Understanding Birth Order: A Within-Family Analysis of Birth Order Effects

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Alfred Adler, often thought of as the father of birth order research, claimed that birth order can have lasting effects on one's personality. He stated that birth order differences in personality are mostly due to siblings trying to compete for the attention of their parents by claiming certain niches or roles within the family (Adler, 1964). One theory underlying this need to establish a role is the social comparison theory (Festinger, 1954). This theory states that humans have a basic need to evaluate themselves and that the easiest way to do so is to compare themselves to others. Within a family, individuals compare themselves to their siblings in order to decide what role they are going to play. If the first-born is extremely intelligent and a subsequent sibling believes that they will not be able to achieve that level of intelligence, they will find another role to play, such as the most sociable child or the most creative one, in order to earn their parents' attention.

At first glance, birth order effects are solely dependent on whether the child was the first-born, middle born, or last-born; in reality, there are many other variables that play into the personality differences seen with respect to birth order (Healy & Ellis, 2007). Examples include age, socioeconomic status of the parents, education of the parents, family size, and gender. Many previous studies that show support for birth order effects have failed to control for these important variables (Kurtz, 2011). For example, some studies fail to control for family size by comparing the personality effects of birth order within a two-child family with those of a six-child family, thus observing differences that might not truly be due to birth order (Ernst & Angst, 1983). Similarly, Rohde et. al. (2003) found that mother's age is an important moderating variable in birth order that is often not controlled for. Due to the lack of control in these studies, birth order effects are still highly debated today.

This study examines classic birth order effects on the following variables: intelligence, openness to experience, conscientiousness, extraversion, agreeableness, neuroticism, impulsivity, sense of self-concept and self-control, and gender attitudes, which could be indicative of a more traditional viewpoint. It also tests to see if the gender composition of a sibling group influences birth order effects. For the purposes of this study, the following classic birth order characteristics will be referenced and challenged:

First-borns are often thought to be high-achieving, responsible, conservative, competitive, and organized. As the first-born, they grow up for a period of time with all of their parents' attention. When a second child is born, that attention is taken away from the first-born, making them feel "dethroned" and consequently crave attention (Adler, 1964). Furthermore, the first-born is thought to have the highest level of intelligence, score highest on tests of extraversion, and respect authority the most. This is likely due to their search for power, their perceived duty to set an example for younger siblings, and a desire to please their parents (Adams, 1972; Kirkcaldy, Furnham, & Siefen, 2009; Zajonc, 2001).

The *middle child* is sometimes considered the "lost child" because they are neither the highest achieving, nor the favored baby of the family, making them feel like they do not belong (Eckstein, 1978; Healey, & Ellis, 2007; Paulhus, Trapnell, & Chen, 1998). They are likely to have the fewest "acting out" problems (Searcy, Cowen, & Terell, 1977) and are more sociable because they rely on friends instead of family for attention (Salmon, 2003).

The *youngest child* can be seen as the most agreeable due to their goal of avoiding threatening confrontations with older siblings (Beck, Burnet, & Vosper, 2006). Although contradictory to their agreeable nature, later-borns are also considered rebellious (Begue, & Roche, 2005; Côté, Earls, & Laumeière, 2002) because they tend to search for a niche to fill within the family that has not yet been claimed by an older sibling. Furthermore, they are often most open to new experiences (Beck et. al., 2006), again relating to the idea that they need to find something that can define them and separate them from their older siblings.

