



# An Extended Twin-pedigree Study Of Voluntary Exercise Behavior In The Netherlands

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## Introduction

We estimated the genetic and environmental contribution to individual differences in different classes of voluntary regular exercise behavior in extended twin-family pedigrees using the Mendel software package. In contrast to much of the earlier work based on twin data only, this allowed us to simultaneously estimate the contribution of shared household effects (C), additive (A) and non-additive genetic effects (D) to the resemblance in exercise behaviour of family members.

## Methods

A total of 51,108 NTR participants (age $\geq$ 16) in 19,842 families from the Netherlands Twin Register (NTR) provided data on their voluntary exercise behavior. Total weekly MET hours spent on leisure time exercise were computed across all activities and across exercise activities in specific classes: team-based exercise, competitive exercise, solitary exercise, non-competitive exercise, internally paced exercise and externally paced exercise.

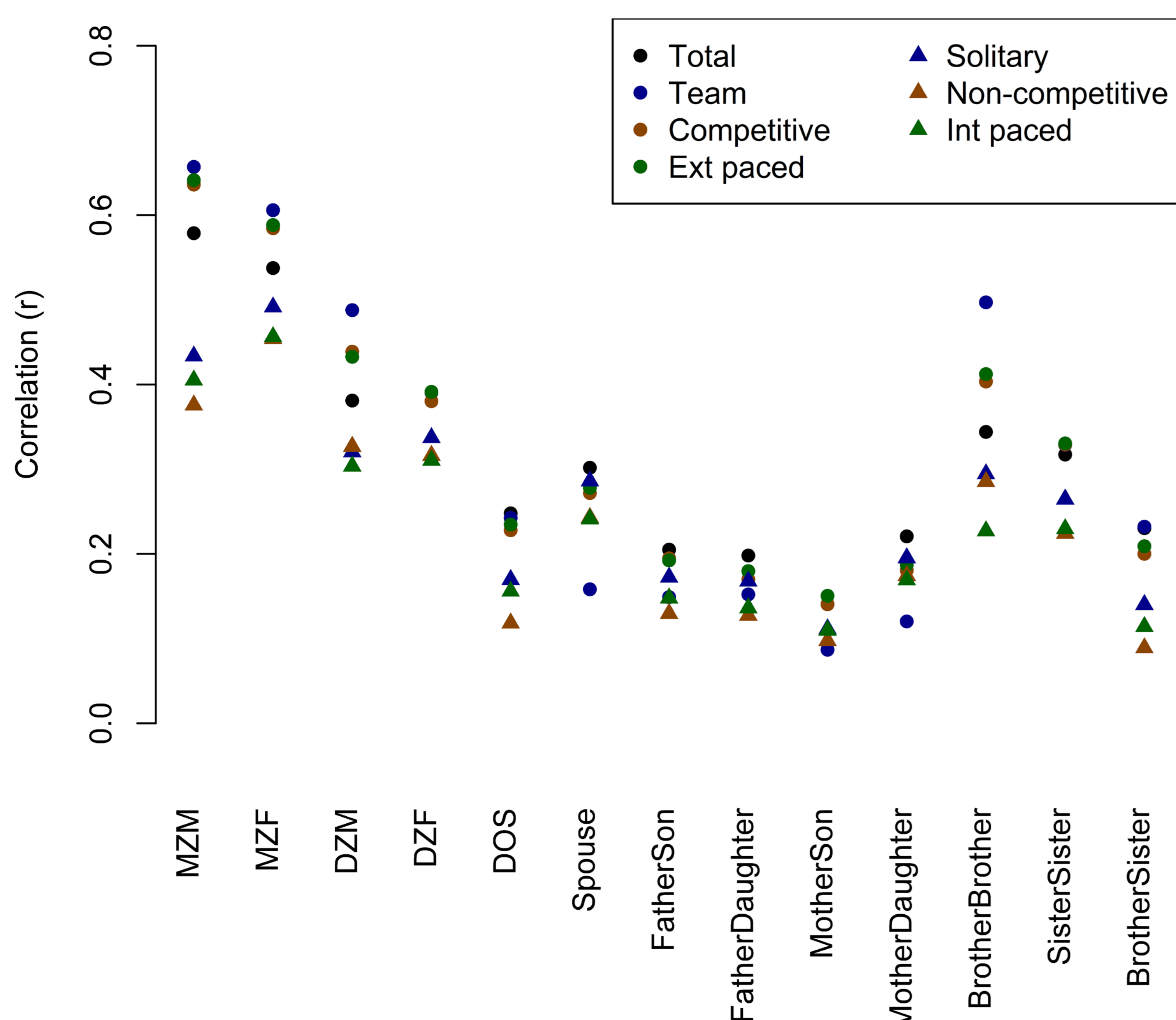
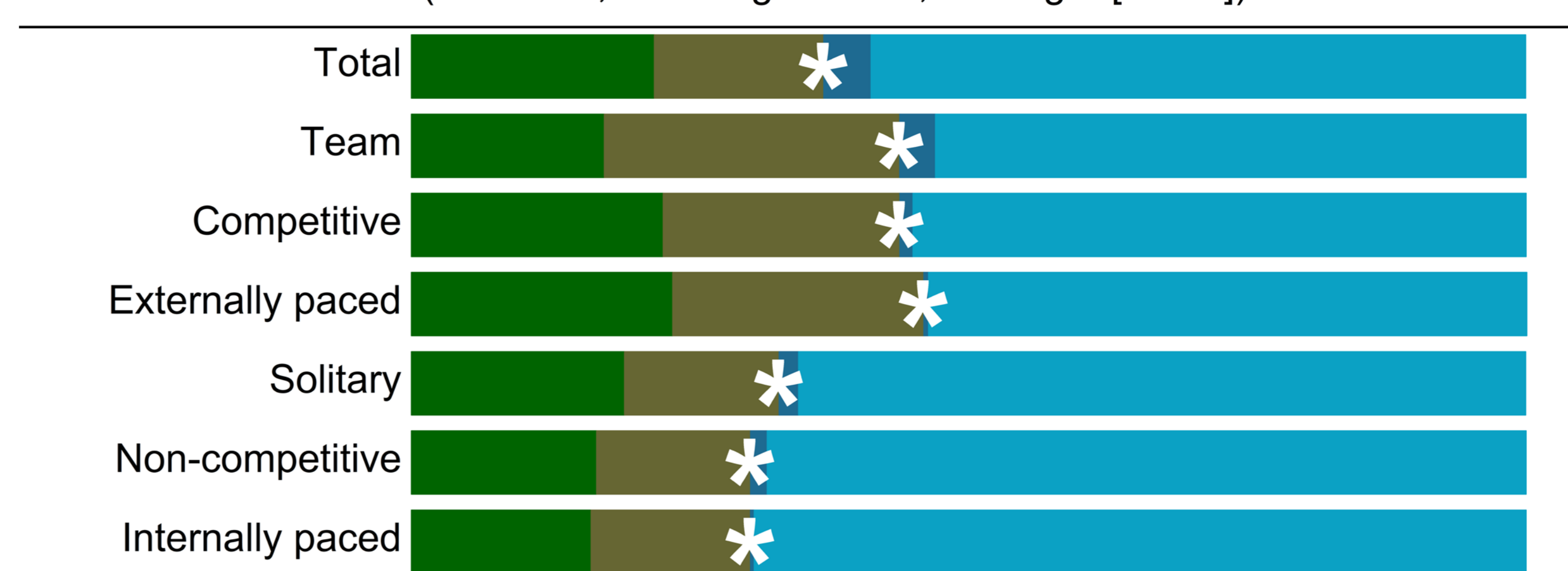


Figure 1: Familial resemblance (Spearman  $r$ ) for total exercise behavior and for specific classes of exercise activities. MZM/MZF monozygotic males/females; DZM/DZF same sex dizygotic males/females; DOS opposite sex dizygotic twins.

