

Birth order, conscientiousness, and openness to experience Tests of the family-niche model of personality using a within-family methodology

Matthew D. Healey^{a,*}, Bruce J. Ellis^b

^aDepartment of Psychology, University of Canterbury, Christchurch, New Zealand

^bJohn and Doris Norton School of Family and Consumer Sciences, University of Arizona, Tucson, AZ, USA

Initial receipt 12 December 2004; final revision received 19 May 2006

Abstract

We investigated differences between firstborn and secondborn siblings on major dimensions of personality, in the context of the proposal of Sulloway [Sulloway, F. J. (1996). *Born to rebel: Birth order, family dynamics and creative lies*. New York: Pantheon] that personality is influenced by the specialized niches siblings adopt in the quest for access to parental resources. Using a within-family methodology, we tested two predictions from Sulloway's model: that firstborns are more achieving and conscientious than secondborns and that secondborns are more rebellious and open to new experiences than firstborns. To test an alternative prenatal hypomasculinization theory proposed by Beer and Horn [Beer, J. M., & Horn, J. M. (2000). The influence of rearing order on personality development within two adoption cohorts. *Journal of Personality*, 68, 769–819], we also examined the size of birth-order effects in sister–sister versus brother–brother pairs. The hypothesized effects of birth order on personality were found in both Study 1 ($n=161$ sibling pairs) and Study 2 ($n=174$ sibling pairs) and provided support for Sulloway's family-niche model. No support was found for Beer and Horn's hypomasculinization model.
© 2007 Elsevier Inc. All rights reserved.

Keywords: Birth order; Personality; Conscientiousness; Openness to experience; Within-family research design; Siblings

1. Introduction

The influence of birth order on personality is an area of long-standing interest in psychology, generating over 2000 studies in the last 75 years (Beer & Horn, 2000; Sulloway, 2001). On the basis of a major review of 40 years of work on the topic, however, Ernst and Angst (1983) concluded that most birth-order effects on personality were methodological artifacts that disappeared when confounds such as socioeconomic status and family size were taken into account.

Sulloway (1996, 2001) strongly challenged this conclusion by offering a new theoretical perspective on birth order and conducting meta-analyses of the birth-order literature. Sulloway argued that competition between siblings for parental investment leads children to cultivate family niches that are associated with birth order. Firstborns tend to

receive greater investment from their parents and have their pick of niches within the family system. They tend to align their interests with their parents and show a strong motivation to fulfill parental expectations, often serving as surrogate parents for their younger siblings. Consequently, firstborns tend to be more amenable to their parents' wishes, values, and standards than their laterborn siblings, as well as more conscientious, responsible, ambitious, organized, and academically successful, more traditional and conservative, and more likely to endorse conventional morality.

The most pressing developmental challenge for laterborns, according to Sulloway, is to find a valued family niche that is not already occupied by an older sibling. Laterborns tend to identify less with their parents and are often subject to domination or bullying by older siblings, which is hypothesized to make them more open to experience than firstborns, and more likely to empathize with the downtrodden, to be supportive of egalitarian social change, to question the status quo, to resist authority and pressure to conform, and to be the “rebels” in the family.

* Corresponding author.

E-mail address: mdh49@it.canterbury.ac.nz (M.D. Healey).

Sulloway's theorizing ignited a new wave of research on birth order and personality, with some studies supportive of the theory (e.g., Davis, 1997; Eckstein, 2000; Paulhus, Trapnell, & Chen, 1999; Rohde et al., 2003; Saroglou & Fiasse, 2003; Zweigenhaft, 2002; Zweigenhaft & Von Ammon, 2000) and others not (e.g., Beer & Horn, 2000; Freese, Powell, & Steelman, 1999; Jefferson, Herbst, & McCrae, 1998; Michalski & Shackelford, 2001). A possible reason for this inconsistency is that Sulloway's (1996, 2001) theory is more nuanced than it first appears and specifies a number of intervening factors (e.g., birth intervals, biological family composition, quadratic effects on personality differentiation within families) that influence the relation between birth order and personality development. Most previous research has sought to test general hypotheses about differences between firstborns and laterborns rather than specific predictions about the relationships between birth order and personality in the context of the intervening factors specified by the theory.

