



# Does prematurity moderate the heritability of early motor development?

Catharina E. M. van Beijsterveldt, Cyrina B. Brouwer,  
Meike Bartels & Dorret I. Boomsma  
Netherlands Twin Registry (NTR) VU Amsterdam

**Introduction:** Motor milestones are recognizable landmarks of development in the first years of life and good indicators of early motor development. One risk factor for a delayed motor development is prematurity. In this study we estimated the contribution of genetic factors on achievement of motor milestones and tested whether prematurity moderates these factors. Because of immaturity of organs and systems in preterm twins we expect that genetic factors contribute to a greater extent in the variation of achieving motor milestones in term born twins than in preterm born twins.

## Methods

The study is part of the longitudinal data collection of the Young-Netherlands Twin Registry on behavioral and emotional development. Data on motor development and gestational age were available for **21,366 twin pairs**, born between 1987 and 2010, and obtained by maternal report (see right). Motor development was assessed by the age of achieving a motor milestone (turning over, sitting up, crawling, standing, and walking).

With structural equation model, we estimated the effects of genetic and environmental influences and tested the moderation effect of prematurity and sex on the means and the variance components.

## mijlpalen

Met hoeveel maanden kon uw tweeling voor het eerst:

**zitten zonder steun?**

oudste:	minder dan 3	3	3%	4	4%	5	5%	6	6%	7	7%	8	8%	9	9%	10	10%	11	11%	12	12%	13	13%	14	14%	15	15%	16	16%	17	17%	18	18%	19	19%	20	20%	21 of meer
jongste:	minder dan 3	3	3%	4	4%	5	5%	6	6%	7	7%	8	8%	9	9%	10	10%	11	11%	12	12%	13	13%	14	14%	15	15%	16	16%	17	17%	18	18%	19	19%	20	20%	21 of meer

**kruipen op handen en knieën?**

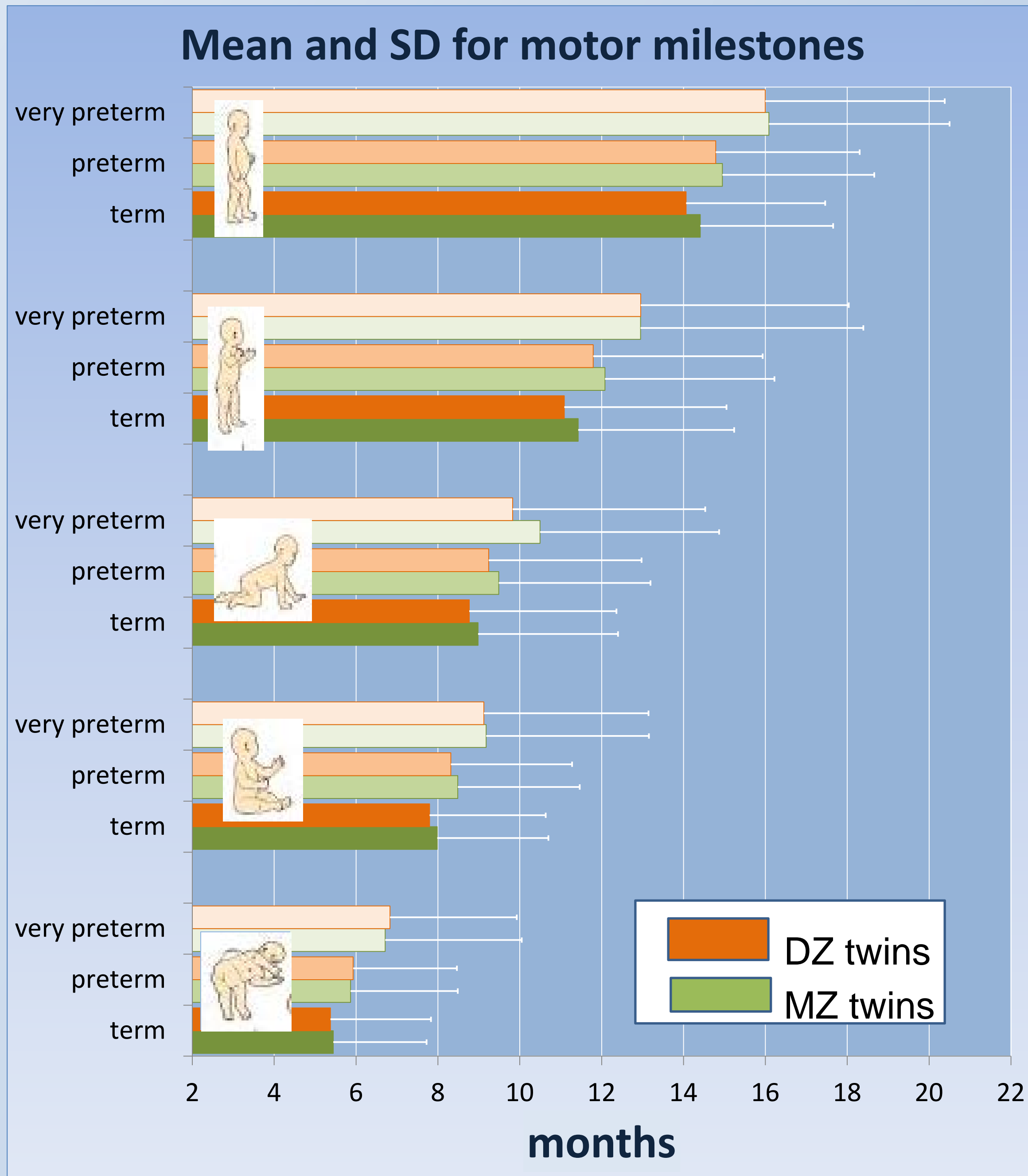
oudste:	minder dan 3	3	3%	4	4%	5	5%	6	6%	7	7%	8	8%	9	9%	10	10%	11	11%	12	12%	13	13%	14	14%	15	15%	16	16%	17	17%	18	18%	19	19%	20	20%	21 of meer
jongste:	minder dan 3	3	3%	4	4%	5	5%	6	6%	7	7%	8	8%	9	9%	10	10%	11	11%	12	12%	13	13%	14	14%	15	15%	16	16%	17	17%	18	18%	19	19%	20	20%	21 of meer

