

Increasing body of literature shows that human olfactory system is plastic and its performance can be enhanced in the course of OT (Hummel et al., 2009; Konstantinidis, Tsakiropoulou, & Constantinidis, 2016; Sorokowska, Drechsler, Karwowski, & Hummel, 2017). Olfactory training comprises a regular, intermittent stimulation of olfactory system by multiple exposures to a set of carefully selected odorants per day. After three months a significant improvement of olfactory abilities has been observed (Hummel et al., 2009; Oleszkiewicz, Hanf, Whitcroft, Haehner, & Hummel, 2017). Hitherto, studies on OT outcomes have mostly been limited to olfactory performance, while neuroanatomical evidence allows to expect OT to have much broader effects, including cognition and emotion, but evidence for this hypothesis remains scarce.

The unique meaning of olfactory input for cognitive and emotional processing is rooted in its strong limbic projections of the olfactory pathways (Brand, 1999; Savic, 2001; Van Toller, 1988). Chemosensory perception of an odor is transformed into electrical potentials at the level of olfactory epithelium and further transmitted to the piriform cortex, structure primary responsible for processing olfactory input. Importantly, olfactory input also directly reaches limbic areas of the brain responsible for cognitive and emotional processing (Royet & Plailly, 2004). The link between emotion and olfaction raised on neuroevolutionary basis, as the structures of the limbic system evolved out of olfactory cortex tissue. Thus, the ability to memorize and decode emotions in humans is derived from structures primarily devoted to processing smells (Cahill, Babinsky, Markowitsch, & McGaugh, 1995). These direct and strong neural connections inspired researchers to study how exposure to odors at the time of measurement affects human cognition and emotion (Ehrlichman & Bastone, 1992; Herz, 2002; Willander & Larsson, 2006), but the evidence is missing whether OT has an effect on cognition and emotion and if so, if this effect is observed without the presence of odors at the time of measurement and how stable it is over time.

The aim of the proposed research project is to broaden knowledge about the role of OT in supporting olfactory processing and related cognitive and emotional functions. **The main objective of the current project is to examine whether positive effects of OT exceed olfactory function and translate into cognition and emotion.** With experimental studies of longitudinal design with control/placebo group, it is intended to examine OT effects on: (1) olfactory, (2) cognitive, (3) emotional domains, in children, adults and elderly people we expect to find OT to have a beneficiary effect on olfactory, cognitive and emotional functions.

To date, the use of OT is limited to neuroscientific and medical research and clinical practice due to the lack of evidence on its efficacy in the psychology. This project aims to test whether OT has an impact on domains exceeding olfaction, i.e. cognition and emotion. Therefore, the current project is of great importance to bridge this interdisciplinary knowledge gap and may constitute a basis for further hypotheses with regard to multisensory stimulation of cognitive and emotional processing. Additionally, OT has a chance to become a tool supporting cognitive and emotional function widely used by psychologist, psychotherapists, psychiatrists. It could also be used as a support in education and learning. Low cost of OT, easy and enjoyable form and no technical requirements additionally account for attractiveness and usefulness of this method.