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Birth order effects in the formation of long-term relationships

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Abstract

Researchers have debated for 134 years whether birth order has long-term effects on the development of a child, and so far no consensus has emerged. In addition to practical applications and relevance to the study of personality, birth order effects are an important test case for theories about how and whether home environment affects the adults children become (Pinker, 2002; Sulloway, 1996). In two large surveys of diverse populations, we found that people are more likely to form close platonic and romantic relationships with other people of the same birth order. This effect cannot be explained by confounds of family size.

Birth Order Effects in The Formation of Long-Term Relationships

In 1874, Francis Galton noted that first-born sons and only sons were over-represented among scientists (Galton, 1874), making birth order one of the first constructs studied in psychology. Presciently anticipating the next 134 years of debate, he attributed this effect to both practical circumstances – "they are more likely to become possessed of independent means, and therefore able to follow the pursuits that have most attraction to their tastes." – and their "independence of character," a result of having been treated more as companions by their parents (Galton, 1874, pp. 34-35).

Since then, numerous studies (Ernst & Angst, 1983; Harris, 1998; Sulloway, 1996) have investigated systematic differences in intelligence, achievement and personality between children of different birth orders. A number of theories have been postulated to account for such differences, generally focusing on the fact that each child's home environment is at least partly a function of their birth order.

In 1918, Alfred Adler gave what is likely the first comprehensive account of birth order, focusing on "dethronement" (Ansbacher & Ansbacher, 1956). The eldest child was, at some point, the center of attention; this is lost with the addition of a sibling. Younger children, in contrast, see their elder siblings as "pacesetters," and race to catch up. The youngest child, in contrast, is never dethroned. A number of effects on personality are predicted on this basis.

Sulloway (1996), in contrast, explains birth order effects in terms of children diversifying in order to better compete for scarce resources, such as parental investment. This leads, under his account, to the eldest child identifying with her

parents and the establishment in general, while younger children are more open to new experiences and are generally more rebellious.

Other accounts exist as well. Not only has no single birth order theory been established, but even the existence of birth order effects remains highly controversial (Bjerkedal, Kristensen, Skjeret, & Brevik, 2007; Harris, 2006; Sulloway, 2007; Wichman, Rodgers, & MacCallum, 2007). This is at least in part because of methodological problems. Poor families tend to have more children, and thus any cross-sectional study confounds birth order with socio-economic status (SES). A correlation between being a later-born child and being more rebellious may in fact just be a correlation between SES and rebelliousness (Ernst & Angst, 1983; Harris, 1998; Sulloway, 1996; Wichman, Rodgers, & MacCallum, 2006). However, even among studies that control for such between-family factors, there has been little agreement (Ernst & Angst, 1983; Harris, 1998; Sulloway, 1996; Wichman, Rodgers, & MacCallum, 2006).

The debate over birth order effects has important implications for a number of fields. Adlerian theorists and clinical practitioners make frequent use of birth order theory (Eckstein, 2000; Laird & Shelton, 2006; Marshall & Fitch, 2006; Tobin & McCurdy, 2006). For this group, the ongoing empirical uncertainty about the existence of birth order effects can be unsettling (Manaster, 1977).

The existence of birth order effects is interesting in its own right and may have practical applications. Birth order effects have also become an important test case in the Nature versus Nurture debates. Harris (1998; 2006) and Pinker (2002) both argue that the literature has conclusively shown that birth order does not affect personality outside of the home, and they use this to help build their case that a child's home

environment has little to no effect on the adult she becomes. Conversely, the existence of birth order effects on personality or intelligence would be strong evidence that the home environment does help shape the child.

In this article, we test for birth order effects in a theory-neutral manner, using a long-term, stable behavior as our dependent measure (the formation of close relationships) rather than personality assessments. Personality assessments are typically based on self-report, the validity of which can be cause for concern, but more importantly are based on an individual's memories about typical behavior. Decades of memory research show that memory exhibits biases in systematic ways (Schacter, 2001). Moreover, the efficacy of personality assessments even under the best of circumstances has been challenged (Gladwell, 2006).

Although previous studies using real-world behavior as a dependent measure have been plagued with the same inconsistencies and methodological problems as the birth order literature as a whole, we believe behavior is more likely to give a stable result. In fact, there is at least one such behavior that appears to be uncontroversially liked to birth order: younger siblings engage in risky behavior earlier (Argys, Rees, Averett, & Witoonchart, 2006; Harris, 2006). However, this may have less to do with personality differences resulting from birth order, and more to do with older siblings exposing younger siblings to such behaviors earlier.