Examples of the questions on motor milestones

## Distribution of prematurity

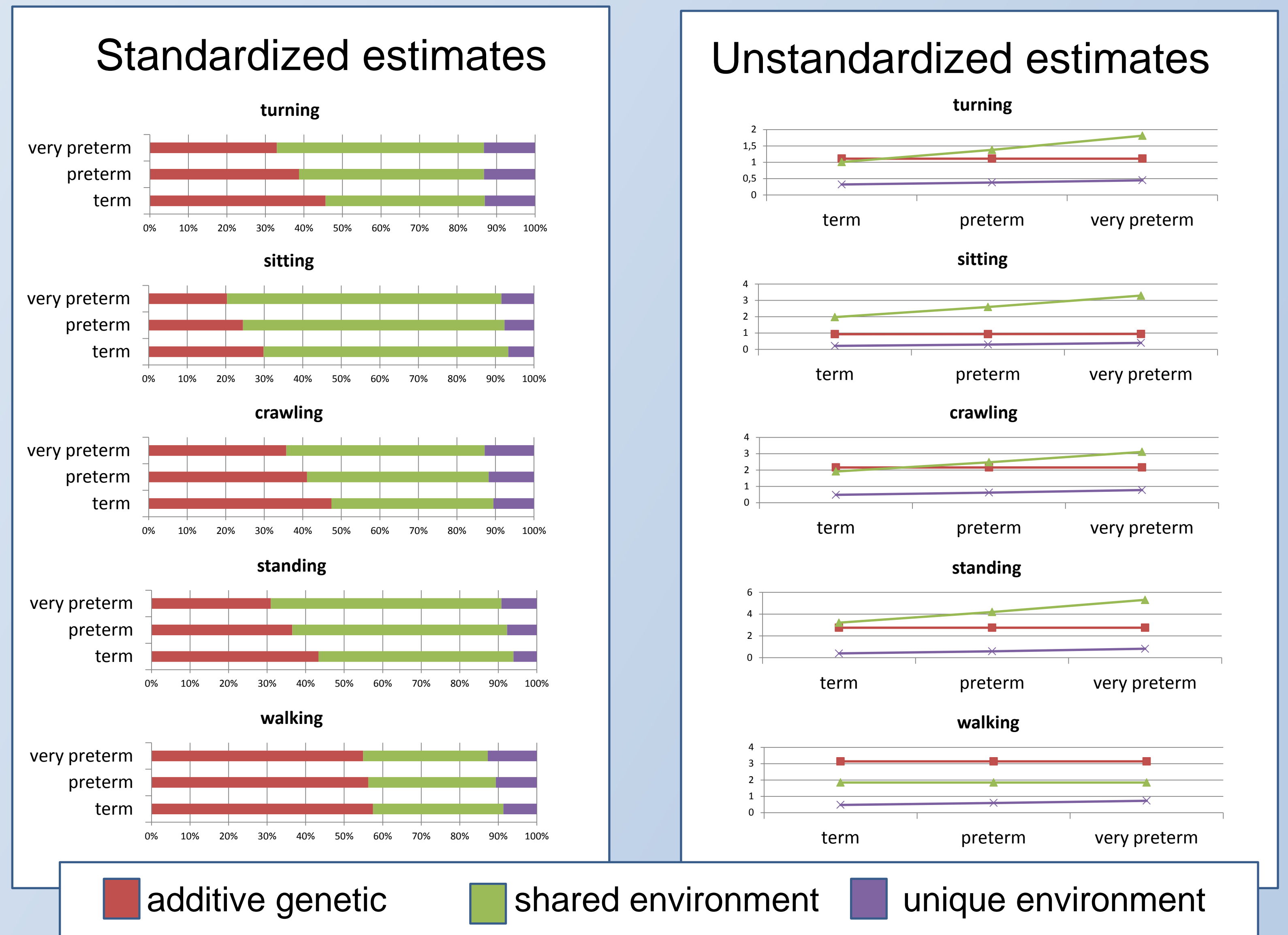
Very preterm (<32 wks)	926 pairs (4.3%)
Preterm (>=32 wks and <37 wks)	7520 pairs (35.2%)
Term (>= 37 wks)	12920 pairs (60.5%)

## Results



- Effect of prematurity was highly significant for all motor milestones.
- Except for turning, boys achieved motor milestones later than girls. However effect sizes were small, varying from 2 to 5 days.

## Genetic and environmental influences



## Conclusion

- Individual differences in motor milestones are explained by both genetic and shared environmental influences.
- Heritability estimates are highest for walking and lowest for sitting.
- Standardized heritability estimates were higher in term born twins than in (very) preterm born. Inspection of the unstandardized estimates showed that the higher heritability could be explained by an increase of the shared environmental variance in the (very) preterm born twins. Genetic variance did not change across groups.

