D10-12

LATERALIZATION IN THE INVERTEBRATE BRAIN: LEFT-RIGHT ASYMMETRY OF OLFACTION IN APOIDEA SPECIES

E. Frasnelli[1,2], E. Rigosi[2], G. Anfora[3], F. Trona[3], G. Vallortigara[2]
[1] Konrad Lorenz Institute for Evolution and Cognition Research, Altenberg, Austria.
[2] CiMeC, Centre for Mind/Brain Sciences, University of Trento, Rovereto, Italy.
[3] Research and innovation Centre, Fondazione Mach, S. Michele all'Adige, Italy.

Brain and behavioural lateralization at the population level has been recently hypothesized to have evolved under social selective pressures as a strategy to optimize coordination among asymmetrical individuals. We compared olfactory responses of the right and the left antenna in two species of Hymenoptera Apoidea and the results seem to support the hypothesis: eusocial honeybees (Apis mellifera L.) appear to be lateralized at the population level in both behavioural (conditioning of the Proboscis Extension Reflex) and physiological (ElectroAntennoGraphy, EAG) responses (with a dominance of right-sides structures), whereas mason bees (Osmia cornuta L.), a solitary species, appear to be lateralized only at the individual level. In the honeybees, lateralization for short-term memory recalls of PER seems to be correlated with a difference in the number of olfactory sensilla, which is significantly higher on the right than on the left antenna. We also investigated lateralization of odour detection and learning in the bumble bee, Bombus terrestris L., an annual eusocial species of Apoidea. By training bumble bees on the proboscis extension reflex paradigm with only one antenna in use, we found asymmetrical performance favouring the right antenna in responding to learned odours even in this species. Electroantennographic responses did not reveal, however, significant antennal asymmetries in odour detection, whereas morphological counting of olfactory sensilla showed predominance in only one type of receptors, with a higher number of olfactory sensilla trichodea type A in the right antenna. The occurrence of a population level asymmetry in olfactory learning of bumble bee provides new information on the relationship between social behaviour and the evolution of population-level asymmetries in animals.

D10-13

DIFFERENTIAL IMPACT OF ACOUSTIC STARTLE ON SACCADE ONSET AND -DURATION AND ON PSYCHOMOTOR REACTION TIMES

T.M. Schilling[1], A. Schulz[1], C. Deuter[1], T.D. Blumenthal[2], H. Schächinger[1]
[1] University of Trier, Department of Clinical Physiology, Germany.
[2] Wake Forest University, North Carolina, USA.

The Acoustic Startle reflex is known to speed up psychomotor reactions times ('StartReac' effect) and to influence horizontal saccades. Horizontal saccades have also been found to be influenced by the congruency of visual and acoustic stimuli in cross-modal reaction time paradigms. The aim of the current study was to test the influence of lateralized acoustic startle stimuli on important saccadic features such as onset (SOL) and duration (SDT) and on reaction times (RT) in a post-saccadic task.43 participants (12 male) were tested in a cross-modal reaction time paradigm. Their task was to focus visual targets on the left or right side of the screen while acoustic startle stimuli were presented lateralized in half of the trials in a either congruent or incongruent condition relative to the target. In half of the trials participants had to press a button at the side of the target as fast as possible if the target indicated to do so (post-saccadic task). Greenhouse-Geisser corrected within subjects ANOVAs showed that acoustic startle slowed down SOL ($p = 0.03$), but shortened SDT ($p = 0.007$) and speeded up RT in the post-saccadic task ($p < 0.001$). However, all this effects were independent of the congruency between the acoustic startle stimulus and the visual target. Our findings indicate that acoustic startle has differential impacts on SOL and SDT in a cross-modal paradigm and on RT in a post-saccadic task. The speeding up of psychomotor RTs and the decrease of SDT can be explained by the 'StartReac' effect. The slowing down of SOL may be due to shared neuronal circuits between startle, blinks and saccades in such a way, that neuronal resources necessary to process selective saccades are occupied during startle stimulation. The missing impact of the lateralization of the startle suggests that monaurally presented startle noise acts bilaterally on premotor burst neurons and that lateralization does not play an important role in this effect. Taken together our findings indicate that startle may not generally speed up the execution of voluntary movements, but that its influence also depends upon the system investigated.