In this investigation, we focus on a stable, long-term and ecologically valid behavior: the formation of close platonic and romantic relationships. We assume that if birth order systematically affects personality, and personality systematically affects the

formation of friendship and mating bonds, there should be a relationship between the birth orders of friends and between the birth orders of spouses.

Note that this should be true regardless of which positive theory of birth order effects is correct. Birth order studies typically consider one particular trait predicted by a theory to differ across birth orders, such as educational achievement, aggression, self-esteem or conservatism (Ernst & Angst, 1983). Thus, a significant birth order effect can only be found if the birth orders differ on that particular construct (and if it is measured in a well-designed study). In contrast, our method casts a wider net.

A small number of studies have investigated birth order effects on mating patterns. The majority of these focused on testing Walter Toman's "duplication theorem," which suggested that adults try to recreate in marriage the social dynamics of their childhood (Toman, 1971). Thus, men with only older sisters should be expected to marry women with only younger brothers, and such marriages should be more stable and successful than other birth order combinations.

Toman and colleagues reported several studies confirming these hypotheses (Toman, 1971), but these studies were severely criticized on methodological grounds (Birtchnell & Mayhew, 1977). The bulk of subsequent studies failed to support the duplication theorem (Birtchnell & Mayhew, 1977; Gold & Dobson, 1988; Ickes & Turner, 1983; Kemper, 1966; Levinger & Sonnheim, 1965; Mendelsohn, Gruen, & Curran, 1974; Weller, Natan, & Hazi, 1974). Unfortunately, these studies for the most part only tested birth-order combinations relevant to the duplication theorem, thus missing any other potential effects.

Given that spouses appear to correlate on just about every imaginable trait (Burgess & Wallin, 1943; Diamond, 2002; Schiller, 1932), if birth order has *any* systematic effect on a person that generalized outside of the home environment, the most likely outcome – in contrast with Toman's theory – is a correlation between the birth orders of spouses. In fact, Burgess and Wallin (1943), in a large study of 1,000 engaged couples, found 14% more oldest-oldest, middle-middle, youngest-youngest and only-only pairings than would be expected by chance. However, this study did not control for SES or total number of siblings (sibship size). As will be discussed below, the same pattern would be expected if children from large, poor families tended to marry each other while children from small, wealthy families married one another.

This finding was replicated in one subsequent, smaller study of 146 college faculty which did control for SES, though not for number of siblings (Ward, Castro, & Wilcox, 1974). However, this study dichotomized birth order into first-born and only children versus later-born children, which may not have sufficient sensitivity. This contrasts with a study of 200 pedestrians, which similarly dichotomized birth order but did not control for SES or family size, and found no significant relationship between the birth orders of spouses (Touhey, 1971). Simple power calculations suggest that a 14% effect on this dichotomous data would require 200 participants (100 first-born or only children, 100 later-born children) to achieve a power of .80 (that is, any given experiment with 200 couples and an $\alpha = .05$ would have an 80% chance of rejecting the null hypothesis which stated no difference) and 331 couples to achieve a power of .95. Thus, at the sample sizes used in the smaller studies, conflicting findings are not unexpected.

Finally, it is worth noting a very early study of 46 first-generation Ashkenazi Jewish couples (thus tightly controlled for SES and ethnicity, if not family size) did not find a statistically significant correlation between spouses' absolute birth number (1st, 2nd, 3rd, etc.) or number of siblings, although the authors did note a surprising number of 1st-1st and 2nd-2nd marriages (Schiller, 1932).

Thus, preliminary evidence suggests that there may be a positive correlation between the birth orders of married couples, but several possible confounds remain. We address those in the present study.

In two large surveys, we tested for a statistical relationship between the birth orders of romantically-involved couples as well as between the birth orders of close friends. Because we had no strong predictions about the form of this relationship (i.e., whether first-borns marry first-borns or marry last-borns), we cast a wide net, testing for *any* pattern in friendship or romantic relationships different from chance. In the second survey, we also tested whether birth order influences the long-term success of romantic relationships. We found that there was a significant tendency for more oldest-oldest, middle-middle and youngest-youngest pairings among both friends and spouses that cannot be explained by total number of siblings (sibship size). Results for only children were less clear. No effect on long-term relationship success was found.

Before turning to the data, other points deserve some discussion. In this study, we are using serial birth order as a proxy for home environment, but it is an inexact proxy. The home environment is presumably not uniform across all members of a particular birth order (e.g., first-borns). Factors that have been argued to interact with serial position include spacing between the siblings (Adler, 1932, p. 114) and the

genders of the siblings (Adler, 1932, pp. 114-115). To that list we might add the dynamics of blended families. Such confounding factors could serve to diminish the size of the effects found in this study. Unfortunately, there does yet not appear to be a rigorous manner of correcting for all such issues (though see below for some attempts to control for sibling gender). This must be left for further research.

