**Abstract**

Previous research in animals has identified the critical role played by prenatal sex hormones in brain development. Using various interventions, including administration of sex hormones, castration, and ovariectomy, these studies showed changes in behavior, cognition, and brain morphology. In humans, the role of prenatal exposure to sex hormones, and its consequences on brain structure and function. has rarely been studied. Animal studies, and a few human studies, have provided evidence for the organizational effects of sex hormones on brain development, stressing the importance of studying this critical period in development. The aim of the present study is to investigate the role of sex hormones on brain structure and function. One of the brain structures that has been the focus of research interest is the corpus callosum. The corpus callosum is the largest white matter tract and main interhemispheric commissure that facilitates the rapid transfer of information between cortical areas. The corpus callosum is also thought to contribute to lateralization of brain function and to autism spectrum disorders. While animal studies have provided initial support for the claim that early exposure to sex hormones has organizational effects on the corpus callosum’s size and structure, the role of prenatal sex hormones in determining these effects in humans has remained largely unexplored.

The effects of sex hormones on cognitive abilities and on emotional processing have been widely studied. Testosterone, estrogen, and progesterone have been demonstrated as playing a significant role in explaining individual differences in cognitive processing (especially in visuospatial abilities) and emotional processing. Furthermore, these individual differences may also have clinical significance as they appear to also play a role in different psychopathological states such as in autism spectrum disorders.

In sum, the present study proposes a linkage between endocrine and neuroanatomical markers, as well as psychological structures such as cognitive and emotional processing, and psychopathological states such as autistic traits. Specifically, our research is a longitudinal study that will take place at three significant stages in development: first, sex-hormone measurement in the early prenatal period; second, measurement of corpus callosum size and brain volume later in the prenatal period; and third, measurement in childhood of cognitive and emotional processing, and autistic traits. With a longitudinal research study, we expect to deepen our understanding of the organizational effects of sex hormones on brain structure and function. Data collection in the three stages in development will use objective measures (i.e., hormone levels in the amniotic fluid; ultrasound examination of corpus callosum size and brain volume; and cognitive and emotional tasks in childhood, including eye-tracking methods, to capture processing mechanisms in cognitive and emotional performance), enabling us to establish our findings on valid and reliable measures. With funding provided by the ISF, we will be able to uncover the role of prenatal neuroendocrine factors in the development of individual differences in emotional as well as cognitive abilities, and we will be able to point to a chain of factors that are suggested to be involved in psychopathological states such as autism spectrum disorders and to further expand our understanding of the neuroendocrine factors contributing to the etiology of these disorders.