**Supplemental Material**

**Non-WEIRD studies about birth order effects on intelligence, educational attainment, and personality**

Table S1

*Previous Non-WEIRD Studies About Birth-Order Effects on Intelligence, Educational Attainment, and Big Five*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Study** | **Country**  **Sample** | **Outcomes** | **Main analysis**  **Covariates** | **Effect** |
| Abdel-Khalek & Lynn (2008) | Kuwait  *N* = 4,643 | Intelligence  Standard progressive matrices | Between-family analysis:  Sibship size | null |
| Calimeris & Peters (2017) | Indonesia  *N* = 13,444 | Intelligence  Raven’s matrices,numerical test | Within-family analysis:  Education, gender, birth year, test version, size of house, value of assets, number of older / younger siblings, multiple birth | negative |
| Davis, Cahan, & Bashi (1976) | Israel  *N* = 191,993 | Intelligence  Raven’s matrices | Between-family analysis:  Sibship size, ethnicity | parabolic |
| Munroe & Munroe (1983) | Kenya  *N* = 1,400 | Intelligence  Memory, pattern completion, block design | Between-family analysis:  No covariates | negative |
| Velandia, Grandon, & Page (1978) | Colombia  *N* = 36,000 | Intelligence  Verbal and mathematical aptitude, abstract reasoning | Between-family analysis:  Sibship size | parabolic |
| Wilson, Mundy-Castle, & Panditji (1990) | Zimbabwe  *N* = 1,143 | Intelligence  Cattell’s B scale | Between-family analysis:  No covariates | negative |
| Dayioğlu, Kirdar, & Tansel (2009) | Turkey  *N* = 1,733 | Educational attainment | Within-family analysis:  Mother’s age at first marriage, mother’s age, mother’s schooling, father’s schooling, absent father, marital status of the mother, 5 country regions, city residence and its population, ethnic background of the child | parabolic |
| Ejrnæs & Pörtner (2004) | Philippines  *N* = 790 | Educational attainment | Within-family analysis:  Gender, year of birth | positive |
| Emerson & Souza (2008) | Brazil  *N* = 52,365 | Educational attainment | Effects of family variables (e.g., sibship size, birth order) on educational attainment | positive |
| Park & Chung (2012) | Bangladesh  *N* = 4,182 | Educational attainment | Effect of sibship size on educational attainment based on birth order position | positive |
| Tenikue & Verheyden (2010) | 12 African countries  *N* = 95,188 | Educational attainment | Between- and within-family analysis:  Household wealth | positive but only in poorer families |
| Begum, Banu, Jahan, & Begum (1981) | India  *N* = 144 | Personality  Personal preferences | Between-family analysis:  Gender | positive  and antiparabolic |
| Kaur & Dheer (1982) | India  *N* = 90 | Personality  Emotional stability | Between-family analysis:  No information | antiparabolic |
| Sethi & Gupta (1973) | India  *N* = 1,000 | Personality  Psychosomatic disorder | Between-family analysis:  No information | negative |
| Sharma (1987) | India  *N* = 180 | Personality  Personality problems | Between-family analysis:  No information | negative |

*Note.* Studies for personality outcomes based on Indian samples (Begum et al., 1981; Kaur & Dheer, 1982; Sethi & Gupta, 1973; Sharma, 1987) were no longer accessible to us. The information in the table is based solely on the abstracts.

