2]*Ohio State University at Mansfield*

Abstract—*We investigated birth order effects on personality and achievement in four studies (*N *= 1,022 families) including both student and adult samples. Control over a wide range of variables was effected by collecting within-family data: Participants compared their siblings (and themselves) on a variety of personality and achievement dimensions. Across four diverse data sets, first-borns were nominated as most achieving and most conscientious. Later-borns were nominated as most rebellious, liberal, and agreeable. The same results obtained whether or not birth order was made salient (to activate stereotypes) during the personality ratings. Overall, the results support predictions from Sulloway's niche model of personality development, as well as Zajonc's confluence model of intellectual achievement.*

The notion that birth order has an influence on personality fell into disrepute with the publication of Ernst and Angst (1983). Although they conceded small effects on intellectual achievement (e.g., Zajonc & Markus, 1975), Ernst and Angst disputed any link between birth order and personality traits. Recently, however, a reconsideration has been provoked by the publication of Sulloway's (1996) book, *Born to Rebel*. In applying his new theoretical perspective, Sulloway reaffirmed the view that adult personality differs systematically across birth order. According to Sulloway, the source of these differences is not, as traditionally argued, a differential parental treatment of children of different birth orders (e.g., Hilton, 1967). Instead, Sulloway's thesis was that birth order effects derive from a competition among siblings as they fight for a family niche.

First-borns (FBs), having the first choice of niche, attempt to please their parents in traditional fashion via success in school and responsible behavior. But, as other siblings arrive, FBs must deal with threats to their natural priority in the sibling status hierarchy. The resulting adult character is conscientious and conservative. Later-borns (LBs) must resist the higher status of FBs, while seeking alternative ways of distinguishing themselves in the eyes of their 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."

Sulloway's (1996) book resonated on a personal level with the general public while offering two forms of data to readers more persuaded by empirical evidence. One form was the systematic documentation of the social attitudes of historical figures as a function of their birth order. The second form of empirical support was a meta-analysis of the large number of studies on personality and birth order (see also Sulloway, 1995, in press). To great advantage, Sulloway organized the studies within the influential Five-Factor Model of personality, or "Big Five" (Goldberg, 1990). Using this organizational system, Sulloway's meta-analysis of the apparently chaotic literature exposed the predicted patterns. In particular, FBs were more conscientious but less agreeable and open to experience than LBs. Sulloway (in press) has followed up those analyses with new data that are consistent with his predictions.

Recent studies from other quarters vary from supportive (Davis, 1997; Salmon & Daly, 1998) to nonsupportive (Parker, 1998; Phillips, 1998). Jefferson, Herbst, and McCrae (1998) found mixed support: The few significant birth order differences obtained in the peer-rating data fell in the direction predicted by Sulloway. Self-ratings and spouse ratings on the same individuals, however, showed none of the predicted effects.

All these studies used between-family designs; that is, the individuals being compared with respect to birth order came from different families. Among the known confounds of between-family birth order data are social class,[1] parental personality, and sibship size. Unfortunately, a full range of appropriate controls is seldom available. Within-family data would provide a natural control procedure for all between-family differences, including their largest contributor—genetics (Dunn & Plomin, 1990). Therefore, within-family analyses should be more powerful (Sulloway, in press), as well as more valid (Rodgers, 1988). We expected they would confirm the following predictions: FBs would be perceived as more conscientious and achieving, and LBs would be perceived as more agreeable, liberal, and rebellious. Our prediction of superior FB achievement was also consistent with the well-known confluence model (e.g., Zajonc & Markus, 1975).

We collected four within-family data sets by asking respondents to compare themselves and their siblings on various personality and achievement dimensions. In Study 1, undergraduates from the University of California were asked to nominate the "rebel" and the "achiever" in their families. Study 2 applied the same methodology to a sample of undergraduates from the University of British Columbia while evaluating an alternative hypothesis. Study 3 extended the criterion variables to include the Big Five personality traits. Finally, Study 4 replicated Study 3 in a large sample of Vancouver adults.