A related point is that, according to some birth order theories, what is important is not so much a child's serial birth order but "the way in which he interprets it" (Ansbacher & Ansbacher, 1956, p. 377). Note that this is also the position taken by Harris (1998; 2006) and Pinker (2002): the home environment does not shape the child; rather, innate characteristics of the child determine how that child reacts to the environment in which she is born and ultimately determine the adult she becomes.

Thus, although there are assessments meant to determine how a child reacts to his home environment and are thus argued to provide a better measure of "psychological birth order" (e.g., Campbell, White & Stewart, 1991), such measures by design do not allow us to determine whether the home environment shapes the child *independent* of the child's innate characteristics. Thus, we cannot use such measures here.

Survey 1: A survey of undergraduates

In Survey 1, we surveyed 900 undergraduates, collecting their own birth order, their best friend's birth order and the birth orders of their parents. This allows us to analyze two relationships: *friendship* and *romantic*.

Method

Participants: Nine hundred students in an introductory psychology course at Central Michigan University voluntarily took part for extra credit.

Materials: Participants were asked to list all children by gender, in order, for four families: their own, their best friend's, their mother's and their father's. From this information, a number of different measures of birth order can be calculated (see discussion below).

Procedure: Participants filled out the surveys in class. This took approximately five minutes.

Pre-analysis: Twenty-eight participants were excluded from the friendship analyses and 42 from the romantic analyses for providing incomplete or contradictory information, or if any of the critical individuals were twins.

Results

Before turning to the results, it should be noted that there is no consensus in the literature as to how to group people by birth order. While the grouping suggested by Adler (oldest, middle, youngest, only; Ansbacher & Ansbacher, 1956) is perhaps the most common categorical measure (e.g., Sulloway, 1996), not all authors distinguish between middle and youngest children (e.g., Ward, Castro, & Wilcox, 1974), while still others count only serial order without regards to whether one is the youngest (first-born, second-born, third-born, etc.; e.g., Wichman, Rodgers & McCallum, 2006; Bjerkedal, et al., 2007).

Such categorical groupings necessarily fail to capture the intuition that being the oldest of ten children may be different from being the oldest of two, or that calling both the second oldest and the second youngest of ten children "middle children" may be

missing some important distinctions. Some researchers (Berg, Fearnley, Paterson, Pollock & Vallance, 1967; Hare & Moran, 1979; Poasa, Blanchard & Zucker, 2004; Purcell, Blanchard & Zucker, 2000; Slater, 1958, 1962) use a continuous, rather than categorical, measure of birth order, calculated using the following formula:

older siblings / total # siblings

An oldest child has a score of 0 and a youngest child a score of 1. Note that this is a sensitive measure of relative position within a family, distinguishing between the second of five children (0.25) and the fourth of five (0.75). It also has the advantage of expressing birth order on a scale with equal distances between siblings within a given family size. One disadvantage, however, is that there is no pre-theoretic way to classify only children, and in fact they are excluded from analyses using the birth rank measure.

Since there do not appear to be any clear empirical or pre-theoretic reasons to choose one measure over another, we chose to use two complementary methods. One, which we call “birth order,” is the Adler-inspired, categorical “oldest, middle, youngest, only” grouping scheme. The other is the continuous measure described in the previous paragraph, which we call “birth rank” to distinguish it from “birth order.” As will be seen below, analyses using both measures support the same conclusions.

Results for Survey 1 using the birth order measure are shown in Tables 1 and 2.

As shown in Tables 1 and 2, more same-birth-order pairings were observed than expected in 7 of the 8 relevant cells, which are along the major diagonal, in the all-

siblings analysis.[1] There are no other obvious trends other than that most other cells have fewer than expected observations, which is a necessary corollary of the first result. However, the chi-square analyses on these distributions were not statistically significant.

We used the birth rank measure to test the specific hypothesis, suggested by previous research and the birth order analyses above, that people associate with others of similar birth ranks. The birth ranks of the respondent and best friend significantly correlated with one another (N = 792, r = .10, $p < .01$), as did the birth ranks of the respondents' parents (N = 814, r = .08, p = .02).

