

## Talking hormones: Prenatal testosterone levels from neonate hair samples predict language development in the first year of life

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There is a common understanding that biological sex plays a role in early language development. These sex-related differences have been partially attributed to children's interindividual differences in sex hormone levels, yet less is known about the early impact of prenatal sex hormones: Specifically, testosterone levels increase in male fetuses during the second trimester of pregnancy, while it remains nearly constant in females. These fetal testosterone levels have been identified as an organizing mechanism for the emergence of sex-related differences in the human brain. Furthermore, first evidence suggests that fetal testosterone levels drawn from amniotic fluid during amniocenteses predicts early vocabulary development at the age of 2 years. In extension of these findings, the current study aims to investigate whether prenatal testosterone levels from neonates' hair samples, reflecting hormone levels during the second and third trimesters, can explain language development during the first year of life. To this end, we assessed prenatal testosterone levels in neonates (n = 32, 19 females; target sample n = 50) through hair samples collected 2 weeks after birth. In addition to their testosterone levels (mean = 2.34 pg/mg, SD = 2.21), we longitudinally assessed infants' language skills using the Bayley Scales of Infant and Toddler Development at 6 months of age (mean test score = 113.7, SD = 8.49). Step-wise regression analysis revealed prenatal testosterone levels to significantly predict infants' language performance at 6 months ( $p < 0.05$ ), while biological sex alone did not predict language outcome. These findings show first that prenatal sex hormone levels can be captured by neonate hair samples reflecting hormonal changes during the last trimesters of pregnancy (with hair growth starting from the 14th week gestation). Second, they show that these prenatal hormonal levels have an explanatory value in early language development.