

# Gestation and Birthweight in Dizygotic Twins: Girls Call the Tune

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Unlike-sex twins provide a unique natural experiment to investigate the influence of sex on gestation. Our data showed that length of gestation of unlike-sex pairs is similar to that of female same-sex pairs, and significantly (0.4 wks,  $p = .02$ ) longer than that of male same-sex pairs. Birthweight of female unlike-sex twins was similar to female same-sex twins, but male unlike-sex twins weighed 78 g more than male same-sex twins ( $p = .001$ ). These data show that in unlike-sex pairs it is the girl that prolongs gestation for her brother, resulting in a higher birthweight than that of same-sex boys.

Despite the longer gestation of girls, their birthweight is less than that of boys (Anderson & Brown, 1943; de Zegher et al., 1999). Unlike-sex twins provide a unique natural experiment to investigate the influence of sex on gestation, since both a male and a female fetus share the womb. Therefore, we compared birthweight and gestation of same-sex and unlike-sex dizygotic twins to examine which sex of the unlike-sex twins determines the length of gestation, and consequently the birthweight of the co-twin.

## Methods

We studied 1929 dizygotic twin pairs of the East Flanders Prospective Twin Survey (EFPTS; Loos et al., 1998), after excluding twin pairs of whom one or both children were stillborn ( $n = 54$ ), had a major congenital malformation ( $n = 53$ ), unrealistic birthweight for a given gestation ( $n = 12$ ), delivery mode unknown ( $n = 22$ ) or birth by cesarean section ( $n = 700$ ). The infants form four groups: males of same-sex pairs ( $n = 936$ ), males of unlike-sex pairs ( $n = 1008$ ), females of same-sex pairs ( $n = 906$ ), and females of unlike-sex pairs ( $n = 1008$ ).

To examine which sex determines the length of gestation, we compared gestation of male same-sex, female same-sex, and unlike-sex pairs. Subsequently, we compared the birthweight of same-sex with that of unlike-sex pairs to check whether any difference in

gestation affected the birthweight of the unlike-sex twins. To control for gestation, birthweights were also expressed as standard deviation scores of their respective means per week of gestation ( $z$  scores).

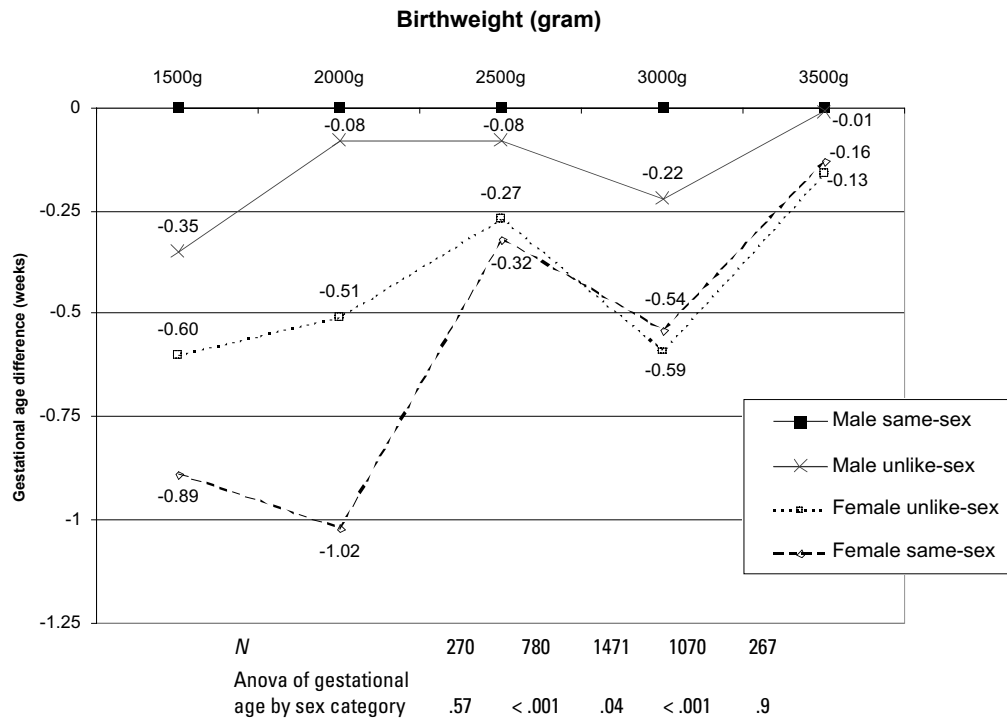
Gestations of the four groups were compared by birthweight classes of 500 g (see Figure 1). We used analysis of variance (ANOVA) to compare birthweight and gestation with SAS 6.12.