**Multiple imputation**

Table S2

*Variables Used for Multiple Imputation.*

|  |  |
| --- | --- |
| Type of variable | Additional used for multiple imputation |
| Grouping variable | Mother’s ID |
| Covariates | Age; Gender |
| Birth order and sibling count | Naive birth order |
| Naive sibling count |
| Naive birth order and sibling count (interaction) |
| Full birth order |
| Full sibling count |
| Full birth order and sibling count (interaction) |
| Intelligence | Raven’s matrices test for older participants 2015 |
| Raven’s matrices test for younger participants 2015 |
| Raven’s matrices test for older participants 2007 |
| Raven’s matrices test for younger participants 2007 |
| Math test for younger participants 2015 |
| Math test for older participants 2007 |
| Math test for younger participants 2007 |
| Counting backwards |
| Delayed word recall test |
| Adaptive number series test |
| Education | Years of education |
| Big Five | Extraversion, Neuroticism, Conscientiousness, Agreeableness, Openness |
| Additional outcomes | Missed elementary school, Worked during elementary school, Ever attended school, Self-employment, Ever smoked, Still smoking, Wage last month, Wage last year |

**Birth Order Effects on Additional Outcomes**

Table S3

*Model Comparisons for Birth Order Effects on Income, Self Employment, Smoking Behavior,*