First and foremost, Sulloway's theory is about differences within families: Siblings in different birth-order positions generally differ in size, strength, and status within the family, and these disparities lead siblings to adopt different strategies for maximizing their parents' investment in their welfare. In a series of articles, Rodgers (1988, 2001) and Rodgers, Cleveland, Van den Oord, and Rowe (2000) have argued forcefully that within-family data must be used to evaluate theories of within-family processes and that between-family data are so riddled with potential selection biases as to be virtually useless. Consistent with this critique, within-family research designs, where individuals rate the personalities of their own family members, typically yield significant birth-order effects, whereas between-family designs typically do not (Ernst & Angst, 1983; Paulhus et al., 1999; Sulloway, 2001). Within-family designs avoid confounding effects associated with differences between families, such as socioeconomic status, race, and genetics.

Sulloway (1996, 2001) posits that competition between siblings promotes mutual differentiation as a way of avoiding direct conflicts and that siblings who are farther apart in age and ordinal position in the family have less need to compete. Wide birth intervals, therefore, may mitigate birth-order effects on personality. The other side of the coin is that narrow birth intervals may also alter systematic patterns of differentiation between siblings because the environmental cues that trigger birth-order strategies (e.g., sibling differences in physical and cognitive development) are often absent. Sulloway (1996, Figure 5.2) suggests that the effects of birth order on sibling strategies are greatest among offspring who are approximately 2 to 5 years apart in age. Furthermore, Sulloway (1996, 2001) states that processes of sibling deidentification (in which children differentiate themselves from their nearest-age siblings) can produce zigzag patterns of personality within families where, for example, differences between firstborns and secondborns and between secondborns and thirdborns are

greater than differences between firstborns and thirdborns (see Paulhus et al., 1999; Salmon & Daly, 1998; Saroglou & Fiasse, 2003). Thus, the clearest and most informative tests of Sulloway's theory may involve comparisons between firstborns (who should be most parent-identified) and secondborns (who should deidentify from firstborns and parents) in the same family, with birth intervals of approximately 2 to 5 years.

Finally, Sulloway (1996) emphasizes the importance of functional birth order (or rearing order), which may change due to sibling mortality, adoption, remarriage, or other events. The effect of other children (whether full sibling, half sibling, or stepsibling) leaving or entering the family environment at crucial times during development could disturb important environmental cues that covary with functional birth order. Furthermore, in blended families, where younger siblings are the genetic offspring of both parents, but older half siblings are not, the younger siblings are likely to receive higher-quality parental investment (see Daly & Wilson, 1998) and may therefore occupy more central and secure positions in the family than the older half siblings and, thus, be more likely to align themselves with parental interests and authority. In sum, changes in functional birth order and blending of families during childhood introduce confounds that preclude clear testing of Sulloway's theory. A strong test requires comparisons between siblings who were born and raised together in the same home in stable birth-order positions.

Beer and Horn (2000) have proposed an alternative theory of the effects of birth order on personality. Drawing on the observation that the number of older brothers is a positive predictor of male homosexuality and the theory that this effect is mediated by progressive immunization of mothers to the H-Y antigen by each succeeding male fetus (see Blanchard & Klassen, 1997), Beer and Horn suggest that men with older brothers are "hypomasculinized" in their personality characteristics and that this explains certain parallels between sex differences and birth-order effects, such as the fact that firstborns and males manifest higher levels of leadership and competitiveness, whereas laterborns and females exhibit more cooperation and flexibility (Sulloway, 1996). If this hypothesis is correct, then differences in personality between firstborn and secondborn brothers should exceed those between firstborn and secondborn sisters because female fetuses do not cause immunization of mothers to the H-Y antigen.

The main goal of the current research was to test the hypotheses, derived from Sulloway's (1996) theory of birth order and personality, that (a) firstborns are more Conscientious than laterborns (e.g., more responsible, organized, and academically achieving) and (b) laterborns are more Open to Experience than firstborns (e.g., more rebellious, unconventional, and liberal). Following Paulhus et al., (1999) and Sulloway (2001), we collected two within-family data sets by asking participants to rank-order themselves and their siblings with respect to certain

personality characteristics. Statistical analyses compared the characteristics of firstborns and secondborns who were raised together in the same household and were 18 months to 5 years apart in age. To examine the alternative theory of Beer and Horn (2000), we also compared birth-order effects in sister–sister versus brother–brother pairs.