## Results

Mean gestation of unlike-sex pairs (36.8 wks  $\pm$  SD 2.7) was similar to that of female same-sex pairs (36.9 wks  $\pm$  2.6), but both unlike-sex and female same-sex pairs had a significantly ( $p = .02$ ) longer gestation than male same-sex pairs (36.4 wks  $\pm$  2.8). Birthweight of female unlike-sex twins was not significantly different from that of female same-sex twins, but male unlike-sex twins weighed 78 g more than male same-sex twins ( $p = .001$ ; Table 1). Even after controlling for gestation ( $z$  scores), the discrepancy between male same-sex and male unlike-sex remained significant. Figure 1 represents the difference of gestation between male same-sex twins (reference group) and male unlike-sex, female unlike-sex and female same-sex, respectively. For any given birthweight class, gestation of male same-sex and male unlike-sex was comparable. Gestation of girls was significantly longer compared to boys for birthweights ranging between 1750 g to 3249 g. This difference decreased with increasing birthweight.

## Conclusions

Our findings in dizygotic twins confirm those in singletons (Anderson & Brown, 1943; de Zegher et al., 1999), that is, despite the longer gestation, birthweight of female twins is lower than that of males. Most interesting are the unlike-sex pairs, showing that it is the girl who 'calls the tune' concerning gestation. She prolongs gestation for her brother. He will benefit from the longer gestation, which results in a higher birthweight than that of male same-sex twins. We do not know by which mechanism girls play this determining role, nor why unlike-sex boys weigh

**Figure 1**

Difference in gestational age (weeks) between twin pairs. Indicated weights are midpoint values of birthweight classes ranging over 500 g.

Note: Difference in gestational age (weeks) of males of unlike-sex pairs, females of unlike-sex pairs and females of female same-sex pairs compared to males of male same-sex pairs (—■—). Indicated weights are mid-point values of birthweight classes ranging over 500 grams.

**Table 1**

Mean (*SD*) Birthweight of Individual Twins

	Same-sex	Unlike-sex	<i>p</i>
<b>Males</b>			
<i>n</i>	936	1008	
Birthweight (gram)	2515 (540.2)	2593 (527.8)	.001
Birthweight standardized for gestational age (z score)	0.01 (0.99)	0.1 (0.98)	.03
<b>Females</b>			
<i>n</i>	906	1008	
Birthweight (gram)	2469 (521.5)	2471 (508.4)	.92
Birthweight standardized for gestational age (z score)	0.02 (0.99)	0.08 (0.97)	.22

Note: Birthweight (*N* = infants) of DZ twin pairs:

Analysis of variance: Males of same-sex pairs (male same-sex) versus males of unlike-sex pairs (M unlike-sex)

Females of same-sex pairs (female same-sex) versus females of unlike-sex pairs (F unlike-sex)

significantly more than same-sex boys even after adjustment for gestation.

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### References

Anderson, N. A., & Brown, E. W. (1943). Causes of prematurity. III. Influence of race and sex on duration of

gestation and weight at birth. *American Journal of Diseases of Children*, 65, 523–534.

de Zegher, F., Devlieger, H., & Eeckels, R. (1999). Fetal growth: Boys before girls. *Hormone Research*, 51, 258–259.

Loos, R., Derom, C., Vlietinck, R., & Derom, R. (1998). The East Flanders Prospective Twin Survey (Belgium): A population-based register. *Twin Research*, 1, 167–175.