Is personality related to biological stress reactivity?

In his influential biopsychological theory of personality, Hans J. Eysenck proposed in 1967 that there was a biological basis to personality. He described two main personality traits which could be measured on a continuum. Individuals scoring high on *extraversion* tend to be very social, and individuals scoring high on *neuroticism* tend to be anxious, moody, and easily frustrated. Eysenck thought that distinct biological substrates might underlie these personality constructs. Specifically, he thought that neurotics would be easily aroused and therefore show strong stress reactivity, whereas extraverts would not be easily aroused and thus show a weaker biological response to stress. Although there have been many empirical examinations of this proposal since the 1960s, most previous research was on adult male subjects. Inspired by Eysenck's theory, we investigated whether individual differences in biological stress reactivity were related to individual differences in personality. Importantly, we measured personality traits in a large sample of girls and boys for five years during adolescence, a critical period in the development of both personality and biological stress reactivity.

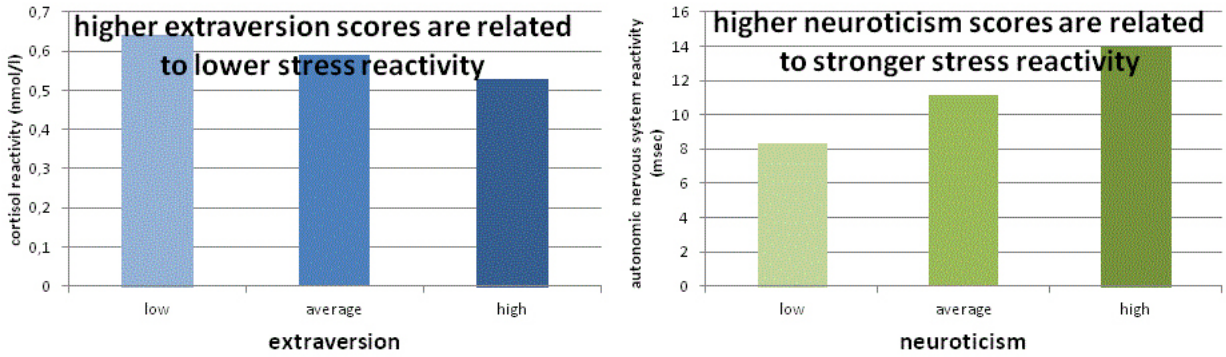

Fig. 1. Left: Cortisol reactivity for adolescents scoring low, average and high on extraversion. Right: Autonomic nervous system reactivity for adolescents scoring low, average and high on neuroticism.

We followed participants (*n* = 327) for five years in an ongoing longitudinal study on adolescent development (RADAR-Young study). Each year, the adolescents filled in questionnaires on personality traits between the ages of 13 and 17 years. When they were 17 years old, we invited participants to take part in a stress task: adolescents were asked to give a speech in front of a pre-recorded audience. During the stress task, we recorded their biological stress reactivity by monitoring their autonomic nervous system (for example, heart rate) and cortisol levels (a stress hormone). Procedures like this are frequently used in laboratory settings in order to induce a biological stress response in a controlled environment.

We tested whether extraversion and neuroticism scores across adolescence were related to

biological stress reactivity. In line with Eysenck's predictions, more extraverted adolescents showed weaker biological stress reactivity, and more neurotic adolescents showed stronger biological stress reactivity. We conclude that there may indeed be a biological basis to personality, although the effects seem to be small. Most comparisons revealed no relation between personality and biological stress reactivity. Adolescents who scored higher on extraversion did show weaker cortisol reactivity. Adolescents who scored higher on neuroticism showed stronger autonomic nervous system reactivity (Fig. 1).

These findings have helped us to understand how personality and biological stress activation are related during this critical period of development. A key component of extraversion is that individuals are more comfortable and less inhibited in social situations. Earlier studies showed that cortisol reactivity is strongly influenced by social factors, which may explain why extraversion was related to cortisol reactivity in our study. Neuroticism is the tendency to experience negative emotions, and therefore individuals who have more neurotic traits may be less able to effectively regulate their emotions. This is known to be related to hyper-reactivity of brain areas involved in stress processing, and our study showed that it is also reflected in higher autonomic nervous system reactivity. Our study thus provides some evidence for an association between personality and biological stress reactivity in adolescents.

Brittany Evans
Department of Developmental Psychology and the EMGO Institute for Health and Care,
VU University Amsterdam, The Netherlands
Behavioural Science Institute, Radboud University, The Netherlands

Publication

Neuroticism and extraversion in relation to physiological stress reactivity during adolescence.
Evans BE, Stam J, Huizink AC, Willemen AM, Westenberg PM, Branje S, Meeus W, Koot HM, van Lier PA
Biol Psychol. 2016 May