STUDY 1: PRELIMINARY DATA FROM UNIVERSITY OF CALIFORNIA STUDENTS

Method

In fall 1996, a large, intact class (N = 164) was asked several questions as part of a class demonstration. Participation was voluntary. First, the students were asked to write down the birth order of the boys and girls in their family, including themselves (e.g., B-G-G). Then,

Address correspondence to Del Paulhus, Department of Psychology, University of British Columbia, Vancouver, Canada V6T 1Z4; e-mail: dpaulhus@cortex.psych.ubc.ca.

1. Moreover, controlling for socioeconomic status has the side effect of removing some ability variance. As a result, it is difficult to demonstrate correlations between ability-related variables (e.g., achievement, conscientiousness) and birth order. In short, between-family data entail an intractable confound.

Table 1. *Proportion of families with first-borns nominated as the achiever and later-borns nominated as the rebel (American students)*

		First-born achievers				Later-born rebels			
		Significance		Effect size		Significance		Effect size	
Sibship size	*n*	Observed-expected	Difference (O – E)	Phi	Odds ratio	Observed-expected	Difference (O – E)	Phi	Odds ratio
2	66	.65-.50	.15*	.30	3.48	.61-.50	.11*	.21	2.37
3	38	.37-.33	.04	.05	1.26	.71-.67	.04	.07	1.35
4	29	.35-.25	.10	.13	1.89	.83-.75	.08	.10	1.83
5–8	15	Varies	.10	.13	2.29	Varies	.09	.11	2.97
Combined	148		.11**	.19	2.28		.08*	.14	2.00

Note. N = 164 families; the 16 one-child families are not included in the table. The mean difference for sibship size 5–8 was calculated by weighting the difference for each sibship size by its frequency. Similarly, the combined values were weighted by frequency. Fisher *r-z* transformations were applied before combining phi's, and natural logs were applied before combining odds ratios. Significance tests were based on binomial approximation.
*p < .05, one-tailed. **p < .01, one-tailed.

they were asked to "put a square around the sibling who is most scholastically achieving, for example, gets the highest grades at school." School grades were cited so that young siblings could be reasonably compared with siblings of college age or older. Next, participants were asked to put a circle around the "rebel" in the family. "Use your own definition of the term rebel," they were told. It was emphasized that the same person could be nominated for both categories. Finally, participants were asked to indicate their own birth order.

Participants were not warned in advance that the topic of birth order was to be addressed in the course. Nor was it covered in the course textbook. Sulloway's (1996) book was not yet available. In short, there was no reason to believe that they had been influenced by the recent birth order research.

Results and Discussion

The results are presented in Table 1, separately for each sibship size but with sizes 5 to 8 pooled because of small frequencies. The 16 sibships of size 1 (i.e., only-children) were not used.

Significance tests

Note from Table 1 that, for every sibship size, the observed probability of an FB being nominated as the achiever was higher than expected by chance (i.e., the rate of FBs in that family size). Similarly, for every sibship size, the probability of an LB being nominated as the rebel was higher than expected by chance. Unfortunately, binomial tests reached significance only for sibship size 2; for other sibship sizes, the samples were too small to confirm the cell differences. When significance levels were combined (see Rosenthal & Rosnow, 1991, p. 504) across the four sibship sizes, however, the hypothesis was confirmed for both FB achievers (combined z = 2.40, p < .01) and LB rebels (combined z = 1.87, p < .05).

Effect sizes

For each cell of Table 1, effect size was calculated by constructing a 2 × 2 table of proportions (birth order by outcome). The rows of each 2 × 2 table corresponded to dichotomous birth order (FB vs. LB), and the columns to outcome (achiever vs. nonachiever or rebel vs. nonrebel). Calculation of the LB values required a correction for number of LBs in each sibship size. Consider, for example, the rate of achievers in sibship size 3. The rate for FBs was .368 (rounded to .37 in Table 1), and therefore an LB was the achiever in .632 (1.00 – .368) of the families. Because there are 2 LBs in this sibship size, however, the rate of achievers among LBs was .316 (.632/2). The values for the nonachiever column of the 2 × 2 table were the complements of .316 and .368, namely, .684 and .632.