[Table 1 Approximately Here]

[Table 2 Approximately Here]

Some researchers have suggested that having same-sex siblings may affect a child differently than having opposite-sex siblings (Blanchard, 1997; Poasa, Blanchard & Zucker, 2004; Toman, 1971). One might hypothesis that one's birth order relative to same-sex siblings is more important than one's birth order relative to all siblings (what is reported in Tables 1 and 2). That is, in a three-child family of a first-born son, second-born daughter, and third-born daughter, the girl is a middle child when considering all siblings, but an oldest child among same-sex siblings. Similarly, the boy

[1] Expected observations were calculated based on the observed data. That is, 36% of best friends were oldest children. Three hundred and twelve of the respondents were oldest children. Thus, one would expect 312 * 0.36 = 112 oldest-oldest pairings.

is an oldest child among all siblings, but an only child when considering only same-sex siblings.

[Table 3 Approximately Here]

[Table 4 Approximately Here]

If this is the indeed the case, considering all siblings in the analyses above may have introduced noise and weakened the observed effect. Thus, we re-tabulated the results considering only same-sex siblings when calculating the birth orders and birth ranks for the respondent, best friend, mother and father. As Tables 3 and 4 show, these results replicated the pattern seen in the above analyses, but more weakly. Thus, there is no evidence that birth order is best calculated considering only same-sex siblings.

Note that Toman (1971) made different predictions about the effects of same- and opposite-sex siblings. Since Toman's theory has already been disconfirmed a number of times, results were not tabulated in such a way as to test it again, though researchers interested in running this analysis should contact the first author.

Discussion

The birth rank analysis of the mother and father data in Survey 1 supported previous suggestions that people are more likely to form romantic relationships with someone of a similar birth order (Burgess & Wallin, 1943; Schiller, 1932; Ward, Castro,

& Wilcox, 1974). This effect was significant using one of the chosen birth order grouping scheme (birth rank) and was suggested but not statistically significant using the other (birth order). We also found that this phenomenon extended to close friendships. The effect size (approximately 15% more same-birth-order pairings than expected) was in the same neighborhood has previously reported (Burgess & Wallin, 1943), suggesting that the two studies that previously failed to show this effect did not have sufficient power (Schiller, 1932; Touhey, 1971). Considering only the all-siblings analyses, the effect sizes in the eight critical comparisons ranged from 0 to 100%, averaging 20% (11% if the small sample-size only-only cells are excluded). This is smaller than the homogamy found among spouses for characteristics such as size of hometown and level of education, but larger than the homogamy found for many personality characteristics, according to at least one study (Burgess & Wallin, 1943).

One concern must be addressed, however, which is the potential confounding factor of sibship size, which correlates with SES (Ernst & Angst, 1983; Harris, 1998; Sulloway, 1996; Wichman, Rodgers, & MacCallum, 2006). If people tend to associate with others of a similar SES, and thus with others who have a similar number of siblings (which is in fact the case in our sample: friends: r = .12; parents: r = .09), one would observe more same-birth-order pairings for that reason alone.

For instance, suppose our sample contained 160 people from two-child (oldest and youngest only) and 160 people from four-child families (oldest, youngest and two middle). Suppose also that all respondents with one sibling are best friends with someone who also had just one sibling. Similarly, all people from four-child families are

best friends with other people from four-child families. The expected results are shown in Table 5.

[Table 5 Approximately Here]

There is one important difference between Table 5 and our data. In Table 5, oldest-oldest, middle-middle and youngest-youngest pairings are more common than expected, but so are oldest-youngest and youngest-oldest pairings. This is because every family that has at least two children has exactly one oldest child and exactly one youngest child. Thus, as long as your best friend or spouse has at least one sibling, s/he is equally likely to be the oldest child as the youngest child. For similar reasons, there is no correlation for the birth orders in Table 5 ($r = 0$).

This contrasts with our data, in which there were fewer youngest-oldest and oldest-youngest pairings than expected by chance (the number of only children is very small, and thus the results do not change appreciably if, as in our thought example, only children are excluded). Thus, any confounding of birth order by sibship size, which correlates with SES and perhaps other factors, cannot explain our data. Note that the previous large study to show a similar effect (Burgess and Wallin, 1943) did not provide data on oldest-youngest or youngest-oldest pairings, their data cannot rule out this alternative explanation.

There are several potential concerns with the above data. The data in this study did not result in a significant chi-square test using the categorical birth order measure. It is important to understand why the birth rank measure, in contrast, gave significant

results. One possibility is that the birth rank measure is simply more sensitive and thus increasing the number of participants should lead to significant birth order results as well. In addition, our sample was also restricted in terms of demographics. Thus, we repeated this study with a larger, more representative sample.