2. Study 1: Effects of birth order on conscientiousness and openness to experience: differences between siblings in a university sample

2.1. Method

As part of an in-class demonstration of experimental methods, students in the second-year Personality Psychology class at the University of Canterbury completed questionnaires on birth order and personality. Participants first listed all siblings, including themselves, in order of birth and provided their siblings' ages, sex, relation to respondent (full sibling, half sibling, or stepsibling), and coresidence (i.e., whether each sibling was born and raised in the same household as the respondent). Next, participants were asked to rank-order their siblings on six personality traits: "rebellious," "nonconformist," "open to new experience," "responsible/organized," "scholastically achieving," and "liberal." Participants returned 209 birth-order questionnaires. Of these, 161 (or 77%) were completed correctly and matched the selection criteria used in this research. Although siblings of any birth order could complete the questionnaire, the rated firstborn and secondborn siblings in the family had to be 18 months to 5 years apart in age, and all siblings had to have been born and raised in the same family with no intervening stepsiblings or half siblings. For the 161 participants, the average age of all firstborns and secondborns in their families was 25.6 (S.D.=9.4) and 23.0 (S.D.=9.3), respectively.

2.2. Results

Alpha reliability coefficients and item–total correlations were computed to examine whether the individual markers of Openness to Experience (rebellious, nonconformist, open to new experience, and liberal) and Conscientiousness (responsible/organized and scholastically achieving) could be aggregated. For Openness to Experience, all items except "liberal" (item–total correlation=.16) had item–total correlations above .30. "Liberal" was thus excluded from the composite measure (increasing α from .52 to .58). For Conscientiousness, both items had item–total correlations above .30 (α =.39).

For each trait marker, the firstborn sibling received a rank of 1 if he or she was ranked higher than the secondborn and a rank of 0 if he or she was ranked lower than the secondborn. Composited measures of Openness to Experience and Conscientiousness were computed by averaging these rankings across the relevant items. For Openness to Experience, for example, a firstborn sibling rank-ordered as

"1" on "nonconformist," "1" on "openness to new experience," and "0" on "rebellious" would receive an Openness to Experience score of .67. For the composited variables, scores of .5 represent the null hypothesis (wherein firstborns and secondborns receive the same average ratings). For the Conscientiousness composite, scores *above* .5 were in the direction of the hypothesis (i.e., firstborns received higher ratings). Conversely, for the Openness to Experience composite, scores *below* .5 were in the direction of the hypothesis (i.e., firstborns received lower ratings). Single-sample *t* tests were employed to test for statistical significance. One-tailed tests were used because the theory generated directional predictions. Cohen's *d* [the standardized mean difference between the null hypothesis (.5) and the mean of the composited variable (in the direction of effect)] was used as an estimate of effect size.

As shown in Table 1, one-tailed single-sample *t* tests indicated that firstborns scored significantly higher than their secondborn siblings on Conscientiousness, whereas firstborns scored significantly lower than their secondborn siblings on Openness to Experience. Thus, both combined Big 5 measures achieved statistical significance in the direction predicted by Sulloway's theory (see Table 1). The effect size measures generated for the single-sample *t* tests ranged from medium (.39) to large (.63) by Cohen's convention.

The single-sample *t* tests were also conducted on the subset of male–male ($n=28$ sibling pairs) and female–female ($n=50$ sibling pairs) dyads. In these analyses, we were specifically interested in comparing effect sizes and, because of the small sample sizes, did not interpret the tests of statistical significance. Contrary to Beer and Horn's (2000) alternative biological explanation for birth-order effects on personality, for both Conscientiousness and Openness to Experience, effect sizes were larger (farther from .50) for female–female than male–male sibling pairs (Table 1).

Table 1
Effects of birth order on composited measures of Conscientiousness and Openness to Experience (Study 1)

Big 5 category	Mean	Distance from null		<i>p</i>	Effect size (Cohen's <i>d</i>)
			<i>t</i>		
Full sibling analysis ($n=161$ pairs)					
Openness to experience	.43	–.07	–2.43	.008	.39
Conscientiousness	.62	.12	4.12	.001	.63
Male–male sibling analysis ($n=28$ pairs)					
Openness to experience	.48	–.02	–0.34	.36	.11
Conscientiousness	.64	.14	1.87	.035	.70
Female–female sibling analysis ($n=50$ pairs)					
Openness to experience	.39	–.11	–2.35	.011	.69
Conscientiousness	.67	.17	3.65	.001	1.03

Note. All *t* tests are one tailed. Means above .50 indicate that average ratings for firstborns were higher; means below .50 indicate that average ratings for secondborns were higher. Distances from the null indicate the extent to which firstborns (+ distance) or secondborns (– distance) were higher.

3. Study 2: Effects of birth order on the Big 5 personality traits: differences between siblings in an older sample

Because the Study 1 sample was composed mainly of university students in their early 20s, a criticism of the current results may be that many of the secondborn siblings were young enough to still be in their “rebellious” years, whereas the firstborns were of at least university age and more likely to be in the academic routine of “achieving.” Thus, differences between firstborns and secondborns may have been a consequence of age differences rather than birth-order differences per se. To address this potential confound, we used a sample of predominately older competitors in a New Zealand coast-to-coast endurance race in Study 2.