From such 2 × 2 tables, we computed our first effect-size index, phi, the product-moment correlation for two dichotomous variables (see Table 1).[2] This index is intuitively appealing because it represents the correlation between birth order and nomination as achiever (or rebel). Averaged over all birth orders, the mean phi was .19 between birth order (favoring FBs) and nomination as the achiever. Similarly, the mean phi was .14 between birth order (favoring LBs) and nomination as the rebel.

Although intuitively appealing, phi coefficients are not ideal for combining across conditions (Fleiss, 1994). An alternative effect size—one that remains constant under changes in marginal frequencies—is the odds ratio, also included in Table 1. The combined odds ratio for achievement can be interpreted as meaning that the relative proportion of achievers to nonachievers is 2.28 times higher among FBs than among LBs. Similarly, the mean odds ratio for rebels (2.00) indicates that the proportion of rebels to nonrebels is twice as high in LBs as it is in FBs.

FBs in the class

Recall that we had also asked participants to indicate what their own birth order was. The rate of FBs in our sample (.44) was significantly higher than the rate expected by chance (.34), $\chi^2(1, N = 164) = 7.0$, p < .01. The chance rate refers to the proportion of FBs that would be expected in our sample of participants had they been randomly selected from the families they reported on.

2. In this type of table, phi corresponds to the binomial effect-size display (see Rosenthal & Rosnow, 1991, p. 281). The values may be interpreted as the differences in rates of nominations of FBs and LBs.

Discussion

Overall, our results are consistent with previous evidence that FBs are more achieving and that LBs are more rebellious. One might wonder, though, whether the effects we found are limited to the highly selected student body at the University of California, Berkeley, campus. Another potential limitation of this study was the susceptibility to contamination by stereotypes about birth order; that is, our respondents may have had preconceived notions about birth order and personality that influenced their nominations of achievers and rebels.

STUDY 2: SALIENCE STUDY WITH UNIVERSITY OF BRITISH COLUMBIA STUDENTS

These potential limitations were addressed in Study 2 by collecting a data set that differed in several respects from the set in Study 1. First, the data were collected at a less selective university in another country, namely, the University of British Columbia in Vancouver, Canada. Second, the salience of birth order during the personality ratings was manipulated. Although some participants were questioned exactly as in Study 1, others were asked to make their nominations by initial only, and only afterward were asked to specify the birth order of the nominees.

Method

Data were collected in four intact classes (total $N = 395$). As in Study 1, participants were asked to nominate the "scholastic achiever" and the "rebel in the family." They were advised that the same person could be nominated for both. In two classes, birth order was made salient during nominations (high-salience condition); in two other classes, the topic of birth order was not made salient during nominations (low-salience condition). To control for possible differences in morning and afternoon classes, we counterbalanced the salience conditions across time of day. As in Study 1, none of the classes was warned in advance that the topic of birth order would be covered in the course.

High-salience condition

As in Study 1, participants ($n = 217$) were asked to write down the birth order of the boys and girls in their family (e.g., B-G-G). They were then asked to indicate which of the children was the scholastic achiever and which was the rebel.

Low-salience condition

Participants ($n = 178$) were asked to write down the initials of the scholastic achiever and the rebel among the children in the family. Then they were asked to write down the birth order of each of the nominees and the total number of children. In this condition, there was no particular reason for participants to reflect on birth order and its effects while they were doing the nominations.

Results and Discussion

The proportions of nominees for each category were again calculated within each family size. The two salience conditions were compared cell by cell using *z* tests for proportions. There were no significant differences on either dependent variable between the high- and low-salience conditions (all zs < 1.40). The pooled results, displayed in Table 2, closely resemble those from Study 1. In particular, the effect sizes in Table 2 are remarkably similar to those in Table 1. In terms of phi coefficients, the mean effect size for FB versus LB achievers was .19 (identical to the value in Study 1). The comparable figure for LB versus FB rebels was .18 (compared with .14 in Study 1). The odds ratios were also similar across the two studies.

This consistency suggests that the results of Study 1 were not an artifact of an idiosyncratic sample. The predicted pattern emerged just as clearly at the Canadian university as at the American university. Because the sample sizes were larger than those in Study 1, however, seven of eight cells reached significance ($p < .07$) on a binomial test. Combined across sibship size, the effects were significant for both FB achievers ($p < .01$) and LB rebels ($p < .01$). In terms of effect sizes, the two weakest associations appeared for sibship size 3 (phi coefficients of .10 and .07).

