



**Karolinska
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Department of Clinical Neuroscience

**Emotional Orientation, Brain Function and
Genetics in Adults and Children:
Implications for Development, and
Psychopathology**

AKADEMISK AVHANDLING

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ABSTRACT

The ability to attend or avoid emotional stimuli is important to our survival. Attending to potential threats can help us avoid danger; while attending to positive stimuli is important for our social function. For example, when we see a man with a knife it is important to run away, or avoid the threat so we are not harmed. Just as the knife warns us of the threatening situation, a smiling face indicates a friendly person. We are drawn to this cue to possibly receive a rewarding social interaction. Attention orientation to both negative and positive stimuli may be impacted by development, psychopathology and genetics. The dot probe task yields both behavioral and neural indices of attention biases towards or away from an emotional cue (angry or happy face). This thesis includes three studies to determine the effects of development, psychopathology, and genetics on attention orientating.

In Study I, we examined age-related correlations in attention-orienting biases to negative and positive faces in a healthy sample using functional magnetic resonance imaging (fMRI) and a dot probe task. Behavioral response data indicated a positive correlation between age and attention bias towards happy faces, such that younger participants showed less bias towards happy, relative to neutral, faces, than older subjects. Attention bias towards angry faces did not correlate with age. Relative to older, younger participants demonstrated greater activation in the left cuneus and left caudate on the contrast of trials used to assess happy-face attention bias.

In Study II, using the dot probe task in a home setting, we studied parents that were highly exposed to the attack on the World Trade Center in 2001 and their children. We found that psychiatrically healthy parents who experienced severe trauma showed greater attention bias towards threat than parents experiencing no such trauma, but trauma experienced by parents did was not predictive of attention bias in their children.

In Study III, using an fMRI on 5-HTTLPR genotyped adults performing dot probe task; we compared amygdala response to threat bias contrasts. The 5-HTTLPR has been previously linked to amygdala reactivity and the amygdala has been implicated in the orienting of attention towards threat. Behavioral data indicated no difference between the two genotyped subject populations for the 5-HTTLPR polymorphism (l/l and s-carrier). However, fMRI data did reveal between-group differences in the amygdala activation. Specifically, relative to l/l, s-carriers showed greater right amygdala activation to trials with angry faces. Because similar levels of threat bias were found in the two genotype groups, these findings suggest that s-carriers exhibit a lower threshold for engaging the amygdala within the context of the task.

In total, these three studies explore the effect of both the environment and genes on behavior and brain function. Studies I and II focus on environment, specifically, how their environment affects their emotional orientation. On the genetic side, Study III focuses on the effect of genetics on emotional orientation.