

Differences in Adolescent Physical Fitness: A twin-sibling study



Nienke Schutte^{1,2}, Meike Bartels^{1,2}, Ineke Nederend^{1,2} & Eco de Geus^{1,2}

¹ Department of Biological Psychology, VU University Amsterdam, the Netherlands

² EMGO+ Institute for Health and Care Research, VU University Medical Center, Amsterdam, the Netherlands

Introduction

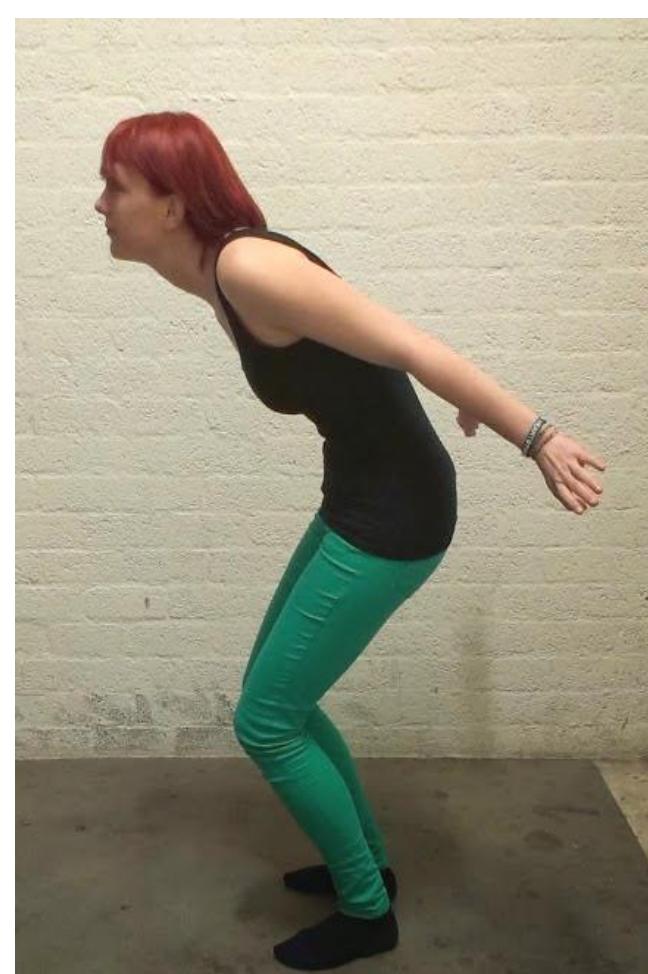
Physical fitness can be defined as a set of components that determine exercise ability and performance in sports. Because exercise ability may be a major driver of voluntary exercise behavior it is important to understand the source of the substantial variation in the components of physical fitness seen already among adolescents.

Most studies have focused on aerobic fitness but other components such as muscular strength, motor control and flexibility also play an important role in exercise ability. This study determines the causes of individual differences in these components of physical fitness.

Methods

The two main factors that can influence individual differences in adolescent physical fitness are innate biological (genetic) differences and environmental factors. In a twin study, intrapair resemblance between two types of twin relationships is compared, namely genetically identical (monozygotic, MZ) and non-identical (dizygotic, DZ) twins. If the MZ resemblance for physical fitness is higher than the DZ (or sibling) resemblance this constitutes evidence for genetic influences on this phenotype.

