Genetic and environmental associations between self-efficacy, fatigue, and depression

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Backgrounds & Aims: Self-efficacy is the one of the most important personality characteristics in health promotion and the recovery from or control of disease. However, the background of the relationships between self-efficacy and present somatic and mental symptoms are unclear. In order to clarify these associations, we examined the role of shared genetic and environmental factors underlying the associations between self-efficacy, fatigue symptoms and depressive symptoms.

Conclusion: The results show that two different genetic factors underlie the associations between self-efficacy, fatigue, and depressive symptoms. One of the genetic factors contribute to the association between self-efficacy and fatigue symptoms and shows a weak association between self-efficacy and depressive symptoms. Another genetic factor affects fatigue and depressive symptom with equally strength. Our results show that the associations between these traits are largely affected by shared genetic background.

Results: When different quad-variate (GSE-2014, CFQ-2014, CFQ-2016, and CES-D-2014) genetic models were compared, the additive genetic/specific environment (AE) model offered the best fit according to Akaike Information Criterion (AIC). When four genetic models (AE Cholesky decomposition, AE Cholesky decomposition with two A factors, independent pathway model, and common pathway model) were compared, the Cholesky decomposition with two A components showed the best fit according to AIC.

Table 1. Sample characteristics

	N(pairs)	M	SD
Mz			
Age-2014	465	62.2	13.6
GSE-2014	260	26.6	7.3
CFQ-2014	267	30.2	7.7
CFQ-2016	219	28.6	7.7
CES-D-2014	261	11.1	7.0
Dz			
Age-2014	136	65.5	13.5
GSE-2014	52	27.0	7.2
CFQ-2014	56	30.0	8.5
CFQ-2016	36	27.1	8.0
CES-D-2014	52	11.8	7.3

Figure1. Best-fit (Quad-variate Cholesky decomposition with 2A factors) with standardized parameter estimates for the four phenotypes.

Non-significant paths (from A3 and A4) were dropped from model. For simplicity, only one twin of a pair is shown.
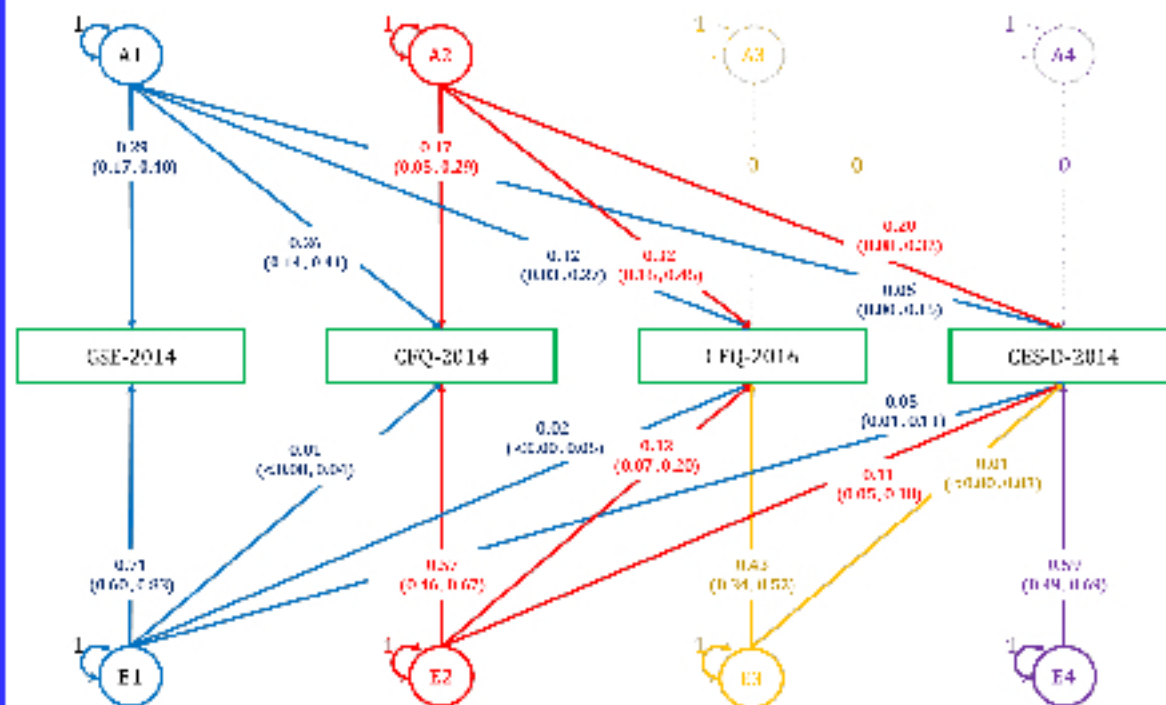
Table2. Univariate analysis

	Variance components (95% CIs)		
	A	C	E
GSE-2014	0.24 (0.11,0.36)	0	0.76 (0.64,0.89)
CFS-2014	0.39 (0.26,0.51)	0	0.61 (0.49,0.74)
CFS-2016	0.40 (0.26,0.53)	0	0.60 (0.48,0.74)
CES-D-2014	0.26 (0.10,0.40)	0	0.74 (0.60,0.90)

*C component was fixed to zero.

Methods: Study participants were derived from the Osaka University Twin Registry. The questionnaires were sent to 1394 twin individuals (697 twin pairs) in 2014, and a total of 720 individuals responded. Because of missing data, 53 individuals were excluded (persons who had incomplete answers for 30% or more in each scale). A follow-up survey was conducted in 2016. Self-efficacy scores were measured by the General Self Efficacy Scale (GSE), fatigue symptoms by the Chalder Fatigue Scale (CFQ), and depressive symptoms by the Center for Epidemiologic Studies Depression Scale (CES-D). All raw scale scores were standardized for age and sex.

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