EXAMINING NEUROBEHAVIORAL EFFECTS OF CHEMOSENSORY EXPOSURE TO LOCAL IRRITANTS USING EVENT RELATED POTENTIALS

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ABSTRACT

The aim of this thesis was to examine whether unpleasant odors disturb cognitive task performance. At first glance, it seems intuitive that for example the smell of fire smoke would immediately interrupt my current writing at the computer. However, the same aim has been addressed in earlier investigations but outcomes were inconsistent, some reporting improvement by odors, some impairment. The basic assumption of this thesis is that former inconsistencies were due to the use of different odorants, the use of different tasks, or the general weakness of examining only behavioral performance.

The empirical studies performed for this thesis improved all three points: First, by comparing performance during inhalation of three different concentrations (low, middle, high) of one odorant in the same individual (human volunteers), second, by choice of a task that was assumed especially sensitivity for olfactory distraction and third, by measuring brain activation in addition to behavioral performance. All studies were performed with a special focus on workplace relevance, since unpleasant odors likely occur at industrial workplaces and distraction from demanding work tasks could endanger workers’ health.

Three substances with workplace relevance were selected. Cyclohexylamine showed strongest and most unpleasant chemosensory effects and was therefore expected to cause stronger distraction than the moderate propionic acid. The neurotoxin ethyl acetate was examined for subtle indication of neurotoxicity. Performance in the cognitive task of response inhibition, which has been shown to interfere with emotional context, was observed on the behavioral (accuracy and speed) and brain level. Encephalography (EEG) was recorded, and well-described EEG curve components were analyzed, which were known to represent response inhibition.

Despite controlled study design and task selection the three studies did not present consistent results. Only propionic acid exposure evoked behavioral and EEG findings that both indicated exposure related impairment of response inhibition. The other assumptions could not be confirmed. One new finding was, that exposure to varying (but lower) exposure levels caused a distinct modulation of the EEG curve. This implicated that olfactory mediated distraction might be determined by other characteristics than odorant intensity or pleasantness.

It can be concluded that EEG implementation to occupational human inhalation exposures was successful and that the method could help to advance understanding of the field.