Correlation of cortical thickness in cognitively healthy elderly monozygotic twin pairs

Anouk den Braber, PhD1,2, Elles Konijnenberg, MD1, Mara ten Kate, MD1, Betty M. Tijms, PhD1, Frederik Barkhof, MD, PhD3, Dorret I. Boomsma, PhD2, Philip Scheltens, PhD1, Pieter Jelle Visser, PhD1,4.

Background

Previous studies showed cortical thickness to be negatively correlated with age (figure 1). In addition, regionally specific cortical thinning was found to be associated with Alzheimer’s disease (AD) (figure 2). Studying cortical thickness in cognitively healthy, identical twins can be a useful approach to understand how genetic and environmental risks contribute to this trait. Previous twin studies (age range 5-59 years) showed that heritability for cortical thickness varies greatly across the cortex with the highest value (.76) for frontal regions (Blokland 2012). Further, a family-based study, showed heritability estimates to be stable between 18-70 years, but suggested that these estimates might change after 70 years of age (Chouinard-Decorte 2014). This is the first study assessing correlations for cortical thickness in a sample of 60-90 year old cognitively healthy twins.

Aim

1. Determine the contribution of genetic and environmental influences on cortical thickness.
2. Investigate whether the contribution of genes and environment changes after the age of 70.

Methods

Monozygotic twins were selected from the Netherlands Twin Register

Inclusion criteria:
• Age ≥ 60 years
• CERAD 10 word list > -1.5 SD; TICS-m ≥ 23; GDS < 10; CDR 0

MRI:
• 3D T1-weighted structural MRI scans (3.0T Philips Achieva)
• Cortical thickness estimated automatically using Freesurfer (figure 3)

Statistical analysis:
• Monozygotic (MZ) twin correlations calculated in SPSS

Conclusions & future directions

1. Besides a strong involvement of genetic factors also non-genetic factors substantially influence cortical thickness in elderly subjects
2. These effects do not change after the age of 70 years

Future studies should focus on identifying modifiable risk factors associated with MZ twin discordance for cortical thickness, which might eventually lead to the discovery of early treatment targets for AD.