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Research Report

Perspective taking is associated with specific facial responses during empathy for pain

C. Lamm, E.C. Porges, J.T. Cacioppo, J. Decety*

Department of Psychology, The University of Chicago, 5848 S. University Avenue, Chicago, IL 60637, USA

Center for Cognitive and Social Neuroscience, The University of Chicago, 5848 S. University Avenue, Chicago, IL 60637, USA

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ABSTRACT

Witnessing the distress of others can result both in empathy and personal distress. Perspective-taking has been assigned a major role in the elicitation and modulation of these vicarious responses. However, little is known about how perspective-taking affects the psychophysiological correlates of empathy vs. personal distress. We recorded facial electromyographic and electrocardiographic activity while participants watched videos of patients undergoing painful sonar treatment. These videos were watched using two distinct perspectives: a) imagining the patient's feelings ('imagine other'), or b) imagining to be in the patient's place ('imagine self'). The results revealed an unspecific frowning response as well as activity over the M. orbicularis oculi region which was specific to the 'imagine self' perspective. This indicates that the pain-related tightening of the patients orbits was matched by participants when adopting this perspective. Our findings provide a physiological explanation for the more direct personal involvement and higher levels of personal distress associated with putting oneself explicitly into someone else's shoes. They provide further evidence that empathy does not only rely on automatic processes, but is also strongly influenced by top-down control and cognitive processes.

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1. Introduction

Imagining how one would feel in someone else's place has been acknowledged as an important factor in the experience of empathy. As far back as the eighteenth century, the Scottish moral philosopher and economist Adam Smith proposed that we project ourselves into the place of others by using our imagination, thereby entering their worlds and bodies and becoming in some sense the same person. Contemporary approaches support this notion by showing that witnessing someone else's emotions using different perspectives can result in distinct psychological, motivational and behavioral

outcomes (e.g., Batson et al., 2007; Batson et al., 1997b; Underwood and Moore, 1982).

In particular, the likelihood of altruistic action is modulated by whether we imagine how *another* person feels ('imagine other') vs. how *we* would feel ('imagine self') in a particular situation. These are two distinct forms of perspective taking carrying different emotional consequences (Batson et al., 1997a; Batson et al., 2003). While both strategies may promote empathic concern, the instruction to explicitly put oneself into the other's shoes also increases personal distress (i.e., a self-oriented aversive emotional response). In two functional neuroimaging studies, we investigated the neural correlates of perspective taking on the perception of

* Corresponding author. Fax: +1 773 702 0886.

E-mail address: decety@uchicago.edu (J. Decety).

pain in others (Jackson et al., 2006; Lamm et al., 2007a). The main finding of these studies was that witnessing another's pain using a first-person perspective recruits areas involved in the first-hand experience of pain more extensively than the more detached and other-oriented imagine-other perspective. This was indicated by higher activation in key structures involved in coding affective-motivational aspects of painful experiences, such as the amygdala, the mid-insula and the medial cingulate cortex. Signal changes in the thalamus, primary and secondary somatosensory cortices, and in ventral and dorsal premotor areas also suggest that imagining oneself to experience the pain of others recruits areas coding the sensory and motor aspects of pain.

These studies also document that both types of perspective taking are powerful elicitors of emotions. This was a prerequisite for the current study which aimed to evoke the sharing of affect between observer and target in order to investigate their physiological concomitants (Langet al., 1980). Apart from the pioneering investigations by Stotland (1969), though, little is known about how perspective-taking affects the peripheral nervous system's correlates of empathy.

The purpose of the present study was to fill this gap. We explored how perspective taking affects the electromyographic (EMG) and electrocardiographic responses to watching the facial expression of pain. To this end participants watched videos of patients undergoing painful sonar treatment. The videos were watched using two distinct perspectives: a) imagining the patient's feelings ('imagine other'), or b) imagining themselves being in the patient's place ('imagine self'). EMG was recorded over two muscles involved in expressing pain — the *Musculus orbicularis oculi*, controlling orbit tightening, and the *Musculus corrugator supercilii*, drawing the eyebrows down and together into a frown (e.g.

Craig et al., 2001). In addition, we monitored stimulus-induced heart rate changes and EMG activity over two unspecific control sites. Our aim was to explore whether the two different perspective-taking conditions result in distinct psychophysiological responses, and whether these responses are in line with the higher levels of personal distress and empathic concern determined on the behavioral level.

2. Results

2.1. Behavioral and dispositional measurements

The perspective taking instructions did not result in significantly different pain intensity ratings ($t(26) = 1.029$, $P = 0.313$, partial $\eta^2 = 0.039$). Mean ratings were 61.96 (S.E. 2.36) for the other-perspective, and 60.09 (S.E. 2.59) for the self-perspective. The mean ratings in both conditions correlated significantly with the emotional contagion scores ($r = 0.470$, $P = 0.013$, for imagine other, $r = 0.462$, $P = 0.015$, for imagine self). None of the other scales correlated with the pain intensity ratings.

The exit interview revealed high levels of compliance with the instructions. Debriefing also showed that no participant was explicitly aware that the main aim of the study was to measure their facial expressions in response to the videos.

2.2. Electromyography

Visual inspection of the EMG time-courses revealed a decrease in EMG amplitude in all channels immediately upon presentation of the neutral face – irrespective of the adopted perspective. Following this decrease, signals remained stable for the left forearm and the *M. medio-frontalis*, and partially

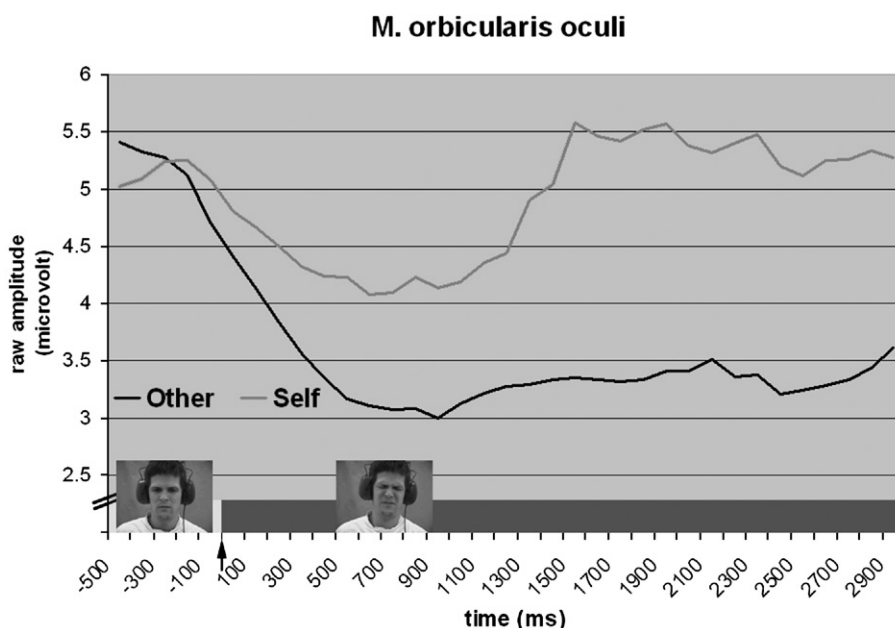


Fig. 1 – Signal amplitudes of *M. orbicularis oculi* during the self- and other-perspectives. The first 500 ms are related to viewing the neutral facial expression (indicated by the light grey bar and the neutral facial expression), which transitions into the expression of pain during the subsequent 3000 ms (dark grey bar and painful expression, onset of painful expression marked by arrow).

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