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Neuroscience of social touch: Emerging directions and challenges

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From rodent grooming to elephant trunk touch and human hugs, mammals spend much of their social interactions engaging in physical touch. Social touch plays a crucial role in human interactions, influencing emotional bonds, communication, and well-being. In the past decade, social touch has garnered significant attention in the field of social neuroscience, offering new perspectives that have enriched theoretical models of touch.

Neuroimaging studies have delineated the neural cascade triggered by tactile stimulation, beginning with the activation of mechanoreceptors in the skin to the somatosensory cortices, insula and the anterior cingulate cortex. Interestingly, research has shown that even the mere observation of touch can activate somatosensory regions and the insula, suggesting the presence of a mirror-like mechanism that enables individuals to perceive and empathize with the tactile experiences of others (Peled-Avron et al., 2016). Furthermore, this neural response to touch was shown to be affiliative-dependent as, tactile interactions involving loved ones are perceived as more pleasurable and comforting compared to those involving strangers (Suvilehto et al., 2021).

In this issue, two papers present intriguing findings on social touch, emphasizing its role in emotional regulation. These studies contribute to a growing body of research that highlights the communicative functions of touch, particularly its role in comforting behaviors and fostering social bonds. This emerging body of research has driven the development of new theoretical frameworks, such as the homeostatic regulation model (Fotopoulou et al., 2022), which proposes that touch helps regulate pain and emotional distress by fulfilling an innate expectation of closeness and by activating self-regulation mechanisms. Likewise, the feedback loop model (Shamay-Tsoory & Eisenberger, 2021) offers a dynamic perspective on comforting touch, describing it as an interpersonal regulatory mechanism where the observer's empathy guides

them in delivering touch that is attuned to the target's emotional and physical needs. The development of the latter model was enabled by the advent of hyperscanning techniques, which allow simultaneous brain imaging of two interacting participants.

Building on the robust foundation of neuroimaging research into the neural mechanisms of touch, recent studies have begun to explore the role of social touch in clinical contexts, including its impact on psychiatric conditions. Individuals with neurodevelopmental conditions, like autism spectrum disorder (ASD), often experience touch differently (Mello et al., 2024). Likewise, participants with high childhood maltreatment levels experience touch as less comforting and exhibit exaggerated responses in the right somatosensory and posterior insular cortex, compared to controls (Maier et al., 2020). This focus on social touch in psychopathology can help integrate the wide array of findings in the field, promoting a translational approach to social touch.

What does the future of social touch research bring? As with many rapidly evolving areas of research, some methodological maturity is required. Emerging studies are increasingly focused on developing more ecologically valid experimental paradigms, such as wearable technologies and hyperscanning approaches, which enable capturing the real-time dynamics between the person receiving touch (target) and the person delivering touch (toucher). The integration of ecological momentary assessment diaries may further allow participants to self-report touch experiences in real-time, without relying on retrospective data. Addressing the conceptual and methodological challenges will be crucial for moving the field forward, particularly as it intersects with emerging technologies and mental health interventions.

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