Twin studies : Nature-Nurture and beyond

SUMMARY

The common theme of the papers gathered in this thesis is that they are all 'twin studies'. The goal of **chapter 1** is, therefore, to describe the context of twin studies. A brief introduction into the twin methodology is given, showing the unique advantage of twin studies in disentangling genetic and environmental influences on the phenotype being studied
The papers in this thesis are related to two projects, which are described in **chapter 2**. The first project examined general cognitive ability in a large sample of young twins. The second project was a longitudinal twin study, focusing at stress reactivity in the flow of daily life.
Chapter 3 examined to what degree individual differences in cognitive ability can be explained by genetic and/or environmental influences. Results showed high heritability for almost all specific cognitive abilities as well as for general cognitive ability. In addition, a small effect of the chorion type was found on two subscales. However, the reported effects were small with confidence intervals close to zero. It was, therefore, concluded that the influence of chorion type on general cognitive was minimal and maybe even negligible.
Chapter 4 examined the hypothesis that childhood psychopathology and lower cognitive ability are associated because both are determined by a third (genetic) cause. Results showed that, although the association itself was rather small (-0.19), genetic factors accounted for 84% of the observed association. This indicated that in children three different genetic factors exist that (1) solely influence the liability for childhood psychopathology, (2) only affect cognitive ability and (3) influence both childhood psychopathology and cognitive ability.
Chapter 5 examined i) the familiality of distress associated with positive and negative subclinical psychotic symptoms and ii) whether the distress was specific to the dimension or represented a general underlying distress factor. It was shown that the familiality of both distress related to positive subclinical psychotic symptoms and distress related to negative subclinical psychotic symptoms was based on a moderate genetic factor (not on common environmental factors). In addition, it was demonstrated that the genetic and unique environmental factors influencing both phenotypes were correlated. Thus, the risk of becoming a patient seems to be based on the individual genetic vulnerability to feel distressed when experiencing a subclinical psychosis. It is attractive to hypothesize that the nature of the psychotic experience (positive, negative, depressive…) may determine what kind of psychiatric illness is developed, while the risk of actually developing the psychiatric illness is, amongst others, based on the vulnerability to feel distressed by that symptom.

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Chapter 6 investigated compliance with the Experience Sampling protocol as used in the study. The Experience Sampling Method is a structured diary technique to assess subjects in their daily life environment, reducing biases in recall. In short, subjects received a digital wristwatch that was programmed to emit a signal ("beep") at an unpredictable moment in each of ten 90-minute time blocks between 7:30 and 22:30, on five consecutive days. After each beep, subjects were supposed to take a saliva sample for cortisol determination and to fill out the ESM self-assessments. Results showed that compliance was satisfactory: 81% of all saliva samples were accurately timed. In addition, inclusion of the non-compliant samples did not bias the cortisol profile. These results indirectly supported the validity of momentary self-report data (e.g. about mood or context) obtained with this intensive, random time sampling protocol.

Chapter 7 examined the relationships between ongoing activity related stress, mood and HPA-activation, using momentary self-report data that was validated in the previous chapter. Minor daily life stress was associated with decreased positive affect, increased negative affect and increased agitation, but only negative affect was independently associated with increased cortisol levels. In addition, negative affect mediated part of the effect of stress on cortisol. The tendency to experience negative affective states in the flow of daily life likely explains part of the pathway whereby cumulative stress-induced cortisol responses shape the risk for mental health disorders.

As the previous chapter showed that the stress-induced increase in negative affect regulated the individual sensitivity to minor daily life stress, **chapter 8** investigated to what extent individual differences in affective reactivity to minor daily life stress can be explained by genetic and/or environmental factors. Results showed that 60 to 70% of the phenotypic variance was explained by genetic factors, while specific environmental factors explained the rest. As the stress reactivity measure included the interaction between stressor and emotional response, the demonstration of a genetic influence on this dynamic relationship is indicative of gene-environment interaction. Genes make some people more sensitive for the negative effect of minor daily events on mood, which might be associated with a higher risk to develop stress related disorders such as depression.

The results of this thesis are discussed in **chapter 9** and are placed in the context of the ancient debate about nature-nurture**.** In fact, the papers gathered in this thesis are a reflection of different views on nature-nurture and are illustrative of different approaches on this nature-nature debate. Furthermore, implications and directions for future research are given in this last chapter.

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SAMENVATTING

Tweelingenstudies zijn een uitstekende manier om het belang van erfelijkheid en milieu te bestuderen als verklaring voor verschillen tussen personen in bepaalde kenmerken of eigenschappen. Immers, eeneiige tweelingen zijn genetisch identiek en twee-eiige tweelingen delen slechts de helft van hun genetisch materiaal. Een grotere gelijkenis bij eeneiige tweelingen t.o.v. twee-eiige tweelingen is bijgevolg een aanwijzing voor een genetische invloed (hoofdstuk 1).

Het eerste deel van dit proefschrift (hoofdstukken 3-4) toont aan dat genetische factoren een belangrijke rol spelen in cognitieve bekwaamheden en laat zien dat deze genetische factoren grotendeels aan de basis liggen van associaties tussen cognitie en mentaal welzijn.

Het tweede deel van dit proefschrift (hoofdstukken 5-8) focust op stress- gevoeligheid in het dagelijks leven. Kleine dagelijkse stress gaat gepaard met veranderingen in affect waarbij vooral de stijging in negatief affect geassocieerd wordt met een biologische stressreactie. Bij deze affectieve stressreactie blijken genetische factoren een belangrijke rol te spelen.

De bevindingen worden besproken binnen het kader van huidige en toekomstige ontwikkelingen op het veld van genetisch onderzoek, zoals de inclusie van omgevingsvariabelen (GxE correlatie en GxE interactie) en de introductie van endofenotypes (hoofdstuk 9).

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