A contrast effect, as first noted by the seventeenth century philosopher John Locke, is the experience of perceiving things differently after you have been exposed to them simultaneously. For example, Locke showed that water at room temperature can feel either hot or cold, depending on the temperature of water that was touched previously (Locke, 1690). The sibling contrast effect can be seen in personality psychology, in which two siblings, when compared, are deemed to have more differences than they actually do (Schachter & Stone, 1987). The sibling contrast effect is shown to have significant effects on parents' perceptions of the differences between their children (Saudino, Wertz, Gagne, & Chawla, 2004). Twin studies that look at temperament, as measured by parent reports, often show moderate resemblance in temperament for monozygotic (MZ) twins, and a near zero or negative resemblance for dizygotic (DZ) twins. (Goldsmith, Buss, & Lemery, 1997; Neale & Stevenson, 1989). Monozygotic twins are babies that develop when one egg is fertilized by one sperm, and are thus identical, while dizygotic twins develop from two different sperm and eggs. This close-to-zero resemblance, or similarity value, for DZ twins elicits questions both in terms of genetics, as well as in terms of the comparison of parent temperament ratings to behavioral observations. Genetically, it is unlikely that a pair of DZ twins would have as few temperament similarities as complete strangers, given that MZ twins have moderate similarities. Furthermore, when measured via behavioral observation instead of parent ratings, temperament similarities for DZ twins were found to be positive, and significantly higher than zero (Plomin et al., 1993; Saudino & Eaton, 1995). From here, it seems likely that these discrepancies are due to parents' self reports exaggerating the temperament differences between their children. Some parents feel the need to classify their children into different groups and end up overlooking similarities that are actually there.

Developmental elaboration, coined by Caspi (1998), explains how temperamental tendencies gradually grow into more pronounced personality traits and is the next step in explaining how sibling gender composition could affect birth order. Environmental elicitation, one of the six mechanisms of developmental elaboration, states that differences in temperaments prompt differential treatment by parents (the environment), which can reinforce these initial distinctions and stabilize the personality traits. As previously described, the sibling contrast effect occurs when parents perceive greater differences in their children than actually exist. Due to these perceived differences, parents treat and interact with their children in ways that reinforce these perceived personality traits, therefore resulting in exaggerated personality differences that may not truly result from birth order. For example, a mother may see that one child is slightly more introverted than her other child, exaggerate this difference in her mind, and subsequently give that child more "introverted" attention by letting him or her be more independent, or by spending more time reading with them. This would then reinforce the child's introvert tendencies and result in greater differences in extroversion/introversion between the two siblings than had previously existed.

The main purpose of this study is to test whether classic birth order characteristics, as stated above, are maintained when family differences are controlled for in a within-family analysis. The participants are divided into two separate gender composition groups: sibling groups of all the same gender (same), and sibling groups where at least one sibling is a different gender (different). Gender composition of sibling groups is tested because it is expected to amplify sibling contrast effects. These contrast effects may lead parents to perceive greater differences between their children, thus eliciting different treatment by parents, as described by Caspi's (1998) developmental elaboration

theory. Dissimilar treatment by parents reinforces initial sibling differences, consequently enhancing any personality differences that are deemed to be solely due to birth order. Therefore, it was anticipated that children in the "same" sibling composition group would show significant birth order effects, as their parents might perceive greater false differences in personality due to their gender. Similarly, we expected sibling pairs in the "different" sibling composition group to not display significant birth order effects. For any variables that have significant birth order effects, this study evaluates the gender composition of the sibling pair to see if sibling contrast effects and environmental elicitation can be combined to explain why birth order effects sometimes seem more significant than they actually are.

Methods

Data were obtained from the National Longitudinal Survey of Youth (NLSY79) NLSY79 Child/Young Adults 1986-2010 substudy. The sample included 11,504 children (51% males and 49% females) born to the NLSY79 mothers as of 2010, and will expand over time as these mothers have more children. Ages of the children studied range from 0-38 years; however, only participants 15 and older were included in this sample. 6,103 are non-black/non-Hispanic, 3,188 are black, and 2,213 are Hispanic or Latino.

Data

The following variables were collected and evaluated: results from the Peabody Individual Achievement Test (PIAT); standard IQ test scores (reading recognition standard score and reading comprehension standard score); Pearlin Mastery test results (7 questions) (Figure 1); Agreement on 6 impulsivity measure statements (Figure 2); Agreement on 6 gender attitudes statements (Figure 3); Ten Item Personality Measure (TIPI); Number of Siblings; Gender of Siblings; and Birth Order.

1. There is really no way I can solve some of the problems I have. (R)
2. Sometimes I feel I am being pushed around in life. (R)
3. I have little control over the things that happen to me. (R)
4. I can do just about anything I really set my mind to.
5. I often feel helpless in dealing with problems of life. (R)
6. What happens to me in the future mostly depends on me.
7. There is little I can do to change many of the important things in my life. (R)

Figure 1: Pearlin Mastery Statements. The Pearlin Mastery survey measures self-concept and feelings of control over one's life. The survey is measured on a 1-4 scale. Questions 1, 2, 3, 5, and 7 were reverse scored so that a larger score corresponds with a greater sense of mastery.