Survey 2: A Web-based survey

To gather data about a more heterogeneous group, we turned to the World Wide Web. Web-based surveys and experiments have been used for well over a decade and are rapidly gaining acceptance. A recent review found that 21% of APA journals have published at least one paper relying on Web-based research (Skitka & Sargis, 2006). Two studies have found that Web-based experimental results agree well with laboratory-based results (Gosling, Vazire, & Srivastava, 2004; Meyerson & Tryon, 2003).

Method

Participants: Participants were volunteers recruited online via the website www.coglanglab.org. The survey was completed 2624 times. One thousand nine hundred eleven participants were American; 713 were foreign.

Equipment: The survey was programmed in Flash MX. Data were recorded in a MySQL database via PHP.

Materials: The survey obtained the same information as the paper survey used in Survey 1, with two additional questions: country of origin and whether the participant's parents were still married (if deceased, were they married at time of death). The participants also reported the initials, year of birth and day of birth for the four critical people (self, friend, mother, father), allowing us to check for repeat subjects without

compromising anonymity. Surveys were checked for consistency in real time, and participants were required to fix inconsistencies. The survey can be viewed in its entirety at www.coglanglab.org/BirthOrder.

Procedure: Participants filled out the survey via the Internet. The survey took approximately 5 minutes to complete.

Pre-analysis: Sixty repeat subjects were removed, leaving 2564 participants (1904 female; 1911 American).

Subjects were excluded from the friendship analyses for the following reasons: repeated friendship pair (7), twins (39 respondents, 48 best friends), and incomplete information (102). 2370 observations remained. Five additional observations were excluded as needed due to incomplete friend sibling gender information.

Parents were excluded from the romantic relationship analyses as follows: repeated parental pair (9), twins (47 fathers, 37 mothers), and incomplete information (334). This left 2137 observations. Twenty-six additional observations were excluded as needed due to incomplete parental sibling gender information.

Results

There was no indication of a systematic difference between foreign and domestic respondents on the analyses of interest, and the number of foreign respondents was too small (N = 713) to allow detailed country-by-country analyses. All analyses reported here are for all subjects.

In the all-siblings analyses (Tables 6 and 7), there were strong effects of birth-order for both the friendship and romantic relationships, with between 6% and 88% (mean = 28%) more oldest-oldest, middle-middle, youngest-youngest and only-only

pairings than expected. As before, this effect was much larger for only-only pairings, possibly because of smaller sample size (excluding the only-only conditions, mean effect size = 13%). As in Survey 1, the correlational analyses on birth rank were significant for both relationship types (see Table 6 and 7). Unlike Survey 1, the chi-square analyses were significant also, consistent with the possibility that the lack of statistical significance in the first survey was due to insufficient power. Since oldest-youngest and youngest-oldest pairings were less frequent than expected by chance, relationships formed based on family size alone cannot explain these effects (see below for discussion of the only child data).

As in Survey 1, analyses that considered only same-sex siblings showed the same general pattern (more same-birth-order pairings than expected), but the results were not as strong. Neither chi-square was significant (friendship: $\chi^2(9, N=794) = 12.14$, $p = .2$; romantic: $\chi^2(9, N = 639) = 10.38$, $p > .2$), and the birth rank correlation was significant for friendships ($N = 302$, $r = .14$, $p = .02$) but not romantic relationships ($N = 383$, $r = .06$, $p = .28$), possibly because of the smaller sample sizes involved.

[Table 6 Approximately Here]

[Table 7 Approximately Here]

Discussion and Additional Analyses

Survey 2 confirmed that oldest-oldest, middle-middle, youngest-youngest and only-only relationships, both among friends and mates, are significantly more likely than expected by chance. However, there are a few additional points.

It is worth noting that while for both mate and friendship analyses, there were fewer heterogamous pairings between oldest, middle and youngest children than expected, there were *more* pairings between only children and both older children and younger children than expected, while fewer pairings of only and middle children than expected were observed. This could potentially reflect only children primarily choosing best friends and mates from among single- and two-child families (see discussion of Table 5).

To avoid this confound, we looked at the participant's best friend *only* where the best friend had at least two siblings (families with 3+ children). As seen in Table 8, only children do appear to be somewhat more likely to have friendships with oldest and youngest children rather than middle children. Combining *self* and *friend*, the pattern of observations differs significantly from that expected by chance ($\chi^2(2, N=190) = 12.138$, $p = .002$).[2] However, no clear pattern was observed for romantic relationships ($\chi^2(2, N=170) = 2.64$, $p = .27$). However, the sample size is too small to interpret this null result. Thus, the question of only children will require further research.

