

## Abstract in English

**Introduction:** Cognitive abilities and mental health can be influenced by the environment, in which individuals grew up, as well as their educational attainment. The aim of this dissertation is to elucidate the relationship between early-life risk factors (childhood socioeconomic deprivation, lower individual's and parental educational attainment) and parameters of lower brain health integrity (lower cognitive ability, trait and symptoms of anxiety, symptoms of depression) and the role of functional connectivity between brain networks in this relationship.

**Methods:** We performed four monothematic studies using data from the Czech arm of the European Longitudinal Study of Pregnancy and Childhood (data source for Studies I and II) and from the Survey of Health, Ageing and Retirement in Europe (data source for Studies III and IV). In Studies I and II, we used linear regression to analyze the relationship between socioeconomic deprivation in childhood, cognitive ability in adolescence, and trait anxiety in adulthood (Study I) and the relationship between parental education and their children's cognitive ability at ages 8 and 28/29 (Study II). In the neuroimaging part of Studies I and II, we evaluated whether this relationship is associated with the strength of functional connectivity between the lateral prefrontal cortex (Study I) and the nodes of the salience network (Study II) to other voxels of the brain. In Studies III and IV, we used logistic regression to assess the association between one's educational attainment and the presence of depressive symptoms (Study III) and anxiety symptoms (Study IV). We then adjusted the analysis for other sociodemographic and health-related characteristics and assessed whether there was an upper threshold for the observed effect. We also examined whether the association between one's educational attainment and depressive or anxiety symptoms varied across European regions.

**Results:** In Study I, socioeconomic deprivation in childhood was associated with lower cognitive ability in adolescence, and lower cognitive ability predicted higher trait anxiety in young adulthood. Higher functional connectivity between the right lateral prefrontal cortex and regions in the left precentral gyrus, postcentral gyrus, and superior frontal gyrus mediated the relationship between lower cognitive ability and higher trait anxiety. In Study II, lower maternal education was associated with lower verbal, performance, and full scale IQ of individuals at age 8 and performance IQ at age 28/29. The relationship between lower maternal education and lower performance IQ at age 28/29 was associated with higher functional connectivity between the right rostral prefrontal cortex and regions in the occipital cortex. In Studies III and IV, higher educational attainment was, independent of other sociodemographic and health-related characteristics, associated with lower odds of depressive (Study III) and anxiety (Study IV) symptoms up to the first level of tertiary education, with further levels of education not providing any additional protective effect. This effect of overeducation was more pronounced for depressive symptoms compared to anxiety symptoms. The strongest protective effect of educational attainment was observed in the region of Central and Eastern Europe and the weakest in Northern Europe.

**Discussion:** Socioeconomic environment in childhood and the education of the individual and their parents are reflected in the integrity of brain health and the variability in the functional connectivity of an

individual's brain networks. Preventive measures and early interventions aimed at improving the quality and accessibility of education and strengthening social support can contribute significantly to individual's cognitive and mental health.