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Withdrawal of social attention: Processing of dynamic facial expressions of happiness, anger, disgust and fear while being turned to and turned away from - an fMRI study.

The ability to perceive, distinguish and interpret facial expressions of emotion is essential for social interaction and constitutes a considerable part of everyday life experience. A vast amount of studies examined the processing of facial expressions (for review, see Sabatinelli et al., 2011), finding activations in the lateral inferior temporal and fusiform gyrus (referred to as the fusiform face area; Kanwisher, McDermott & Chun, 1997), the superior temporal sulcus and adjacent areas (referred to as the STS region; Allison, Puce & McCarthy, 2000), the amygdala (perception of negative stimuli; Morris et al., 1998), the insula (perception of disgust; Philips et al., 1997), the orbitofrontal cortex (perception of pleasant stimuli; Gorno-Tempini et al., 2001) as well as in primary and secondary visual areas (Lang et al., 1998).

However, the preceding studies predominantly applied static stimuli that lack the dynamic aspects of emotional expressions in social contexts, which are rapidly changeable depending on situational requirements. In contrast, dynamic facial expressions are ecologically more valid as they contain the temporal development of the emotional expression as well as head and eye movements (Sato et al., 2004). A recent meta-analysis by Arsalidou, Morris and Taylor (2011) confirms the advantage of dynamic expressions eliciting increased activity in regions associated with interpretation of social signals and emotional processing. Nonetheless, only few studies investigated the neural networks underlying the processing of dynamic facial expressions, often applying computer generated animations or morphs of static pictures. In an fMRI study, Trautmann and colleagues (2008) compared the processing of static and dynamic expressions of happiness and disgust in women and found extended emotion-specific brain activation patterns in parahippocampal gyrus, amygdala, fusiform gyrus, superior temporal gyrus, inferior frontal gyrus, and occipital and orbitofrontal cortex. Sato and colleagues (2004) also reported more widespread and “higher” activations for dynamic compared to static stimuli, concluding that dynamic stimuli trigger an enhanced emotional, perceptual/cognitive and motor processing of emotional features.

Another aspect that will be addressed in this diploma thesis is the shift of social attention, as emotional expressions can be interpreted in different ways depending on the attentional focus of the person watching them, and thus modulate the individual emotional reaction (Sato, Kochiyama &

Yoshikawa, 2010). Lee and co-workers (2010) presented video stimuli displaying turning heads as well as static faces and dynamic scrambled videos and reported heightened responses along the STS region to turning heads compared to static and only a slightly increased activity in the fusiform face area in response to the dynamic stimuli. Sato and colleagues (2010) investigated dynamic and static emotional expressions of anger and happiness and the role of gaze and head direction, and they reported "larger" activity in the amygdala during the processing of proximally oriented expressions as compared to distally oriented expressions, concluding that the amygdala integrates emotional expression and gaze direction in dynamic facial expressions and modulates emotional arousal.

However, no neuroimaging or electrophysiological study considering both aspects, dynamic facial expressions and the shift of emotional attention expressed by gaze and/or head movements, has yet been conducted. Therefore, the stimulus database that in part has already been evaluated and applied by Trautmann and colleagues (2008) will be employed in the presently planned study. This stimulus set shows male and female faces that look either to the left or the right side, then turn to the front and start expressing a neutral, happy, disgusted, angry or fearful face as soon as they were proximally oriented to the observer. Additionally, the stimuli will be adapted in order to achieve a contrary course of action (with at first a facing maximum, then a fading emotional or neutral expression and a turn either to the left or the right side), thus containing a shift of social attention expressed through joint head and eye movements.

The aim of this diploma-thesis is, thus, to study the neuronal correlates of processing dynamic facial expressions of happiness, anger, disgust and fear in a passive emotion perception task, investigating possible gender-specific differences and the influence of social attention shift. For this purpose, dynamic facial expressions will be presented to young healthy male and female adults in an fMRI-session.

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