3.1. Method

Questionnaires were sent to participants in the Coast-to-Coast Endurance Race on the South Island of New Zealand. The questionnaire had the same structure as that used in Study 1 but included slightly different personality items: rebellious, lazy, nonconformist, open to new experiences, responsible/organized, conventional, scholastically achieving, and liberal. Of the 750 mailed questionnaires, 237 were returned, of which 174 were completed correctly and matched the selection criteria. Although siblings of any birth order could complete the questionnaire, the rated firstborn and secondborn siblings in the family had to again be 18 months to 5 years apart in age, and all siblings had to have been born and raised in the same family with no intervening stepsiblings or half siblings. For the 174 participants, the average age of firstborns and secondborns in their families was 37.5 (S.D.=10.2) and 35.2 (S.D.=10.2), respectively.

3.2. Results

Alpha reliability coefficients and item–total correlations were again computed to examine whether the individual markers of Openness to Experience [rebellious, open to new experience, liberal, nonconformist, and conventional (reverse coded)] and Conscientiousness [lazy (reverse coded), responsible/organized, and scholastically achieving] could be aggregated. For both Openness to Experience ($\alpha=.73$) and Conscientiousness ($\alpha=.55$), all item–total correlations were above .30. All items were thus included in the composites. As in Study 1, composited measures of Openness to Experience and Conscientiousness were computed by averaging the relevant individual items. Single-sample *t* tests were then conducted on these composite measures.

As shown in Table 2, one-tailed single-sample *t* tests indicated that firstborns scored significantly higher than their secondborn siblings on conscientiousness, whereas firstborns scored significantly lower than their secondborn siblings on Openness to Experience. Thus, both combined Big 5 measures achieved statistical significance in the direction

Table 2

Effects of birth order on composited measures of conscientiousness and openness to experience (Study 2)

Big 5 category	Distance			<i>p</i>	Effect size (Cohen's <i>d</i>)
	Mean	from null	<i>t</i>		
Full sibling analysis (<i>n</i> = 174 pairs)					
Openness to experience	.43	-.07	-2.9	.002	.41
Conscientiousness	.55	.05	1.75	.04	.28
Male–male sibling analysis (<i>n</i> = 63 pairs)					
Openness to experience	.40	-.10	-2.11	.019	.59
Conscientiousness	.53	.03	0.62	.27	.16
Female–female sibling analysis (<i>n</i> = 29 pairs)					
Openness to experience	.40	-.10	-1.63	.055	.61
Conscientiousness	.57	.07	0.95	.17	.32

Note. All *t* tests are one tailed. Means above .50 indicate that average ratings for firstborns were higher; means below .50 indicate that average ratings for secondborns were higher. Distances from the null indicate the extent to which firstborns (+ distance) or secondborns (– distance) were higher.

predicted by Sulloway's theory (see Table 2). Effect size measures for the single-sample *t* tests in Study 2 ranged from small (.28) to medium (.41) as per Cohen's convention.

We again used the same-sex pairs to test the Beer and Horn (2000) prediction that data in the direction of Sulloway's hypotheses would characterize pairs of brothers but not sisters, and again, we found contrary evidence. Specifically, single-sample *t* tests were conducted on the subset of male–male (*n* = 63 sibling pairs) and female–female (*n* = 29 sibling pairs) dyads. As shown in Table 2, for Conscientiousness, effect sizes were notably larger for female–female than male–male sibling pairs; for Openness to Experience, effect sizes were the same for female–female and male–male pairs.

4. Discussion

The current research investigated differences between firstborn and secondborn siblings on two major dimensions of personality, in the context of Sulloway's argument that personality is influenced by the specialized niches siblings adopt in the quest for access to parental resources. The current within-family research design allowed for a better test of Sulloway's model than has previously been conducted, by focusing on the differences between firstborn and secondborn full siblings, by ensuring that these sibling pairs were born and raised in the same household, and by selecting siblings with an age gap between 18 months and 5 years. The hypothesized effects of birth order on personality were found in both Study 1 and Study 2, lending support to Sulloway's (1996, 2001) family-niche model of personality development.

The firstborn advantage in Conscientiousness was larger in Study 1 than in Study 2, perhaps because the effect in Study 1 was inflated by the use of a university-age sample in which some of the secondborn siblings were still in their rebellious years. This interpretation is unlikely, however, because the effect of birth order on Openness to Experiences

was approximately the same across the two studies, and the Openness to Experience measures were dominated by markers of rebelliousness and nonconformity.