Table 2. *Proportion of families with first-borns nominated as the achiever and later-borns nominated as the rebel (Canadian students)*

		First-born achievers				Later-born rebels			
		Significance		Effect size		Significance		Effect size	
Sibship size	*n*	Observed-expected	Difference (O – E)	Phi	Odds ratio	Observed-expected	Difference (O – E)	Phi	Odds ratio
2	165	.63-.50	.13**	.26	2.91	.64-.50	.14**	.27	3.06
3	115	.40-.33	.07*	.10	1.56	.71-.67	.05	.07	1.38
4	64	.39-.25	.14**	.19	2.52	.88-.75	.13**	.17	2.88
5–8	25	Varies	.12*	.15	2.49	Varies	.12*	.14	5.27
Combined	369		.11**	.19	2.31		.11**	.18	2.45

Note. $N = 395$ families; the 26 one-child families are not included in the table. The mean difference for sibship size 5–8 was calculated by weighting the difference for each sibship size by its frequency. Similarly, the combined values were weighted by frequency. Fisher *r-z* transformations were applied before combining phi's, and natural logs were applied before combining odds ratios. Significance tests were based on binomial approximation.
*$p < .07$, one-tailed. **$p < .01$, one-tailed.

STUDY 3: STUDENT TAKE-HOME PACKAGE

The two dependent variables studied up to this point—rebelliousness and intellectual achievement—capture a rather limited range of human personality. Broad trait taxonomies typically reveal the five-dimensional personality space known as the Big Five, or the Five-Factor Model (see Goldberg, 1990; Trapnell & Wiggins, 1990).

Indeed, Sulloway (1995, in press) profited considerably from organizing his findings in terms of the Big Five. He was able to show that FBs were higher on Conscientiousness and LBs were higher on Openness to Experience and Agreeableness. Accordingly, in Study 3, we expanded our range of questions to tap four of the Big Five traits. Neuroticism was omitted because it has the weakest effects (Sulloway, in press).

We asked participants to rank themselves and their siblings on seven variables. The terms *rebellious* and *scholastically achieving* were included to correspond to the variables used in Studies 1 and 2. Factor 1 of the Big Five (Extraversion) was represented by *socially confident*, one of its highest loading items (Trapnell & Wiggins, 1990). Factor 2 (Agreeableness) was represented by *agreeable*, and Factor 3 (Conscientiousness) by *conscientious*. Factor 5 (Openness to Experience) was represented by *rebellious*, *creative*, and *liberal* (see Trapnell, 1994).

Based on the literature cited, we predicted that FBs would be rated as more achieving and conscientious. We also predicted that LBs would be perceived as more liberal, rebellious, and agreeable. Creativity (despite its association with Openness) and extraversion have shown weak or mixed results in the literature (Sulloway, 1996), so we made no predictions about those two variables.

Method

The data collection (N = 203) differed from the procedure in Studies 1 and 2 in that (a) rather than answering questions in class, students took questionnaire packages home to complete and (b) rather than nominating one family member for each variable, students ranked all family members on each variable.

Results

The results are summarized in Table 3. Data for the 9 only-children are not included in the table. For simplicity and consistency with earlier tables, we retained our dichotomous scoring of all dependent variables. On agreeableness, for example, we assigned a score of 1 to the individual who was nominated as highest in the family; all others were assigned a score of 0.

The asterisks in the row showing mean differences in Table 3 indicate that all hypotheses were supported. Moreover, the pattern is consistent across sibship sizes. That is, FBs were nominated as most conscientious as well as most achieving more frequently than expected by chance. In contrast, LBs were more frequently nominated as most liberal, agreeable, and rebellious. The combined significance levels were significant for all predicted outcomes. Neither of the variables for which we made no predictions (creativity and extraversion), however, showed significance in either direction. Effect sizes, as indexed by phi coefficients, were highest for conscientious (.20) and liberal (.18).

