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## **Expanding Perception: The Role of Touch in Comparative Psychology - Introduction to the Special Issue**

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In recent years, researchers have begun to include diverse modes of perception in comparative studies, such as vocal and tactile forms of communication, in an effort to understand social, cognitive, and affective processes in various species. In this special issue, we have collected a series of articles that approach, from an interdisciplinary perspective (i.e., psychology, behavioral sciences, anthropology, and philosophy), how touch/contact has been included in diverse fields of research, exploring the new insights produced by including this mode of perception.

Much of the research concerned with comparative approaches to social cognition has focused on gaze as a mode of communication. For example, studies on Joint Attention (JA) (i.e., two individuals simultaneously focusing on an object or event and sharing a perspective on that object or event) in different species have focused on the mechanisms serving joint visual attention in apes (for an example in orangutans, see Gruber, 2014; in gorillas, see Gomez, 2010; Tanner & Byrne, 2010; in chimpanzees, see Leavens & Hopkins, 1998; Okamoto-Barth, & Tomonaga, 2006; Tomasello, Carpenter, & Hobson, 2005), and humans (Corkum & Moore, 1998; D'Entremont, 2007; Gustafsson et al., 2015). Comparative studies have also focused on gaze as a measure of JA (see, e.g., Carpenter, Tomasello, & Savage-Rumbaugh, 1995; Okamoto-Barth, Moore, Barth, Subiaul, & Povinelli, 2011). Similar examples can be found in comparative studies of other forms of social cognition, such as Theory of Mind (ToFM) (i.e., the capacity to attribute mental states to others, such as beliefs and desires, to explain behavior). Traditional experimental designs that have been used to test ToFM always include variations of participants seeing a social partner who has seen (or not) an important piece of information (see Call & Tomasello, 2008, for a review). This focus on the visual mode can also be seen in the use of gestures to understand language development (see, e.g., Cartmill & Byrne, 2010). Moreover, a similar concern can be raised regarding the use of vision as the main focus in studies of animal perception (for a review, see Mascialzoni & Regolin, 2011).

However, in recent years this has started to change with a renewed focus on touch across a wide range of disciplines and approaches. In line with this recent trend, in this special issue we have collected a series of articles that approach, from an interdisciplinary perspective (i.e., psychology, behavioral sciences, anthropology, and philosophy), how touch/contact has been included in diverse fields of research. Our aim was to focus on articles that would explore how including this mode of perception contributes to our understanding of social, cognitive, and affective processes in various species.

Two of the papers in this special issue focus on demonstrating the importance of touch for the development of social capabilities in nonhuman primates. Dunayer and Berman have provided a comprehensive review of different hypotheses used to explain infant handling among nonhuman primates (with an emphasis on macaques and baboons). They argue that to fully understand patterns of handling among

different species, it is necessary to understand how conflicting interests play a role in different species, breeding systems, reproductive biology, socioecological factors, and life history characteristics. Among these different hypotheses, they argue for the social bond hypothesis, in which handling is viewed as an investment in long-term social bonds. As illustrated in their own research, this hypothesis has the potential to explain how handling benefits interactors in all three roles: handler, mother, and infant, as well as handlers in a variety of age/sex classes. It is also potentially applicable to both forms of handling that are considered *allocare* and merely affiliative. Botero has offered a theoretical exploration of how comparative research on the expression of emotions in apes has traditionally focused on the visual mode. She has provided a review of the neurophysiological, developmental, and behavioral evidence that links touch with social interactions to show that touch is intrinsically linked with social cognition because it motivates human and nonhuman animals, from birth, to form social bonds. She argues for a novel use of touch as one of the modes of interaction used by the mother-infant or caregiver-infant dyad in humans and apes that facilitates the expression of emotions by the infant (and, later, the expression of emotions by the adult that the infant has become) in ways that are understood by other members of the group.

Two of the studies in this special issue examined how patterns of touch interaction can be used to characterize different infant/children-caregiver dyads in humans and how touch can serve as a mode of communication that can help us understand the development of social cognition of the infant/child among different dyads. Mantis and Stack focused on the communicative functions of mutual touch during human mother-infant interactions and how these communicative function patterns have an effect in the infants' affect and the quality of the mother-infant relationship. They investigated differences in the communicative function between two different groups of mother-infant dyads: mothers and their 5 ½-month-old full-term infants and mothers and their very-low-birthweight (VLBW) /preterm infants. Their results demonstrated the importance of evaluating the functions of mutual touch in different mother-infant dyads, especially for preterm infant-mother dyads. Moreover, their findings help us understand how factors associated with prematurity may affect the quality and coordination of the mother-infant interaction. Gabouer, Oghalai, and Bortfeld examined parents' use of nonauditory cues (i.e., vision and touch) to establish how child-parent dyads, in which the child is deaf and the parent is hearing, engage in joint attention during a free-play interaction. They found that hearing parents frequently use the auditory modality with children who are deaf, despite the children's limited-to-no access to the auditory modality; however, they also found that the parents use this modality in combination with other modalities (i.e., visual, tactile) that are more accessible to their children who are deaf. The authors concluded that the hearing parents differentially accommodated their strategies to engage their children in joint attention, expanding our understanding of how joint attention is established between parents and their preverbal children, regardless of the children's hearing status.

Jefferies, Tunçgenç, and Cohen investigated the relationship between touch and prosocial behavior. They offered two novel studies that described associations between physical activity (PA), touch, and prosociality in 5-to-8-year-old children in children's play. In the first study, they conducted naturalistic observations, in which the amount of PA (measured through behavioral observations and through readings of heart rate monitors), the rates of smiling/laughing, touch, and prosociality in children's play behavior during school breaks were recorded. In a second study, they experimentally tested the effect of touch on helping behavior in the context of physically-active play. The results presented in these studies offer novel insights into children's natural play behavior and open up a new area of research into the links between PA and enjoyment, touch, and prosocial behavior.

Finally, two of the studies in this special issue focused, with two different aims, on touch and marine mammals. Bauer, Reep, and Marshall have provided a review of both naturalistic and controlled studies that have described neurobiological and behavioral evidence for the tactile senses of marine mammals, including cetaceans (whales and dolphins), sirenians (sea cows), pinnipeds (seals, sea lions, and walruses), and semi-aquatic mammals (rodents, shrews, tenrecs, and moles). This review focused on the evolution of vibrissal (sensory hair) systems that contribute to tactile sensitivity. They demonstrated that high numbers of vibrissal receptors, associated dense innervation, prominence of neural tracts, and hypertrophy of brain areas associated with touch suggest an importance of tactile senses for aquatic mammals. Dudzinski, Hill, and Botero provided a discussion of the methodological implications of engaging in cross-species comparisons of the use of touch/contact. They identified and discussed the parameters, assumptions, and measurement schemes applicable to multiple taxa and species that facilitate cross-species comparisons. To illustrate these guidelines, they have presented data on mother-offspring relationships in the two species studied by the authors: chimpanzees (*Pan troglodytes schweinfurthii*) and dolphins (bottlenose and spotted, *Tursiops truncatus* and *Stenella frontalis*). They argued that cross-species comparative studies allow for a more comprehensive assessment of the similarities and differences with respect to how animals traverse the relationships that form their social groups and societies.

In short, this special issue provides a series of papers, theoretical and/or empirical in nature, that attempts to bridge different disciplines, consolidate research evidence, and provide different methodological alternatives on how to incorporate touch in comparative studies. As such, we hope this special issue contributes to the advance of this relatively new area of research.

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