

Birth Order and Number of Older Male Siblings: Evidence of a Downstream Intrauterine Testosterone Effect



ABSTRACT

We present evidence to support a downstream effect of testosterone for individuals having one or more older brothers. Data from two independent samples in two separate studies show that birth order and number of older male siblings play a significant role in the development of specific behavioral and biological characteristics. Number of older brothers was positively correlated with handgrip strength (HGS) in females ($p < .05$), and negatively correlated with hip diameter in males ($p < .05$). High HGS and narrow hip morphology are masculine specific characteristics that are both under the influence of testosterone. In addition, we have preliminary evidence that as the number of older brothers increases the onset of sexual intercourse in females occurs at earlier ages. This effect is even more pronounced when the female's immediate older sibling is a male. These data are consistent with the possibility of a downstream intrauterine testosterone effect.

OBJECTIVES

Here we investigated the effects of older siblings and birth order on aspects of body morphology and behavioral characteristics.

We hypothesized a downstream effect of testosterone in individuals with one or more older brothers. Research has shown that prenatal exposure to testosterone can affect female's brain development and lateralization (Knickmeyer et al., 2006; Cohen-Bendahan et al., 2004; Grimshaw et al., 1995; Connolly Resko, 1994). Sex-typical behavior also seems to be influenced by prenatal testosterone levels. Research has shown that females who have been exposed to increased levels of testosterone *in utero* show more male-specific preferences/personality traits (Cohen-Bendahan et al., 2005; Knickmeyer et al., 2005; Pasterski et al., 2005; Nordenstrom et al., 2002; Grimshaw et al., 1995). Based on previous research using animal models (Steckler et al., 2005; Zieliński et al., 2004; Hotchkiss et al., 2002; Wolf et al., 2002; Rehees et al., 1997), we predicted that more masculine specific characteristics would be present in individuals with older brothers. This model predicts that *in utero* the fetus can be subjected to androgens in the mother's womb that are present from previous male pregnancies. We also hypothesized that this effect would be even more pronounced in those individuals with immediate older brothers, that is when their closest, older, maternal sibling is a brother. Morphological traits that were studied included shoulder-to-hip ratios (SHR) in males, and waist-to-hip ratios (WHR) in females. Based on sex differences recorded in previous research (Gallup et al., under review; Manning et al., 2000), handgrip strength (HGS) and second and fourth digit ratios (2D:4D) was also recorded in both males and females. Promiscuity and the onset of sexual activity were also collected.

METHODS

Data from two independent samples in two separate studies were analyzed. The first sample included 76 males and 53 females. This study included survey data along with morphological measurements. SHR, WHR, HGS, and 2D:4D ratios were all recorded. Questions regarding birth order and siblings were also collected including age and sex of siblings. This sample is limited because specifics regarding abortion, miscarriage half-sibs, and maternal relatedness were not present. Sexual history was also recorded.

The second sample included 60 males and 123 females. These data were collected using mass surveys and did not include any morphological data. More sophisticated methods were taken to record sibling data; however questions concerning adoption and miscarriage were not asked. Questions regarding each sibling's relatedness were included. Participants were instructed to explain each sibling's relatedness in detail (i.e. full sib, maternal ½ sib, paternal ½ sib, etc.). Sexual history was also recorded.

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Males (N=83)	Max HGS Combined	Shoulder Diameter	Hip Diameter	SHR	2D:4D	Age First Sex	Number of Sex Partners	Number of Older Brothers
Max HGS Combined	1							
Shoulder Diameter (81)	.432**	1						
Hip Diameter	.149 (81)	.594** (81)	1					
SHR	.243* (81)	.217 (81)	-.652** (81)	1				
2D:4D	-.087 (83)	.029 (81)	.042 (81)	-.035 (80)	1			
Age First Sex	-.271* (71)	-.296* (70)	-.041 (70)	-.225 (70)	-.214 (71)	1		
Number of Sex Partners	.320** (81)	-.023 (80)	-.112 (80)	-.116 (80)	-.029 (81)	-.526** (71)	1	
Number of Older Brothers	.015 (76)	-.134 (76)	-.226* (76)	-.144 (76)	.015 (76)	-.079 (67)	.077 (76)	1

**. Correlation is significant at the .01 level (2-tailed)

*. Correlation is significant at the .05 level (2-tailed)

RESULTS

In the first study, the only significant correlate between males and number of older brothers was hip morphology ($r = -.226$, $p < .05$, $N = 76$). These data are interesting because in relation to a broad shoulder diameter, a narrow hip structure is a masculine-specific biological feature. In females, hip diameter is positively correlated with the number of older brothers. Handgrip strength (HGS), another masculine specific characteristic, is also positively correlated with number of older brothers ($r = .273$, $p < .05$, $N = 53$).