Discussion

Two additional potential artifacts must be considered as explanations of the observed birth order differences in Studies 1 through 3. The finding that LBs were more likely to be nominated as rebels may be an artifact of the age range of the raters. The youngest siblings in families of students 19 to 21 years old are likely to be teenage or younger. In other words, the LBs are likely to be of an age for which rebelliousness is commonplace. As teenagers grow out of this period,

Table 3. *Proportion of families consistent with each hypothesis: Study 3*

		Favor first-borns		Favor later-borns			No prediction	
Sibship size	*n*	Scholastic achiever	Conscientious	Liberal	Rebellious	Agreeable	Extraverted	Creative
2	107	.54	.65	.61	.56	.59	.52	.51
		(.04)	(.15)*	(.11)*	(.06)	(.09)	(.02)	(.01)
3	61	.43	.34	.77	.74	.74	.34	.69
		(.09)	(.01)	(.10)*	(.07)	(.07)	(.01)	(.02)
4	18	.39	.39	.78	.78	.78	.33	.67
		(.14)	(.14)	(.03)	(.03)	(.03)	(.08)	(–.08)
5	4	.25	.25	1.00	.50	.50	.00	.50
		(.05)	(.05)	(.20)	(–.30)	(–.30)	(–.20)	(–.30)
6	4	.25	.50	1.00	1.00	.75	.25	1.00
		(.08)	(.33)	(.17)	(.17)	(–.08)	(.08)	(.17)
Mean difference from chance		(.07)*	(.11)*	(.10)*	(.06)*	(.07)*	(.02)	(.00)
Mean effect size (phi)		.11	.20	.18	.10	.13	.04	.01

Note. N = 203 families; the 9 one-child families are not included in the table. Differences from chance are shown in parentheses. They were calculated so that positive values indicate differences consistent with the hypotheses. The column means were derived after weighting the entries by sample size. Some of the differences from chance may appear faulty because the values in the table are rounded off.
*$p < .05$, one-tailed.

Table 4. *Proportion of adult families consistent with each hypothesis: Study 4*

		Achievement			Big-Five-related traits				
		Favor first-borns				Favor later-borns			No prediction
Sibship size	*n*	Scholastic	Financial	Prestige	Conscientious	Liberal	Rebellious	Agreeable	Extraverted
2	55	.55	.55	.53	.60	.56	.60	.58	.55
		(.05)	(.05)	(.03)	(.10)	(.06)	(.10)	(.08)	(.05)
3	60	.38	.45	.40	.50	.88	.78	.77	.33
		(.05)	(.12)*	(.07)	(.17)*	(.21)	(.11)*	(.10)	(.00)
4	48	.25	.33	.29	.31	.83	.73	.83	.23
		(.00)	(.08)	(.04)	(.06)	(.08)	(–.02)	(.08)	(–.02)
5	33	.36	.27	.30	.24	.92	.94	.82	.21
		(.16)*	(.07)	(.10)	(.04)	(.12)	(.14)*	(.02)	(.01)
6	44	.39	.23	.32	.25	1.00	.93	.82	.11
		(.22)*	(.06)	(.15)*	(.08)	(.17)	(.10)*	(–.02)	(–.05)
Mean difference from chance		(.09)*	(.08)*	(.07)*	(.10)*	(.14)*	(.09)*	(.06)*	(.00)
Mean effect size (phi)		.12	.11	.10	.15	.24	.13	.10	.01

Note. $N = 260$ families; the 20 one-child families are not included in the table. Differences from chance are shown in parentheses. They were calculated so that positive values indicate differences consistent with the hypotheses. Column means were derived after weighting the entries by sample size.
*$p < .05$, one-tailed.

maturity-related birth order differences should wane (see Harris, 1998). Although such a maturity artifact is plausible in student data, it would be an implausible explanation if similar differences appeared in adult data.

Similarly, the finding that FBs are more scholastically achieving than LBs may follow from the age range of our raters. The LBs that were rated, being teenagers or younger, may have had little opportunity to exhibit intellectual achievement—at least, they may not have had as much opportunity as the FBs. Measurements taken later in life might not show the FB advantage. Study 4 was designed to overcome these possible artifacts in the student samples of Studies 1 through 3.

