

# Body perception in social environments

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## Impact paragraph

Body and facial expressions are ubiquitous in our daily lives, yet most research focuses predominantly on facial expressions, often overlooking the significance of body expressions. The findings have significant scientific, social, and clinical implications.

**In Chapter 2**, we broaden the understanding of body expression perception by showing that N170 amplitude can be modulated by social and non-social threats, induced by angry and neutral body expressions. While previous studies found no significant deviation in N170 for fearful versus neutral bodies in the context of social threat, our findings indicate that social threat can be rapidly detected during the early stages of body expression processing, approximately 180ms after the onset of the threatening stimulus.

Methodologically, we developed a novel VR-EEG-ECG setup, which allowed us to collect clean EEG data in a VR environment. From a social and clinical perspective, social threats are often encountered in familial or educational settings. Individuals who have experienced social threats, such as domestic or school violence—often accompanied by threatening body gestures—may display different neural and behavioral patterns compared to those who have not.

N170 could serve as a neural marker for assessing individuals' sensitivity to social threats. While our experiment did not find that control over a threat influenced social threat perception, this could be due to the lack of ecological validity in lab settings. In real life, a sense of control may help people manage social threats, such as domestic or school violence.

**In Chapter 3**, we replicated the results from Chapter 2, showing that angry body expressions elicit larger N170 amplitudes than neutral body expressions in a social interaction context. Few studies have explored how emotional predictions influence the perception of emotional body expressions within social interactions. We found that low-level information modulates emotional effects in the early processing stage (N170). Additionally, we identified the N300 component as a potential neural marker of prediction error.

These findings suggest that social context and prior information play crucial roles in shaping our judgments during daily interactions. Individuals with emotional difficulties, such as those with alexithymia—who have reduced sensitivity to emotions—or individuals with autism, who experience challenges in social interactions, may be ideal candidates for testing the N170 and N300 effects. These neural markers could be used to assess changes following medical or psychological treatment or to differentiate these individuals from healthy populations.

**In Chapter 4**, we explored self-identity perception using fully personalized avatars and avatars with faces and bodies completely different from the participants. This study provided evidences that body expression plays an important role in self-identity and offers new insights into the growing issue of body size and its impact on mental and physical health. We found that the N2 component serves as an index of self-identity processing. Notably, facial expression alone was insufficient to trigger self-identification. Participants preferred avatars with medium-sized bodies similar to their own over larger avatars, even when the larger avatars featured the participant's face. This highlights the critical role body expression plays in self-identity.

Previous studies have primarily used facial stimuli to investigate self-identity perception, whereas our research implemented

personalized face-body compound stimuli. Additionally, we employed VR techniques and an embodiment task to deepen participants' connection with each avatar. Technologically, this introduces a novel method for studying self-identity by using VR to create embodied experiences with different avatars, tapping into participants' feelings of connection.

These findings hold important social and clinical implications, particularly regarding attitudes toward obesity. Participants preferred medium-sized bodies over larger bodies, suggesting that body size plays a significant role in self-perception. Furthermore, VR technology could be a valuable tool for helping individuals with obesity engage in physical exercise by allowing them to embody avatars of varying body sizes in immersive, realistic environments.

**In summary**, this doctoral thesis makes multiple contributions. First, it advances the theoretical understanding of body expression in social environments. Second, it offers valuable experimental paradigms and methodological innovations for collecting clean EEG data in VR contexts. Finally, it has significant societal implications, enhancing our understanding of non-verbal communication and its impact on human life.