"Mind reading," or perceiving another's mental state, is inherently linked to "face reading." Somatosensory perception has a stronger link to emotional state than one may expect. Additionally, the somatic states of those around us affect our personal motor system. Therefore, it follows that somatic perception of the other leads directly to emotional perception of that same other. This theory can be best explored through the concept of mirror neurons.

Mirror neurons account for the activation of an observer's motor system in the area being activated by the observant. Much of the literature on mirror neurons explores bodily actions such as walking, dancing, or reaching. However, the mirror neuron system is also activated for facial expressions. As a facial expression, typically, is an outward manifestation of an internal emotional state, facial expressions provide a superb conduit for interpersonal detection of inner states. The mirror neuron system– with its aptitude for mimicry and mimesis– can thus be credited for emotional empathy.

Current models of the human empathetic system suggest that it is composed of the mirror neuron system, the limbic system, and the insula.[1] In both imitation and perception of emotional facial expressions, mirror neurons are activated, which in turn activates the insula, which in turn modulates the limbic system.[2] This suggests that, simply by viewing another's facial expression, humans perceive and mirror their emotional state.

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1 Iacoboni, Marco. "Imitation, empathy, and mirror neurons." *Annual review of psychology* 60 (2009): 653-670.

2 Carr, Laurie, Marco Iacoboni, Marie-Charlotte Dubeau, John C. Mazziotta, and Gian Luigi Lenzi. "Neural mechanisms of empathy in humans: a relay from neural systems for imitation to limbic areas." *Proceedings of the national Academy of Sciences* 100, no. 9 (2003): 5497-5502.

This is further supported by studies of patients in which the mimicry system is not fully functioning: particularly those with autism. Autistic patients have long been known to have difficulty with social interactions and theory of mind[3], but the directly neural cause was unclear. In a study that showed both autistic and control participants images of happy/angry facial expressions, the autistic patients did not automatically mimic facial expressions whereas the neurotypical participants did.[4] Based on autistics' difficulty with empathy, it seems that this automatic mimicry is inherent in emotional understanding, or "mind reading." Two other studies take this discovery a step further by linking this lack of emotional empathy directly with a disruption of the mirror neuron system.[5,6] As in many neurological studies, this lack of function paired with anatomical disruption provides strong evidence that the anatomical area (mirror neuron system) is linked with the cognitive function (emotional empathy).

If an autistic patient were to read a piece of literature about a character in a certain situation, they would have trouble understanding what the character was thinking or feeling at the time.[7] The aforementioned studies would suggest that this lack of literary

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3 Baron-Cohen, Simon, Alan M. Leslie, and Uta Frith. "Does the autistic child have a "theory of mind"?." *Cognition* 21, no. 1 (1985): 37-46.

4 McIntosh, Daniel N., Aimee Reichmann-Decker, Piotr Winkielman, and Julia L. Wilbarger. "When the social mirror breaks: deficits in automatic, but not voluntary, mimicry of emotional facial expressions in autism." *Developmental science* 9, no. 3 (2006): 295-302.

5 Williams, Justin HG, Andrew Whiten, Thomas Suddendorf, and David I. Perrett. "Imitation, mirror neurons and autism." *Neuroscience & Biobehavioral Reviews*25, no. 4 (2001): 287-295.

6 Kana, Rajesh K., Heather M. Wadsworth, and Brittany G. Travers. "A systems level analysis of the mirror neuron hypothesis and imitation impairments in autism spectrum disorders." *Neuroscience & Biobehavioral Reviews* 35, no. 3 (2011): 894-902.

7 Baron-Cohen, Simon, Alan M. Leslie, and Uta Frith. "Does the autistic child have a "theory of mind"?." *Cognition* 21, no. 1 (1985): 37-46.

empathy is also due to the autistics' nonfunctional mirror neuron system. Thus, literary "mind reading" and "face reading" are both necessary for emotional empathy and are inherently linked through the mirror neuron system.