In both studies, birth-order differences in accordance with Sulloway's model tended to be larger within pairs of sisters than within pairs of brothers. These data cast doubt on the hypothesis, proposed by Beer and Horn (2000), that effects of birth order on personality are caused by prenatal hypomasculinization of younger brothers through progressive immunization of mothers to the H–Y antigen by each succeeding male fetus.

Several recent studies (e.g., Davis, 1997; Eckstein, 2000; Paulhus et al., 1999; Salmon & Daly, 1998; Saroglou & Fiasse, 2003; Zweigenhaft, 2002; Zweigenhaft & Von Ammon, 2000) provide general support for Sulloway's family-niche model of personality development. Our study extended this past work by providing a more carefully targeted test of Sulloway's theory. By focusing specifically on contrasts between firstborn and secondborn siblings, delimiting age gaps between siblings, and restricting the analyses to sibling pairs that were born and raised in the same family environment without the confounding influence of half siblings and stepsiblings, the current research design provided a strong test of Sulloway's theoretical model. This refined within-family design has proved to be an adequate method for uncovering birth-order personality effects.

Acknowledgments

The authors are grateful to all those who participated in the two studies, to Professor Garth Fletcher for his timely advice, and to the Department of Psychology, University of Canterbury, for funding and continued support.

References

- Beer, J. M., & Horn, J. M. (2000). The influence of rearing order on personality development within two adoption cohorts. *Journal of Personality*, 68, 769–819.
- Blanchard, R., & Klassen, P. (1997). H–Y antigen and homosexuality in men. *Journal of Theoretical Biology*, 185, 373–378.
- Daly, M., & Wilson, M. (1998). *The truth about Cinderella*. London: Weidenfeld & Nicolson.
- Davis, J. N. (1997). Birth order, sibship size, and status in modern Canada. *Human Nature*, 8, 205–230.
- Eckstein, D. (2000). Empirical studies indicating significant birth-order related personality differences. *Journal of Individual Psychology*, 56, 481–494.
- Ernst, C., & Angst, J. (1983). *Birth order: Its influence on personality*. Berlin: Springer-Verlag.
- Freese, J., Powell, B., & Carr Steelman, L. (1999). Rebel without a cause or effect: Birth order and social attitudes. *American Sociological Review*, 64, 207–231.
- 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.
- Michalski, R. L., & Shackelford, T. K. (2001). Methodology, birth order, intelligence, and personality. *American Psychologist*, 56, 520–521.
- Paulhus, D. L., Trapnell, P. D., & Chen, D. (1999). Birth order effects on personality and achievement within families. *Psychological Science*, 10, 482–488.
- Rodgers, J. L. (1988). Birth order, SAT, and confluence: Spurious correlations and no causality. *American Psychologist*, 43, 476–477.
- Rodgers, J. L. (2001). What causes birth order–intelligence patterns? *American Psychologist*, 56, 505–510.
- Rodgers, J. L., Cleveland, H. H., van den Oord, E., & Rowe, D. C. (2000). Resolving the debate over birth order, family size and intelligence. *American Psychologist*, 56, 599–612.
- Rohde, P. A., Atzwanger, K., Butovskaya, M., Lampert, A., Myserud, I., Sanchez-Andres, A., & Sulloway, F. (2003). Perceived parental favoritism, closeness to kin, and the rebel of the family. The effects of birth order and sex. *Evolution and Human Behavior*, 24, 261–276.
- Salmon, C. A., & Daly, M. (1998). Birth order and familial sentiment: Middleborns are different. *Evolution and Human Behavior*, 19, 299–312.
- Saroglou, V., & Fiasse, L. (2003). Birth order, personality, and religion: A study among young adults from a three-sibling family. *Personality and Individual Differences*, 35, 19–29.
- Sulloway, F. J. (1996). *Born to rebel: Birth order, family dynamics and creative lies*. New York: Pantheon.
- Sulloway, F. J. (2001). Birth order, sibling competition, and human behavior. In H. R. Holcomb, III (Ed.), *Conceptual challenges in evolutionary psychology: Innovative research strategies*. Boston: Kluwer.
- Zweigenhaft, R. (2002). Birth order effects and rebelliousness: Political activism and involvement with marijuana. *Political Psychology*, 23, 219–233.
- Zweigenhaft, R., & Von Ammon, J. (2000). Birth order and civil disobedience: A test of Sulloway's "born to rebel" hypothesis. *Journal of Social Psychology*, 140, 624–627.