Exploring Resting Frontal EEG Asymmetry as a Genetic Marker of Anxiety and Depression.

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Frontal asymmetry has been found to be correlated with depression. Since depression is heritable, frontal asymmetry has great potential to be used as a so-called endophenotype in studies linking genes to depression. For this, frontal asymmetry must a) be heritable, b) share a genetic source with depression. We explored these relations in combination with sex and age effects.

Participants were 732 twins and additional siblings (45% male) from the Netherlands Twin Registry (www.tweelingenregister.org), divided into two cohorts of ages 24.6 and 49.9.

Questionnaires were used to measure anxiety, neuroticism, somatic anxiety, and depression. These were summarized in a factor score capturing the genetic risk for anxiety and depression (Boomsma, 2001).

Resting EEG (eyes closed) was collected in a single 3 min episode from leads F3 and F4 with the usual instructions and precautions. Alpha activity was defined as spectral power from 8.0 to 13.0 Hz. FA = ln(alpha F4/alpha F3).

Low voltage EEG may introduce noise into frontal asymmetry measurement. Therefore, all calculations were repeated with 20% of the subjects with lowest average frontal EEG power excluded.

Table 1. **Heritability** (h^2) **of Frontal Asymmetry** for each sex by cohort group.

	Subject group			
	Young adult		Middle-aged	
Low voltage selection	Male	Female	Male	Female
None (all subjects)	32% *	37% *	0%	18%
-10% low frontal power	30%	29% *	1%	21%
-20% low frontal power	28%	35% *	2%	25%

Table 2. **Genetic Correlations** (R_A) between **frontal asymmetry** and the **risk for anxiety and depression** for young females only.

Low voltage selection	h^2 frontal asym.	h^2 anxious depression	R_A
None (all subjects)	37%	45%	0.30
-10% low frontal power	38%	43%	0.38
-20% low frontal power	43%	44%	0.42

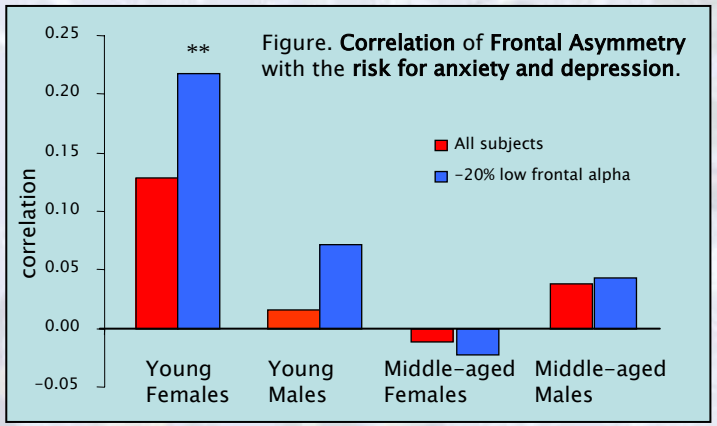

Figure. **Correlation** of **Frontal Asymmetry** with the **risk for anxiety and depression**.

<> Genetic factors contribute significantly to variance in resting Frontal Asymmetry: average heritability across sex and age cohorts was 20%.

<> Frontal Asymmetry correlates with the risk for anxiety and depression in young adult females, but only after exclusion of subjects with the least reliable frontal EEG.

<> Frontal Asymmetry and the risk for anxiety and depression have about one-third of their genes in common.

<> Linkage or association studies for anxiety and depression in young females may benefit from using Frontal Asymmetry as an endophenotype, but removing subjects with very low frontal EEG power is mandatory.

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