**SibHousehold** (N=21932, mean age=28.51, IQR age=[19-34])



**SpouseHousehold** (N=32021, mean age=45.39, IQR age=[40-51])

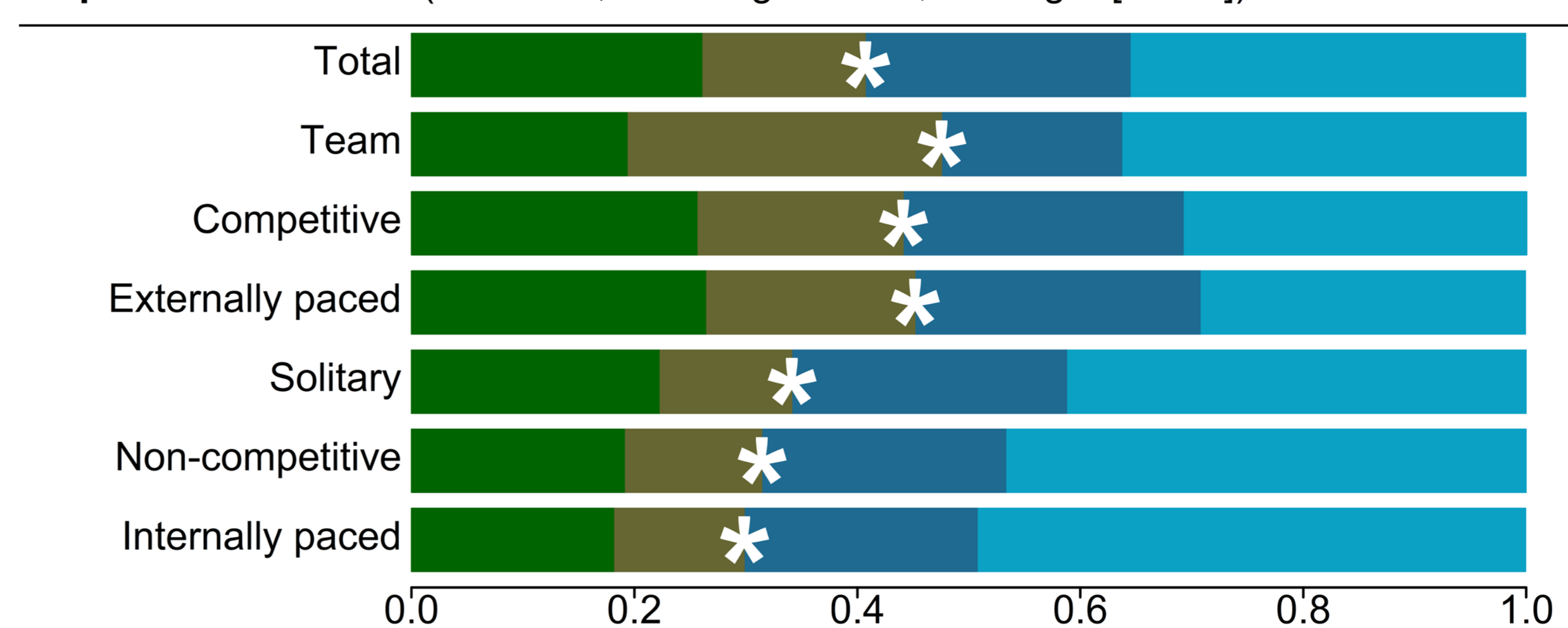


Figure 2: Proportion of variance explained by **additive genetic (A)**, **non-additive genetic (D)**, **shared environmental (C)**, **unique environmental (E)** factors and broad sense heritability(\*) for different classes of exercise. The C component in the sibling household (Upper) is the traditional C from twin-studies, being the environment shared by siblings in their youth. The C in the spouse household (Lower) reflects the environment shared by spouses.

## Results

Figure 1 displays familial resemblance for exercise as a function of family relationship. Figure 2 shows the contribution of genetic and shared environmental factors to this familial resemblance. Results confirm the influence of genetic factors throughout the life span with broad sense heritability ranging from 37% to 41% in total volume of exercise (22-26% A, 15% D). Engaging in team-based, competitive, externally paced activities (e.g. soccer) is ~15% more heritable than engaging in non-competitive, solitary activities (e.g. jogging).

## Conclusion

In young adults, genetics and environmental factors unique to one member of the family are the main sources of variation in volume and type of exercise behaviour.

In middle-age, the environment shared by spouses plays an additional role and causes substantial spouse resemblance in exercise behaviour.