Title of research proposal

On the origin of healthy food consumption and physical activity: a consortium of international twin studies

Discipline/research area

Nutrition, Diet Quality, Physical Activity, Behavioural Genetics, Twin studies

Host laboratory/ies

Details of supervisor(s):

Prof. dr. Maurice Zeegers is professor of Complex Genetics & Epidemiology. He is internationally recognised for his research on twins. He serves as head of Maastricht's School of Care and Public Health Research Institute (CAPHRI) and the department of Complex Genetics. He has published >250 papers and supervised >20 PhD students.

Dr. Marij Gielen is an Assistant Professor at Maastricht University. She has an expertise in programming of the cardiometabolic risk factors in the prenatal and early postnatal period. She is an expert in twin birth cohorts and collaborates with the East Flanders Prospective Twin Survey (EFPTS), contributed to the establishment of twin registers of the University of Birmingham (Birmingham Registry for Twin and Heritability Studies; BiRTHS) and of the University of Hasselt, Belgium. She published over 45 peer-reviewed scientific articles.

Dr. Sally Fenton is a Lecturer in Lifestyle Behaviour Change at the University of Birmingham (UK). She has an expertise in physical activity and sedentary behaviour epidemiology. Specifically, conducting quantitative observational and experimental research to identify individual and environmental determinants of physical activity and sedentary behaviour in different populations. This work includes validation and application of self-report and objective measures of physical activity and sedentary behavior in different populations.

Miss Elena Tore is the manager of the international twin consortium of this project. She has experience in nutritional epidemiology and twin studies.

The student will be supervised by a group of experts with different but complementary expertise in Nutrition (ET and MZ), Physical Activity (SF), Twin Research (MG, ET and MZ) and Statistical Genetics (ET and MG). The student will receive multidisciplinary training in all of these topics. S/he will be based within the team 'Evidence-Based Nutrition' of the department of Complex Genetics at Maastricht University, the Netherlands (http://www.ccge.nl). This productive team comprises one of the two twin research centres in the Netherlands. Here, s/he will work with other colleagues and PhD students that are also involved in twin research (e.g. via their projects in the East Flanders Prospective Twin Survey), other consortia (e.g. the BLEND consortium that has also harmonized dietary information), other nutritional research projects (e.g. clinical trials and cohort studies on dietary supplementation) and other genetic projects (e.g. Health Potential). The student will be working in close collaboration with the School of Sport Exercise and Rehabilitation Sciences, which will provide the methodological expertise regarding the assessment and interpretation of physical activity data.

About the project

Background

The association between modifiable risk factors, such as diet and physical activity, and most chronic diseases is now clear. Despite convincing evidence from numerous studies, a large proportion of the population still does not meet the recommendations for healthy diet and physical activity. Environmental as well as genetic factors may play an important role in influencing people's behaviours. Indeed, several twin studies have shown an association, but the details are lacking. The knowledge regarding the genes effectively responsible is even scarcer. No genome-wide association study (GWAS) has been performed specifically to analyse the effect of specific genetic differences on food intake, and only one small GWAS was found on physical activity behaviour.

This research aims at increasing our understanding of the relative genetic and environmental influence on healthy food consumption and physical activity by using available international data on this topic. So far, fifteen twin studies from across the world, with a total of 37,838 twin pairs (75,676 individuals) have expressed their willingness to join this pooled analysis, which would be the largest ever conducted on the origins of food consumption and physical activity.

Discerning the origin through which healthy behaviours occur is essential in order to develop effective personalised interventions for lifestyle change and the promotion of population's health.

Key objective

To examine in depth the influence of genetic and environmental factors in healthy diet and physical activity behaviour in a large consortium of twin studies.

Research questions

To what extent genetic and common and unique environmental factors influence dietary intake?

To what extent genetic and common and unique environmental factors influence physical activity and sedentary behaviour?

Which single nucleotide polymorphisms (SNPs) influence dietary intake, sedentary behaviour and physical activity?

Study recruitment

Via literature searches, the professional network of the research team and the International Network of Twin Registries, we have identified 35 twin studies with at least 100 adult twin pairs that underwent assessments on their dietary intake and/or physical activity. Fifteen large twin studies (40%) from China, Sri Lanka, Finland, United Kingdom, Sweden, Belgium, the Netherlands, Italy, Guinea Bissau, Australia, United States, Spain, Japan and South Korea have expressed their willingness to participate in the project and provide their data. More information on participating studies and principle investigators are provided in the table below. In the unlikely event that no other studies would join the consortium, the current pooled analysis would already be by far the largest ever conducted on food consumption and physical activity, with data on 37,838 twin pairs (75,676 individuals).

Expected results

Discerning the origin through which healthy behaviour occurs is essential to develop effective personalised interventions for lifestyle change. This PhD project aims to provide strong evidence-base information for policy strategies to enable the design of more effective interventions promoting healthy behaviours. Successful termination of this project will result in a PhD thesis and at least four to six WI-1 publications.

Table: Overview of twin registries that so far have agreed to collaborate

Study name	Country	Collaborator	#MZ pairs	#DZ pairs	Dietary data	Physical Activity data	Genetic data	Data provided
The Swedish Twin Study of Adults: Genes and Environments-STAGE	Sweden	Dr. Patrik Magnusson	2321	1479	X	X	X	
TwinsUK	United Kingdom	Dr. Victoria Vazquez	1426	822	X	X	X	X
The South Korean Twin Registry	South Korea	Dr. Joohon Sung	416 (in 2006)*	183 (in 2006)*	X	X		
Chinese National Twin Registry	China	Dr. Wenjing Gao, Prof. dr. Liming LI	250*	250*	X	X		
Finnish Twin Registry-FinnTwin16	Finland	Prof. dr. Jaakko Kaprio	1408	2980	X	X		
Sri Lankan Twin Registry	Sri Lanka	Dr. Kaushalya Jayaweera	1691	2274	X	X		
Washington State Twin Registry	United States of America	Prof. dr. Glen Duncan	3832	3387	-	X		X
Bandim Health Project Twin Registry	Guinea Bissau	Dr. Morten Bjerregaard-Andersen	*	*	-	X		
East Flanders Prospective Twin Survey	Belgium	Dr. Catherine Derom	1000*	2000*	-	X	X	X
Netherlands Twin Registry**	The Netherlands	Prof. dr. Eco de Geus	3636*	7272*	-	X	X	
Queensland Twin Registry	Australia	Prof. dr. Nicholas Martin	*	*	-	X		
Twins & Sisters Study	Australia	Dr. Jenny Boadle	330*	220*	X	X	X	
Keio Twin Registry	Japan	Prof. dr. Chizuru Shikishima	398	263	X	X		X
Murcia Twin Registry	Spain	Dr. Huan R. Ordoñana Martín	*	*		X	X	X
Italian Twin Registry	Italy	Dr. Sonia Brescianini Dr. Maria Antonietta Stazi	*	*	X	X	X	

*Actual number may differ, as the response rate to the assessment of dietary intake and physical activity was still unknown at the time of submitting this proposal.
** The NTR will provide correlation matrices instead of individual data