In the second study, the presence of older male siblings seemed to inhibit the onset of sexual activity in males. Males with an immediate maternal, older brother engaged in oral sex at later ages ($r = .290$, $p < .05$, $N = 54$). In females, we observed the opposite effect. Females with older male siblings tended to engage in heterosexual activity at earlier ages. This effect was more pronounced by the presence of an immediate older brother after you control for maternal similarity.

Males (N=60)	Number of Older Brothers	#Maternal Older Brothers	Immediate Maternal Older Brother	Age Oral Sex	Age First Sex	Number of Sex Partners
Number Of Older Brothers	1					
#Maternal Older Brothers	.814** (58)	1				
Immediate Maternal Older Brother	.717** (58)	.810** (58)	1			
Age Oral Sex	.191 (54)	.231 (54)	.290* (54)	1		
Age First Sex	-.014 (55)	.098 (55)	.174 (55)	.767** (53)	1	
Number of Sex Partners	.105 (53)	.033 (53)	.072 (53)	-.546** (50)	-.572** (52)	1

**. Correlation is significant at the .01 level (2-tailed)

*. Correlation is significant at the .05 level (2-tailed)

Females (N=65)	Max HGS Right	Waist Diameter	Hip Diameter	WHR	2D:4D	Age First Sex	Number of Sex Partners	Number of Older Brothers
Max HGS Right	1							
Waist Diameter (59)	.021 (59)	1						
Hip Diameter	.221 (59)	-.669** (59)	1					
WHR	-.216 (59)	.440** (59)	-.369** (59)	1				
2D:4D	-.079 (65)	.249 (59)	.007 (59)	.296* (59)	1			
Age First Sex	-.041 (58)	.103 (54)	.079 (54)	.026 (54)	.044 (58)	1		
Number of Sex Partners	.021 (65)	-.011 (59)	.004 (59)	-.012 (55)	.156 (58)	-.360** (53)	1	
Number of Older Brothers	.273* (53)	.150 (52)	.284* (52)	-.119 (52)	.082 (53)	-.180 (47)	.082 (53)	1

**. Correlation is significant at the .01 level (2-tailed)

*. Correlation is significant at the .05 level (2-tailed)

Females (N=123)	Number of Older Brothers	#Maternal Older Brothers	Immediate Maternal Older Brother	Age Oral Sex	Age First Sex	Number of Sex Partners
Number Of Older Brothers	1					
#Maternal Older Brothers	.800** (123)	1				
Immediate Maternal Older Brother	.689** (123)	.849** (123)	1			
Age Oral Sex	-.164 (101)	-.132 (101)	-.076 (101)	1		
Age First Sex	-.243* (100)	-.184 (100)	-.193 (100)	.607** (94)	1	
Number of Sex Partners	.106 (108)	.099 (108)	.114 (108)	-.378** (98)	-.403** (94)	1

**. Correlation is significant at the .01 level (2-tailed)

*. Correlation is significant at the .05 level (2-tailed)

DISCUSSION

The presence of older male siblings correlates with a variety of behavioral and biological characteristics. In our two studies, this effect is predominantly seen in females. Number of older brothers predicted the onset of sexual activity as well as HGS in females. Although not significant, the presence of older, maternal, male siblings correlated with an earlier onset of sexual activity in females. This trend is consistent with the notion that a change in the uterine environment due to the presence of earlier male pregnancies may result in more masculine-specific characteristics in females.

In males, number of older brothers significantly correlated with a narrow hip structure. Interestingly, the presence of older male siblings seemed to delay sexual activity in males. The presence of an immediate older, maternal brother seemed to prolong the onset of oral sex and sexual intercourse in males. These data may support recent evidence showing that the number of older brothers may effect sexual orientation (Puts et al., 2006; Blanchard & Bogaert, 1996).

Based on previous research (Manning et al., 2000), we hypothesized that number of older male siblings would significantly alter the digit ratios in subsequent births. We predicted females to be most noticeably affected. However, second and fourth digit ratios (2D:4D) did not predict birth order or the number of older brothers in males or females. Earlier onset of sexual activity (as seen in females), higher HGS, and narrow hip morphology (in relation to shoulder breadth) in males are all representative of masculine specific characteristics. These data are suggestive of a downstream intrauterine testosterone effect in humans. That is, previous male pregnancies may have an effect on a variety of morphological traits and sexual behavior due to increased levels of prenatal testosterone. The presence of androgens in the mother's womb due to prior male pregnancies may influence the development and behavior of the subsequent fetus in lasting ways. Future studies will track blood testosterone levels and the length of time between births. The incidence of abortion and miscarriage will also be tracked to further support the hypothesis.

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