[Table 8 Approximately Here]

One final analysis of interest concerned whether parents who were divorced or never-married differed in any way from the total sample in terms of birth order. 490

[2] A different method of computing expected values was required. For each relationship, the probability was computed for the relationship to be with an oldest, middle or youngest child based on the number of children in the family. Thus, if the participant was best friends with someone from a four-child family, the chance of that person being an oldest child was 25%; middle child, 50%, and; youngest child, 25%.

parent pairs were reported as not currently married. As shown in Table 9, the frequencies of different birth order pairings did not differ between the married and non-married parents. Likewise, the birth rank correlations for married and non-married parent pairs did not differ significantly, though there was a trend for a stronger relationship for married than non-married parents ($r_{married}$ = .08, $r_{non\text{-}married}$ = .03, p = .31). Thus, any effect of birth order on the long-term success of relationships in this sample appears to be very small.

[Table 9 Approximately Here]

General Discussion

In two large surveys, we found that people are more likely to be in long-term relationships (friendship or romantic) if they share a birth order (oldest, middle, youngest, only) than would be expected by chance. This was shown using two different methods of measuring birth order, thus suggesting that it is not an artifact of a particular coding scheme. The effect size was similar in both surveys and can be conservatively estimated at 10%-15%. This accords well with the single previous study with sufficient power to detect an effect of this size, which found 14% more same birth order spouses than would be expected due to chance (Burgess & Wallin, 1943). Furthermore, this effect was not due solely to people associated with others of similar sibship size and by extension of similar SES, a possibility the previous literature did not

eliminate. The sex of the siblings did not appear to modulate the effect, though we did not test all of the possible ways in which this factor might be relevant.

Our data do not directly speak to the question of what drives this effect. We believe the most likely explanation is as follows: one's birth order helps systematically shape one's personality (Ansbacher & Ansbacher, 1956; Galton, 1874; Manaster, 1977; Frank J. Sulloway, 1996). Given that spouses tend to be similar to one another on a host of character traits (Burgess & Wallin, 1943), and this is likely to be the same for close friends as well, one might expect birth order to correlate between spouses, mediated by personality.

There are several possible alternative accounts, but we do not believe any are particularly likely. One possibility is that oldest children prefer relationships with people who have only younger siblings, middle children prefer relationships with people who have both older and younger siblings, etc. While this is a logical possibility that must be tested directly, it seems less likely than other explanations. Another deflationary explanation would be that birth order effects are explained by prenatal or gestational factors (Kristensen & Bjerkedal, 2007). However, there does not appear to be any empirical support for such a claim, and such factors seem not to explain the birth order effect on intelligence (Kristensen & Bjerkedal, 2007).

A more plausible explanation is that the effect reported in this paper is mediated by IQ. Evidence suggests that birth order is related to intelligence, with IQ decreasing as a function of the number of older siblings (Bjerkedal, Kristensen, Skjeret, & Brevik, 2007; Kristensen & Bjerkedal, 2007; Record, McKeown, & Edwards, 1969; Zajonc & Sulloway, 2007). This evidence has been controversial (Rodgers, Cleveland, va den

Oord, & Rowe, 2000; Wichman, Rodgers, & MacCallum, 2006; Wichman, Rodgers, & MacCallum, 2007), however, a recent, gargantuan study appears to have resolved the debate in favor of a small effect of birth order on intelligence (Bjerkedal, Kristensen, Skjeret, & Brevik, 2007). Since spouses also tend to correlate on intelligence scores (Burgess & Wallin, 1943; Schiller, 1932), IQ could potentially drive the effect found here.

To test this hypothesis it will be necessary to collect intelligence scores for a large population of friends and spouses. Preliminary analysis, however, suggests that intelligence is not likely to be the only mediator of the birth order effect found here. That hypothesis would also suggest that there should be more oldest-middle and middle-youngest pairings than oldest-youngest. Instead, as shown in Tables 1-4, 6 and 7, in most cases fewer oldest-middle and middle-youngest relationships were observed than would be expected by chance. Furthermore, only in the friendship analysis, and only in Survey 1 were oldest-youngest relationships less common than both oldest-middle and middle-youngest (in terms of percentage difference from expected). This was not the case in the friendship analysis for Survey 2 or for the mate selection analysis in either survey.

The idea that birth order affects personality has been important in informing clinical practice, particularly among clinicians and researchers within the Adlerian tradition (Ansbacher & Ansbacher, 1956; Laird & Shelton, 2006; Manaster, 1977; Marshall & Fitch, 2006). In his introduction to a special issue on the topic of birth order in this journal, Manaster wrote that “Birth order and family constellation information may be extremely useful. Empirical justification for their use is still needed” (Manaster, 1977, p. 9).