*Working Category, and Working Sector*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Model Comparison | | | | |
| Outcome | Model | AIC | BIC | *X2* | *df* | *p* |
| Income Last Year  *n* = 2,477 | Covariates | 7066 | 7130 |  |  |  |
| Linear birth order | 7067 | 7137 | 0.43 | 1 | .51 |
| Categorical birth order | 7070 | 7163 | 4.87 | 4 | .30 |
| Interaction | 7082 | 7233 | 8.76 | 10 | .56 |
| Self Employment  *n* = 3,763 | Covariates | 3861 | 3930 |  |  |  |
| Linear birth order | 3863 | 3938 | 0.06 | 1 | .80 |
| Categorical birth order | 3870 | 3969 | 1.33 | 4 | .86 |
| Interaction | 3882 | 4044 | 8.08 | 10 | .62 |
| Smoking Behavior  *n* = 6,104 | Covariates | 4133 | 4207 |  |  |  |
| Linear birth order | 4135 | 4216 | 0.00 | 1 | .9996 |
| Categorical birth order | 4140 | 4248 | 3.09 | 4 | .54 |
| Interaction | 4153 | 4327 | 7.75 | 10 | .65 |
|  |  |  |  |  |  |  |
| Working Category  Casual Worker in Agriculture  *n* = 3,763 | Covariates | -5181 | -5113 |  |  |  |
| Linear birth order | -5180 | -5105 | 0.42 | 1 | .52 |
| Categorical birth order | -5177 | -5077 | 4.74 | 4 | .32 |
| Interaction | -5171 | -5009 | 14.04 | 10 | .17 |
| Working Category  Casual Worker not in Agriculture  *n* = 3,763 | Covariates | 705 | 774 |  |  |  |
| Linear birth order | 707 | 782 | 0.13 | 1 | .72 |
| Categorical birth order | 714 | 813 | 1.78 | 4 | .78 |
| Interaction | 721 | 883 | 12.58 | 10 | .25 |
| Working Category  Government Worker  *n* = 3,763 | Covariates | 608 | 677 |  |  |  |
| Linear birth order | 609 | 684 | 1.24 | 1 | .26 |
| Categorical birth order | 615 | 714 | 2.28 | 4 | .68 |
| Interaction | 628 | 790 | 6.89 | 10 | .74 |
| Working Category  Private Worker  *n* = 3,763 | Covariates | 5279 | 5348 |  |  |  |
| Linear birth order | 5281 | 5356 | 0.16 | 1 | .69 |
| Categorical birth order | 5286 | 5386 | 2.91 | 4 | .57 |
| Interaction | 5299 | 5461 | 6.61 | 10 | .76 |
| Working Category  Self Employment  *n* = 3,763 | Covariates | 3861 | 3930 |  |  |  |
| Linear birth order | 3863 | 3938 | 0.06 | 1 | .80 |
| Categorical birth order | 3870 | 3969 | 1.33 | 4 | .86 |
| Interaction | 3882 | 4044 | 8.08 | 10 | .62 |
| Working Category  Unpaid Family Worker  *n* = 3,763 | Covariates | 1344 | 1413 |  |  |  |
| Linear birth order | 1345 | 1420 | 0.80 | 1 | .37 |
| Categorical birth order | 1348 | 1448 | 4.71 | 4 | .32 |
| Interaction | 1362 | 1524 | 6.09 | 10 | .81 |
|  |  |  |  |  |  |  |
| Working Sector  Agriculture, Forestry, Fishing, and Hunting  *n* = 3,610 | Covariates | 3231 | 3300 |  |  |  |
| Linear birth order | 3233 | 3307 | 0.66 | 1 | .42 |
| Categorical birth order | 3232 | 3331 | 8.95 | 4 | .06 |
| Interaction | 3241 | 3402 | 10.51 | 10 | .40 |
| Working Sector  Construction  *n* = 3,610 | Covariates | -13505 | -13437 |  |  |  |
| Linear birth order | -13503 | -13429 | 0.10 | 1 | .75 |
| Categorical birth order | -13500 | -13401 | 5.51 | 4 | .24 |
| Interaction | -13485 | -13324 | 4.41 | 10 | .93 |
| Working Sector  Electricity, Gas, and Water  *n* = 3,610 | Covariates | -4839 | -4771 |  |  |  |
| Linear birth order | -4837 | -4762 | 0.05 | 1 | .82 |
| Categorical birth order | -4882 | -4732 | 2.87 | 4 | .58 |
| Interaction | -4817 | -4656 | 5.40 | 10 | .86 |
| Working Sector  Finance, Insurance, Real Estate, and Business Service  *n* = 3,610 | Covariates | 4263 | 4331 |  |  |  |
| Linear birth order | 4264 | 4339 | 0.22 | 1 | .64 |
| Categorical birth order | 4270 | 4369 | 2.60 | 4 | .63 |
| Interaction | 4248 | 4445 | 5.55 | 10 | .85 |
| Working Sector  Manufacturing  *n* = 3,610 | Covariates | 4169 | 4264 |  |  |  |
| Linear birth order | 4198 | 4272 | 0.28 | 1 | .60 |
| Categorical birth order | 4203 | 4302 | 3.11 | 4 | .54 |
| Interaction | 4219 | 4380 | 3.50 | 10 | .97 |
| Working Sector  Mining and Quarrying  *n* = 3,610 | Covariates | -2965 | -2897 |  |  |  |
| Linear birth order | -2963 | -2889 | 0.71 | 1 | .40 |
| Categorical birth order | -2960 | -2861 | 4.90 | 4 | .30 |
| Interaction | -2944 | -2783 | 3.89 | 10 | .95 |
| Working Sector  Social Services  *n* = 3,610 | Covariates | -291 | -223 |  |  |  |
| Linear birth order | -289 | -215 | 0.63 | 1 | .43 |
| Categorical birth order | -283 | -184 | 1.53 | 4 | .82 |
| Interaction | -273 | -112 | 10.08 | 10 | .43 |
| Working Sector  Transportation, Storage, and Communication  *n* = 3,610 | Covariates | -1911 | -1843 |  |  |  |
| Linear birth order | -1911 | -1837 | 2.17 | 1 | .14 |
| Categorical birth order | -1905 | -1806 | 1.89 | 4 | .76 |
| Interaction | -1893 | -1732 | 7.92 | 10 | .63 |

*Notes*. The covariates model included the categorical effect of sibship size (effects of sibship size 2, 3, 4, 5, and over 5), self-reported gender, a third-order polynomial for age, and a family random effect. The linear birth order model added birth order as a linear predictor, the categorical model added birth order as a categorical predictor (effects of birth order 1, 2, 3, 4, 5, and over 5), the interaction model included the interaction of the categorical birth order and the categorical sibship size. The linear birth order model was compared to the covariates model, the categorical birth order model was compared to the linear birth order model and the interaction model was compared to the categorical birth order model. Sample sizes differed slightly because not all individuals completed all outcome measurements. AIC = Akaike information criterion, BIC = Bayesian information criterion, df = degrees of freedom.

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