1. I often get in a jam because I do things without thinking.
2. I think that planning takes the fun out of things.
3. I have to use a lot of self-control to keep out of trouble.
4. I enjoy taking risks.
5. I enjoy new and exciting experiences even if they are a little frightening or unusual.
6. Life with no danger in it would be too dull for me.

Figure 2: Agreement of Statements (Impulsivity). These agreement statements are used to measure an individual's level of impulsivity. The survey is measured on a 1-4 scale. A higher score corresponds to a greater level of impulsivity.

The PIAT reading recognition and reading comprehension scores, used in other comparable studies (Rodgers et al., 2000), were averaged to create an overall intelligence measure. The Pearling

Mastery questions were reverse scored appropriately and averaged to create an overall self-concept / self-control measure. The impulsivity statements were averaged to create an overall impulsivity measure. The gender attitudes statements were reverse scored appropriately and averaged to create and overall gender attitude score. The TIPI scores were reverse scored appropriately and combined to create five different personality measures (Openness to Experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism).

1. Girls and boys should be treated the same at school.
2. A girl should not let a boy know she is smarter than he is. (R)
3. Competing with boys in school would make a girl unpopular with boys. (R)
4. A girl should pay her own way on dates.
5. If there is not enough money for all children in a family to go to college, the boys should go. (R)
6. It's perfectly OK for a girl to ask a boy for a date, even if he never asked her.

Figure 3: Agreement of Statements (Gender Attitudes). These agreement statements are used to measure an individual's gender attitudes. The survey is measured on a 1-4 scale. Questions 2, 3 and 5 were reverse scored so that a higher score corresponds to gender equality views.

Values were taken from varying years to ensure that each measurement applied to when the child was age 15 or 16, and again when they were age 22-23. The only exception to this was the PIAT test data, which was obtained when the child was age 13 or 14 to allow for a larger sample size. Careful year selection eliminated the chance that measured variables would reflect age differences instead of actual birth order effects. Similarly, each variable was separated by family number rather than child ID, allowing within-family tests instead of a between-subject tests. This controled for any differences in family environment or dynamic that could effect the variables measured. Finally, children were grouped based on gender composition of their sibling group, into either a "same gender" group or a "different gender" group. The same gender group included children who were the same gender as the rest of their siblings, no matter how many there were, and the different gender group included children who were a different gender from at least one of their siblings.

Results

The NLSY data were analyzed using various repeated ANOVA tests, with sibling gender group ("same" or "different") added as a between-subjects factor when needed. Consistently significant birth order effects were only seen for the intelligence measure. First-born children were more intelligent than second-born children ($p=.012$), third-born children ($p=.004$), fourth-born children ($p=.009$), and sixth-born children ($p=.012$), but not fifth-born children. Second-born children were more intelligent than fourth-born children ($p<.001$) and sixth-born children ($p=.043$). Third-born children were more intelligent than sixth-born children ($p=.007$). There was no significant intelligence difference between fourth-born children and fifth-born children (Figure 4). All of these significant differences follow a pattern that older children (i.e. first-born) are more intelligent than the younger children (i.e. sixth-born).

When testing the intelligence values using sibling gender group ("all same gender" or "different genders") as a between-subjects variable, no changes in significance were observed, and no interaction effect was observed. This means that the significance in the intelligence value does not depend on whether the sibling group was composed of all one gender or different genders.