In the slightly more than one quarter century since Manaster wrote, the empirical situation has, if anything, deteriorated, leading some researchers to deny the existence of birth order effects (Ernst & Angst, 1983; Harris, 1998; Pinker, 2002; Wichman, Rodgers, & MacCallum, 2007). We hope that this paper has helped provide support to the hypothesis that a person is shaped in part by his or her birth order. This is a challenge to theorists who argue that the home environment has no lasting effect on behavior outside of the home (Harris, 1998; Pinker, 2002).

However, our research does not directly address the questions of most importance to clinicians[3]: what are the common personality traits of different birth orders, and is this differentiation driven by differential parental investment (Galton, 1874), "dethronement" (Ansbacher & Ansbacher, 1956), family niches (Sulloway, 1996), the "intellectual environment" (Zajonc & Markus, 1975) or some other factor?

As mentioned in this introduction, this was partly by design. The *why*s and *what*s of birth order effects do not matter if birth order has no effect (Ernst & Angst, 1983; Harris, 1998; Pinker, 2002; Wichman, Rodgers, & MacCallum, 2007). Thus we used a method that, while not ideal for testing specific theories about birth order, was very well adapted to testing the broader hypothesis. While we do not by any means expect this paper to resolve the controversy, we do hope it will point a way forwards.

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[3] Clinicians may be encouraged by these data to consider birth order in relationship counseling. That is probably not advisable at this stage. Our mate-selection effect, while observable in a relatively small population (900 participants), is not sufficiently predictive to be of much clinical significance. Moreover, in our sample, birth order did not predict which mate pairs ultimately broke up.

Thus, more careful empirical work into the nature of birth order effects is needed -- work that avoids the methodological problems and disputes that have plagued the field, (Ernst & Angst, 1983; Harris, 1998). Given that some of the clearest results so far appear to be in studies of risky behavior (Argys, Rees, Averett, & Witoonchart, 2006), IQ (Bjerkedal, Kristensen, Skjeret, & Brevik, 2007; Kristensen & Bjerkedal, 2007), and marriage patterns (Burgess & Wallin, 1943; Schiller, 1932; Ward, Castro, & Wilcox, 1974; this paper), we believe concentrating on objective behaviors and easy-to-replicate psychometric tests may yield results.

By way of a suggestion, we note that in Survey 2, 1018 oldest children, but only 715 youngest children, participated (42% more oldest than youngest), despite oldest and youngest children being presumably equally prevalent in the population. After restricting participants to those with at least 2 siblings (thus, families with oldest, middle and youngest children), there were still more oldest-child respondents than expected (511 v 423) and fewer middle-child (645 v 693) or youngest-child (383 v 423) respondents, an effect which was significant ($\chi^2(1, N = 1539) = 25.25$, $p < .01$). While this result needs to be replicated, it is suggestive of a personality trait that differs among the birth orders.

Finally, it has been argued that one's "psychological birth order" may differ from one's chronological birth order either because of a death of a sibling (Kristensen & Bjerkedal, 2007) or because of a large age gap between siblings (Manaster, 1977). We opted to consider only chronological birth order, because psychological birth order is difficult to measure in a non-circular fashion. That is, the notion of psychological birth order seems to be invoked to explain why a person does not fit the profile of their

chronological birth order, rather than as a method of predicting, based on birth circumstances, a person's behavior, which was the goal of this study. However, the failure to account for psychological birth order may have weakened the strength of our results. Future research should address this issue.

Conclusion

Birth order appears to be a reliable factor for determining the formation of long-term relationships, with people of similar birth orders forming close platonic and romantic relationships with other people with the same birth order.

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Table 1

Survey 1: Best Friend Data for Undergraduate Responses to Paper and Pencil Survey

	Best Friend			
	Oldest	Middle	Youngest	Only
Respondent				
Oldest	**129 (112)**	73 (80)	102 (109)	10 (13)
Middle	82 (80)	**63 (57)**	69 (77)	9 (9)
Youngest	83 (102)	77 (73)	**114 (99)**	12 (11)
Only	18 (18)	10 (13)	17 (17)	**4 (2)**

Note. Cells contain the number of observations with the expected number in parentheses.

Birth Order: $\chi^2(9, N = 872) = 14.41, p = .11$.

Birth Rank: $N = 792, r = .10, p < .01$.

Table 2

Survey 1: Mother and Father Data for Undergraduate Responses to Paper and Pencil Survey

	Father			
	Oldest	Middle	Youngest	Only
Mother				
Oldest	**59 (51)**	90 (96)	36 (41)	8 (6)
Middle	102 (111)	**222 (211)**	93 (90)	8 (13)
Youngest	57 (58)	107 (110)	**48 (47)**	10 (7)
Only	7 (5)	6 (9)	4 (4)	**1 (1)**

Note. Cells contain the number of observations with the expected number in parentheses. Birth Order: $\chi^2(9, N = 858) = 10.42$, $p > .2$.