STUDY 4: VANCOUVER ADULT TAKE-HOME PACKAGE

Questionnaires were administered to a large sample of adults who were older than 40 years of age. These adults were asked to provide personality rankings of their own families of origin. Because of the age restriction, the possible artifacts attributable to student samples should have been eliminated. For one thing, all the rated individuals were well beyond the "rebellious" teenage years and were, therefore, more comparable. And by age 30, an individual's intellectual achievement (as well as other forms of achievement) should be evident. The replication of our findings in this older generation would boost our confidence in the robustness of these birth order effects.

Method

A sample of 309 adults was solicited by asking university students to take home a questionnaire package to be completed by their parents or other adults over 40. A returned questionnaire was excluded from analysis if any of the participant's siblings were less than 30 years of age. A total of 260 questionnaires was usable. Ages of siblings ranged from 30 to 61 ($M = 44.2$, $SD = 9.9$). Education ranged from 6 years to 20 years, with a median of 12 years.

The package of questionnaires was similar to that used in Study 3. One change was the inclusion of three forms of achievement (*scholastic, financial, prestige*) instead of one. The term *extraverted* was used to represent Factor 1 (Extraversion), and the term *reliable* was used to represent Factor 3 (Conscientious). Finally, *creative* was dropped. It was made clear that respondents were to rate the siblings in their families of origin, not their own children.

Results and Discussion

The results are summarized in Table 4. They appear remarkably similar to the data obtained with college students. All three forms of achievement showed the predicted pattern, and the findings for the other variables replicated earlier studies. The combined significance levels for the seven predictions were all significant. Note from Table 4 that the largest mean effect sizes were .15 for conscientious (favoring FBs) and .24 for liberal (favoring LBs).

GENERAL DISCUSSION

As a whole, the studies reported here confirm the birth order differences predicted by the family-niche model of personality development (Sulloway, 1996), as well as the confluence model of intellectual development (e.g., Zajonc & Markus, 1975).[3] Given the mixed support from recent between-family studies, our success likely derives from

3. Of course, our data are mute with respect to the dynamics of these models, and are consistent with other theories (Rodgers, 1988).

our use of the powerful within-family methodology. This additional power follows from the built-in control over a variety of between-family differences, namely, social class, family size, and, especially, genetics.

Big Five Personality Traits

The results for the personality traits largely followed the birth order pattern emerging from Sulloway's (1995) meta-analysis. The weakest effects were for Extraversion, one of the two weakest factors in Sulloway's summary. Clear differences were found, however, in Conscientiousness, Agreeableness, and two of our indicators of Factor 5 (Openness to Experience), namely, liberalism and rebellion. Another indicator of Openness, creativity, did not show significant differences. This null finding is consistent with Sulloway's (1996) historical data, as well as data he has collected on contemporary samples (Sulloway, in press). Because intelligence is confounded with openness in person perception (Trapnell, 1994), attributions of creativity combine one trait favoring FBs with another trait that favors LBs. This combination has a null relation with birth order.

Intellectual Achievement

Our finding that FBs are perceived as more intellectually achieving than LBs is consistent with previous work using concrete indicators (e.g., Paulhus & Shaffer, 1981; Zajonc & Markus, 1975). The results held whether intellectual achievement was operationalized as school grades or ratings on intellectual achievement. This effect was not restricted to intellectual achievement, but extended to financial and prestige achievement. Future research showing a similar pattern for unconventional forms of achievement would support Zajonc's claims for a general intellect advantage in FBs. Finding that this pattern reversed (or at least diminished) for unconventional forms of achievement would support Sulloway's theory that LB achievement typically has a radical flavor.

Needless to say, perceptions of intellectual achievement are not equivalent to concrete indicators (Davis, 1997; Paulhus, Lysy, & Yik, 1998). The former incorporate perceptions of conscientiousness, which may inflate the association with FBs (Sulloway, in press).

Controlling Artifacts

We dealt with several threats to internal validity in Studies 2 through 4. Study 2 revealed no differences between an administration condition in which birth order was made salient and a condition in which birth order was not mentioned until after the sibling nominations had been made. Even without the direct activation of stereotypes, the predicted effects still obtained.

