



Ruprecht-Karls-Universität Heidelberg
Medizinische Fakultät Mannheim
Dissertations-Kurzfassung

Neural, peripheral and subjective correlates of aversive and appetitive conditioning in healthy 14-year-old adolescents

Autor: Jelka Tzschope
Institut / Klinik: Zentralinstitut für Seelische Gesundheit Mannheim (ZI)
Doktormutter: Prof. Dr. H. Flor

Adolescence is a period which is marked by typical behavioral and neuroanatomical changes which reflect enhanced responsiveness to emotional stimuli and incentives. How the brain encodes and processes these emotionally relevant stimuli can be investigated through associative learning paradigms. In the present thesis we used a pavlovian differential delay conditioning paradigm to investigate aversive and appetitive learning processes in a sample of healthy 14-year-old adolescents during event-related fMRI. In the aversive paradigm we used an unpleasant sound, whereas in the appetitive condition an odor of orange served as the unconditioned stimulus (US). In both conditions we chose pictures of neutral male faces as conditioned stimuli (CS+, followed by the US in 50% of the cases; CS-, never followed by the US). Furthermore, we measured skin conductance responses as well as subjective ratings of valence, arousal and contingency. In the first study we obtained subjective ratings, skin conductance responses and activation of brain regions such as the amygdala, the supplementary motor area, the anterior cingulate and medial prefrontal cortex as well as the striatum that indicated successful aversive conditioning in a sample of 39 (21 female) healthy 14-year-old adolescents. Furthermore, we showed that higher levels of neuroticism were associated with a positive interaction between the right amygdala and prefrontal cortical regions, such as the ventromedial prefrontal cortex, dorsolateral prefrontal cortex and anterior cingulate cortex as well as a positive interaction between the right amygdala and the right hippocampus during acquisition (CS+/- differentiation) but were unrelated to the magnitude of the conditioned responses. These results suggest that participants higher in neuroticism may show stronger storage and consolidation of CS/US associations reflected by stronger interaction between the amygdala and the hippocampus as well as limbic and frontal regions. In the second study 38 (18 female) 14-year-old healthy adolescents participated in an appetitive pavlovian differential delay conditioning paradigm. The analyses of the subjective ratings of valence have revealed that not all participants rated the odor of orange as pleasant throughout all learning phases. Thus, we analyzed the data of those 17 participants who rated the odor as pleasant to confirm successful appetitive pavlovian conditioning. In this subsample the results of the subjective ratings showed no significant perceived valence and arousal differences between CS+ and CS- and no significant differentiation between the skin conductance responses to CS+/- during learning. However, the participants rated the US more likely to be followed after the CS+ compared to CS-. This contingency awareness was also reflected by stronger activation in learning-related regions such as the amygdala, the thalamus, the anterior cingulate cortex, the nucleus accumbens and the medial orbitofrontal cortex in the differentiation between CS+/- during learning. Furthermore, successful appetitive conditioning was confirmed by an association between the skin conductance responses and the brain activation related to appetitive learning as well as an association between the ratings of valence and arousal and the described learning-related brain regions. The results of the second study confirmed the applicability of this procedure using an olfactory differential conditioning paradigm in a sample of healthy 14-year old adolescents. In sum, the present thesis presents the first studies investigating the modulatory role of neuroticism on brain activation as well as the coactivation of the underlying learning-related brain regions during aversive pavlovian conditioning and the subjective, peripheral and neural correlates of appetitive pavlovian conditioning in a sample of healthy 14-year-old adolescents. The present results might not only be of theoretical but also of clinical significance because the adolescence represents a period with an enhanced vulnerability for the development of mental disorders, especially anxiety disorders and substance abuse.