Birth Rank: $N = 814$, $r = .08$, $p = .02$.

Table 3

*Survey 1: B*est Friend Data*, Counting only Same-Sex Siblings*_

	Best Friend			
	Oldest	Middle	Youngest	Only
Respondent				
Oldest	**63 (61)**	15 (16)	50 (62)	101 (90)
Middle	21 (19)	**8 (5)**	17 (19)	25 (28)
Youngest	47 (52)	13 (14)	**68 (53)**	68 (77)
Only	79 (79)	21 (21)	81 (81)	**117 (117)**

Note. Cells contain number of observations with the expected number in parentheses.

Birth Order: $\chi^2(9, N = 794) = 12.14, p = .2$.

Birth Rank: $N = 302, r = .14, p = .02$.

Table 4

Survey 1: Mother and Father Data, Tabulated Counting only Same-Sex Siblings

	Father			
	Oldest	Middle	Youngest	Only
Mother				
Oldest	**51 (52)**	43 (37)	42 (50)	42 (38)
Middle	27 (34)	**31 (24)**	33 (32)	23 (24)
Youngest	62 (57)	33 (40)	**61 (54)**	37 (41)
Only	48 (45)	27 (32)	44 (43)	**35 (33)**

Note. Cells contain number of observations with the expected number in parentheses.

Birth Order: $\chi^2(9, N = 639) = 10.38, p > .2$.

Birth Rank: $N = 383, r = .06, p = .28$.

Table 5

Expected Results for 160 Respondents with One Sibling and 160 with Three Siblings, Where Respondents Pair with Friends Who Have the Same Number of Siblings

	Best Friend		
	Oldest	Middle	Youngest
Respondent			
Oldest	**50 (45)**	20 (30)	50 (45)
Middle	20 (30)	**40 (20)**	20 (30)
Youngest	50 (45)	20 (30)	**50 (45)**

Note: In parentheses are expected observations if pairings were truly random.

Table 6

Survey 2: Best Friend Data for Responses to Web-based Survey.

	Best Friend			
	Oldest	*Middle*	*Youngest*	*Only*
Respondent				
Oldest	**359 (339)**	221 (228)	290 (304)	85 (84)
Middle	202 (207)	**172 (139)**	173 (185)	35 (51)
Youngest	215 (233)	140 (157)	**237 (209)**	66 (58)
Only	65 (62)	33 (42)	54 (56)	**23 (15)**

Note. Cells contain the number of observations with the expected number in parentheses.

Birth Order: $\chi^2(9, N = 2370) = 29.811, p < .001$.

Birth Rank: $N = 2009, r = .057, p = .01$.

Table 7

Survey 2: Mother and Father Data for Responses to Web-based Survey

	Father			
	Oldest	*Middle*	*Youngest*	*Only*
Mother				
Oldest	**200 (174)**	208 (223)	126 (142)	38 (34)
Middle	241 (265)	**379 (340)**	214 (216)	39 (52)
Youngest	164 (168)	201 (215)	**153 (137)**	35 (33)
Only	44 (42)	44 (54)	36 (34)	**15 (8)**

Note. Cells contain the number of observations with the expected number in parentheses.

Birth Order: $\chi^2(9, N = 2137) = 27.668, p = .001$.

Birth Rank: $N = 1886, r = .069, p = .003$.

Table 8

Survey 2: Relationships of only children (self, friend, mother, father) with people from 3+ child families.

	Friend or Romantic Partner		
	Oldest	Middle	Youngest
Only Child			
Self	24 (23)	33 (37)	26 (33)
Friend	37 (30)	35 (47)	35 (30)
Mother	28 (23)	44 (45)	19 (23)
Father	23 (20)	39 (39)	17 (20)

Note. Cells contain the number of observations with the expected number in parentheses.

Table 9

Percentage of parental pairs in each birth order combination for parents not currently married (for parents currently married).

	Father			
	Oldest	Middle	Youngest	Only
Mother				
Oldest	**10 (9)**	10 (10)	6 (6)	2 (2)
Middle	11 (11)	**18 (18)**	10 (10)	2 (2)
Youngest	8 (8)	10 (9)	**6 (7)**	2 (2)
Only	2 (2)	2 (2)	2 (2)	**1 (1)**

Note. Cells contain the number of observations with the expected number in parentheses.