Perhaps the stereotypes run deeper than that: They may have already had a permanent impact on the way our subjects perceived their brothers, their sisters, and themselves. If so, this impact must endure, because our adult sample showed the same pattern and size of birth order effects as much younger samples, despite (presumably) living apart from siblings for many years. Yet the very stability of these perceptions across the life span undermines the accusation that they are artifactual and makes a stereotype perspective difficult to distinguish from standard conceptions of personality. The stereotype argument implies that the birth order differences reported by our participants develop from false attributions that, nevertheless, have a permanent, substantial impact on self-conception akin to a self-fulfilling prophecy. The argument further requires that, throughout their lives, siblings systematically ignore bona fide evidence of their brothers' and sisters' traits in favor of erroneous impressions fostered by maturity-related or age-related roles and stereotypes within their families. To us, it seems far more reasonable to believe that such stereotypes exist because they are true—that is, birth order does influence personality development—rather than to believe that the stereotypes, the self-perceptions, and the peer perceptions are all faulty.

The achievement results seem least assailable for two reasons. First, the facts about which adult sibling achieved the most or which child sibling received the best grades should be relatively concrete and objective. We can see no self-serving motivation for our participants to have named the FB as the achiever. Only a fraction were nominating themselves, so allegations of self-serving responding cannot be sustained (Paulhus, 1991). Second, these nominations are backed up by a concrete indicator in Study 1: The proportion of FBs (44%) was significantly higher than chance (34%). Although this comparison is vulnerable to the usual confounds of between-family designs (Rodgers, 1988), this concrete indicator converges with the within-family indicators to provide mutual support.

The age restriction in our first three studies raised the possibility of two artifacts: The first was that LB siblings of college students were less achieving because they had less opportunity to display achievement behavior. The second was that these LBs were perceived as rebellious because many were experiencing the (notoriously rebellious) teenage years. This limitation was overcome in Study 4 by sampling respondents age 40 and up. Given that the lowest reported sibling age was 30, even the youngest LBs in this study had lived sufficiently long to display intellectual achievement. Moreover, these LBs were well past the inherently rebellious teenage years.

Effect Sizes

Effect sizes for the FB-versus-LB comparisons varied in a coherent fashion across the dimensions we assessed. Averaged over all four studies, the effect size for liberalness was strongest (phi = .21). The comparable figure for intellectual achievement was .16. These figures are likely to be underestimates because we used only single-item indicators for all our variables. For an index combining all five predictions in Study 3, the effect size was .24—a substantial figure on a par with that reported by Sulloway (in press).

Some critics might argue that our within-family design is too powerful in the sense that it detects birth order differences that are trivial in daily life (Ernst & Angst, 1983; Harris, 1998; Jefferson et al., 1998). The between-family studies, which found weak results at best, are said to be more representative of life beyond the family of origin. But even those critics concede the likelihood that birth order has an impact (a) during the developmental years and (b) during continuing interactions with one's family of origin. These effects alone are reason to take our birth order effects seriously. Certainly, we can rule out the claim that birth order effects are "parent-specific" (Ernst & Angst, 1983), although they may be "family-context-specific."

Another reason for taking our results seriously is the emerging consensus (e.g., Bouchard, 1997; Dunn & Plomin, 1990; Jang, McCrae, Angleitner, Riemann, & Livesley, 1998; Rowe, 1997) that (a) between-family differences in personality and intellect are dominated

by genetic variance and (b) the environmental variance is largely within family. It follows that social scientists interested in intervention must turn their attention to processes that operate to differentiate the children within the same family.

Note, finally, that any single within-family source, such as birth order or peer effects (Harris, 1998), may seem modest relative to the between-family genetic variance. Yet even modest effect sizes can translate into dramatic social consequences (Rosenthal & Rosnow, 1991; Sulloway, in press). And it is precisely the within-family effects that are most amenable to the benevolent tools of psychology.

Acknowledgments—We thank Jeff McCrae, Dan Ozer, Dave Shaffer, and Frank Sulloway for comments on an earlier draft. Thanks to Jennifer Beer, Paul Wehr, and Kim Barchard for assistance with the analyses. This research was supported by a grant to the senior author from the Social Sciences and Humanities Research Council of Canada.

REFERENCES

Bouchard, T.J. (1997). The genetics of personality. In K. Blum, E.P. Noble, R.S. Sparkes, T.H.J. Chen, & J.G. Cull (Eds.), *Handbook of psychiatric genetics* (pp. 273–296). Boca Raton, FL: CRC Press.