	Second born	Third born	Fourth born	Fifth born	Sixth born
First born	*p=.012 (N=1802)	*p=.004 (N=830)	*p=.009 (N=292	p=.442 (N=104)	*p=.012 (N=45)
	M_{first}= 200.76	M_{first}= 197.41	M_{first}= 190.73	M_{first}= 181.34	M_{first}= 182.24
	M_{second}=198.89	M_{third}= 194	M_{fourth}= 185.55	M_{fifth}= 184.24	M_{sixth}= 170.89
Second born		p=.111 (N=833)	*p=.000 (N=295	p=.068 (N=107)	*p=.043 (N=51)
		M_{second}=195.58	M_{second}=192.41	M_{second}=189.42	M_{second}=184.39
		M_{third}= 193.8	M_{fourth}= 184.07	M_{fifth}= 183.64	M_{sixth}= 177.29
Third born			p=.199 (N=312)	p=.763 (N=116)	*p=.007 (N=52)
			M_{third}= 187.91	M_{third}= 184.53	M_{third}= 181.69
			M_{fourth}= 185.56	M_{fifth}= 183.54	M_{sixth}= 170.23
Fourth born				p=.088 (N=117)	p=.700 (N=60)
				M_{fourth}= 178.26	M_{fourth}= 168.53
				M_{fifth}= 183.26	M_{sixth}= 170.78
Fifth born					p=.569 (N=58)
					M_{fifth}= 171.76
					M_{sixth}= 169.24

Figure 4: Intelligence measure. Significant birth order effects are seen with First v. Second, First v. Third, First v. Fourth, First v. Sixth, Second v. Fourth, Second v. Sixth, and Third v. Sixth. In each significant birth order pair, children lower in birth order (i.e. first) are more intelligent that children higher in birth order (i.e. sixth).

For the remaining variables—Openness to Experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism, Pearlin Mastery score, Impulsivity, and Gender Attitudes—no birth order patterns were observed. There were a few significant comparisons, but none that could lead to the conclusion that birth order was the moderating variable. For example, second-born children (M=20.94) scored significantly higher on the Pearlin Mastery Test ($p<.014$) than fourth-born children (M=20.69), meaning that second-born children have a greater self-concept and feeling of control. Similar to the intelligence values, there was no observed change in significance and no interaction effect when the remaining variables were tested using sibling gender group as a between-subjects variable.

Conclusion

Results of the analysis of the NLSY data support the idea that birth order effects are moderated by other important variables and cannot be attributed to birth order alone. When these variables are controlled for, birth order effects can only be seen for intelligence. However, the lack of birth order effects cannot be explained by sibling contrast effects or environmental elicitation, because the between-subjects moderating variable of gender composition does not have any significant effect. There is no significant differences in personality measures between sibling groups of all one gender and those of different genders, which means that the greater differences the parents may be perceiving due to gender differences do not have a large enough effect to create any personality differences.

Unlike many other studies in the field which are done using between-subjects analyses, this study used a within-family analysis, which is likely the reason for observing no birth order effects in all of the variables except for intelligence. By performing the analyses within each family, we controlled for variables such as socioeconomic status, parents' education level, race of parents, presence or absence of a father or mother, and many other minor variables that distinguish one family from another. When these confounding variables are eliminated, birth order appears to only affect intelligence.

A few reasons that relate directly to birth order could explain why those who are born first would be more intelligent than those born later. First, the resource dilution hypothesis (Blake, 1981) states that first-born children should do better than later-born children because they have greater access to parental resources early in life, as they do not have to share them with any siblings. Similarly, the confluence hypothesis explains the greater intelligence of first-born children by stating that first-borns have a higher level of intellectual stimulation than later-borns because they only interact with their parents, who are smarter, instead of sharing their time between parents and other siblings (Kajonc & Markus, 1975). Furthermore, Kajonc and Markus state that first-borns benefit intellectually from having to teach and tutor younger siblings, and later-borns do not have this added learning practice.

Overall, this within-family analysis of birth order opposes classic birth order theories and goes against the findings of many between-subjects analyses. The true effects of birth order remain controversial and may never be completely clear, but one of the best ways to move forward is to continue ruling out moderating variables. Possible limitations of this study include the ages that were chosen for analysis and the survey basis of the NLSY data set. Because many of the NLSY variables are not collected until at least 10 years of age, it is not possible to look at birth order effects on toddlers or young children, when they are likely the most prevalent (Roberts & DelVecchio, 2000). Additionally, there is always the possibility that a study that uses self-report and online surveys for data collection may not be entirely accurate due to self-report biases. Future studies should attempt to study birth order using primarily within-subjects analyses and should examine a variable other than sibling gender group, such as family size, as a between-subjects moderator.

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