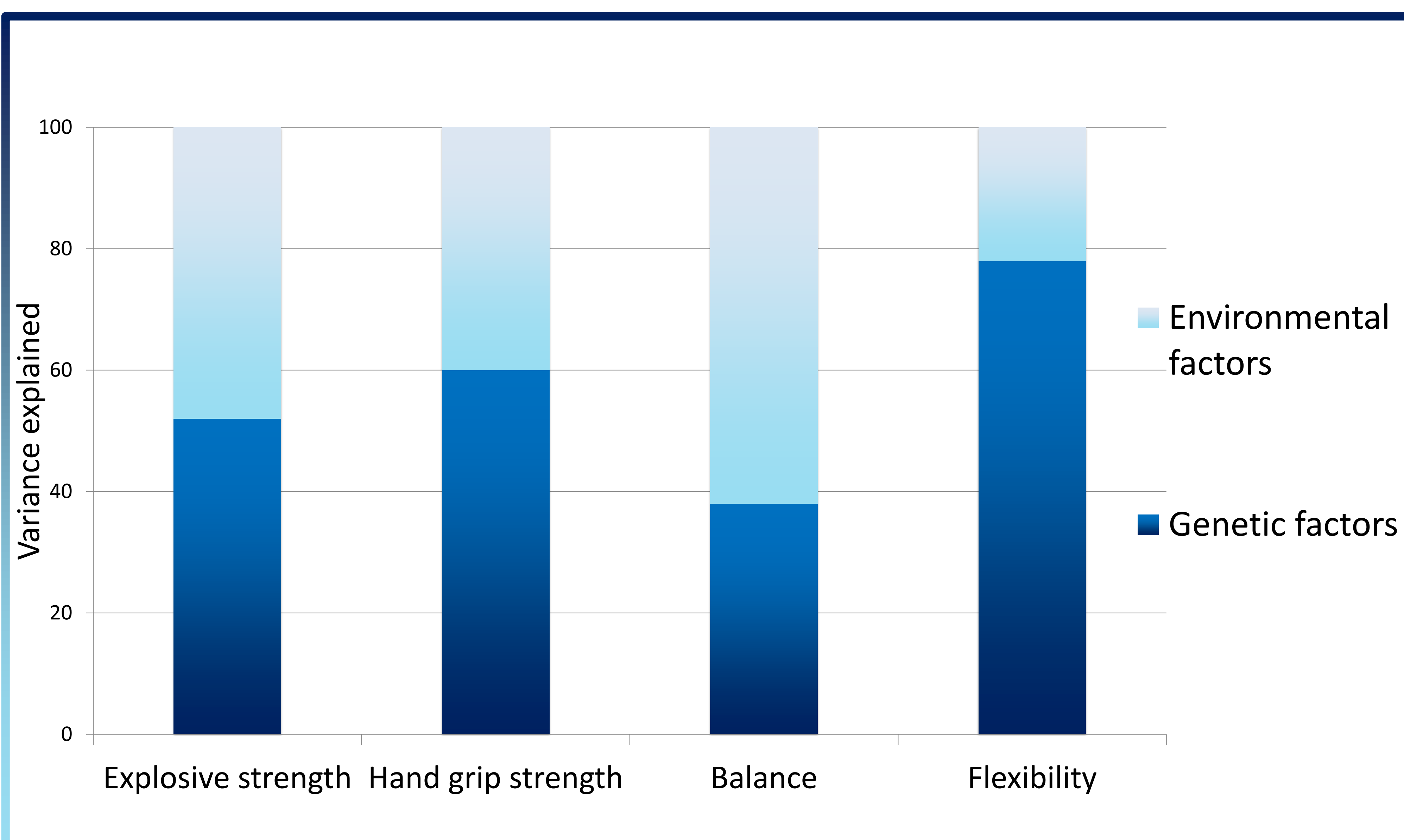
Explosive (dynamic) leg strength, hand grip (isometric) strength, balance, and flexibility (sit and reach) were examined in 227 healthy MZ and DZ twin pairs and 38 of their singleton siblings (mean age 17.2 ± 1.2).



Results

52% and 60% of the individual differences in explosive leg strength and hand grip strength could be explained by genetic factors. For balance and flexibility this was 38% and 78% (see Table).

The remaining variance is accounted for by person-specific environmental factors.



Conclusions

Genetic factors contribute significantly to strength, flexibility and balance in adolescence. As exercise ability plays a role in the maintenance of regular voluntary exercise, these genetic factors could partly explain the known heritability of exercise behavior.