Davis, J.N. (1997). Birth order, sibship size, and status in modern Canada. *Human Nature, 8*, 205–230.

Dunn, J., & Plomin, R. (1990). *Separate lives: Why siblings are so different.* New York: Basic Books.

Ernst, C., & Angst, J. (1983). *Birth order: Its influence on personality.* New York: Springer-Verlag.

Fleiss, J.L. (1994). Measures of effect size for categorical data. In H. Cooper & L.V. Hedges (Eds.), *Handbook of research synthesis* (pp. 245–260). New York: Russell Sage Foundation.

Goldberg, L.R. (1990). An alternative "description of personality": The Big-Five factor structure. *Journal of Personality and Social Psychology, 59*, 1216–1229.

Harris, J.R. (1998). *The nurture assumption: Why children turn out the way they do.* New York: Free Press.

Hilton, I. (1967). Differences in the behavior of mothers toward first-born and later-born children. *Journal of Personality and Social Psychology, 7*, 282–290.

Jang, K.L., McCrae, R.R., Angleitner, A., Riemann, R., & Livesley, W.J. (1998). Heritability of facet-level traits in a cross-cultural twin sample: Support for a hierarchical model of personality. *Journal of Personality and Social Psychology, 74*, 1556–1565.

Jefferson, T., Herbst, J.H., & McCrae, R.R. (1998). Associations between birth order and personality traits: Evidence from self-reports and observer ratings. *Journal of Research in Personality, 32*, 498–509.

Parker, W.D. (1998). Birth order effects in the academically talented. *Gifted Child Quarterly, 42*, 29–36.

Paulhus, D.L. (1991). Measurement and control of response bias. In J.P. Robinson, P.R. Shaver, & L.S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 17–59). San Diego: Academic Press.

Paulhus, D.L., Lysy, D.C., & Yik, M.S.M. (1998). Self-reports of intelligence: Are they useful as proxy IQ tests? *Journal of Personality, 66*, 525–554.

Paulhus, D.L., & Shaffer, D.R. (1981). Sex differences in the impact of number of older and younger siblings on scholastic aptitude. *Social Psychology Quarterly, 44*, 363–368.

Phillips, S.M. (1998, February). *Birth order and personality—Not again?* Paper presented at the annual meeting of the Eastern Psychological Association, Boston.

Rodgers, J.L. (1988). Birth order, SAT, and confluence: Spurious correlations and no causality. *American Psychologist, 43*, 476–477.

Rosenthal, R., & Rosnow, R.L. (1991). *Essentials of behavioral research: Methods and data analysis* (2nd ed.). New York: McGraw-Hill.

Rowe, D.C. (1997). Genetics, temperament, and personality. In R. Hogan, J.A. Johnson, & S.R. Briggs (Eds.), *Handbook of personality psychology* (pp. 367–386). San Diego: Academic Press.

Salmon, C.A., & Daly, M. (1998). The impact of sex and birth order on familial sentiment: Middleborns are different. *Evolution and Human Behavior, 19*, 299–312.

Sulloway, F.J. (1995). Birth order and evolutionary psychology: A meta-analytic overview. *Psychological Inquiry, 6*, 75–80.

Sulloway, F.J. (1996). *Born to rebel: Birth order, family dynamics, and creative lives.* New York: Pantheon.

Sulloway, F.J. (in press). Birth order, sibling competition, and human behavior. In P.S. Davies & H.R. Holcomb (Eds.), *The evolution of minds: Psychological and philosophical perspectives.* Boston: Kluwer Academic.

Trapnell, P.D. (1994). Openness versus intellect: A lexical left turn. *European Journal of Personality, 8*, 273–290.

Trapnell, P.D., & Wiggins, J.S. (1990). Extension of the Interpersonal Adjective Scales to include the Big Five dimensions of personality. *Journal of Personality and Social Psychology, 59*, 781–790.

Zajonc, R.B., & Markus, G.B. (1975). Birth order and intellectual development. *Psychological Review, 82*, 74–88.

(RECEIVED 7/9/98; ACCEPTED 11/24/98)