Researchers find hand to mouth movement in humans likely hard-wired

April 1 2014, by Bob Yirka

A small child in Mumbai, with a shaved head, eating bread with her hand. Credit: Wen-Yan King/Wikipedia

(Medical Xpress)—A team of researchers in France has found evidence

that suggests that human hand-to-mouth actions are hard-wired into the brain. In their paper published in *Proceedings of the National Academy of Sciences*, the researchers describe an experiment they conducted on adults undergoing brain surgery and why what they found could have profound implications on human brain development theories.

Because human babies are born with so few abilities, scientists, and others have come to believe that virtually everything they do has to be learned—we really don't have any genetically hard-wired things we can do, e.g. baby kangaroos that can find their way into their mother's pouch or newly born wildebeests that instinctively run when a lion comes near. But as it turns out, conventional thinking may not be right. In this new effort, the researchers have found evidence of what might be an instinctive behavior in humans, the raising of the hand to the mouth in the conjunction with the mouth opening to receive it.

The research by the team in France involved stimulating a part of the human brain that has been found to be involved in automatic hand to mouth gestures in other primates. In this case, the human brains belonged to adult patients undergoing brain surgery—they were unconscious, yet when a certain brain region was stimulated, 9 of 26 patients (who'd given permission to be tested) raised their arms to lift their hands to their mouth and their mouths opened. This suggests, the researchers conclude that an involuntary instinctual activity is taking place—if it were learned, they point out, more than one area in the brain would be involved.

The research backs up claims made earlier by some researchers and mother's alike—babies don't have to be taught to grab things and lift them to their mouth—they do so as an automatic response to things they discover in their immediate surroundings. That generally includes fingers and thumbs as well—some babies have been seen sucking on them while still in utero.

The researchers suggest that their findings have implications regarding our understanding of human brain development and how motor functions originate in primates, including humans and that further research needs to be conducted to see if other instinctive types of behaviors can be found.

More information: Neural representations of ethologically relevant hand/mouth synergies in the human precentral gyrus, *PNAS*, Michel Desmurget, DOI: 10.1073/pnas.1321909111

Abstract

Complex motor responses are often thought to result from the combination of elemental movements represented at different neural sites. However, in monkeys, evidence indicates that some behaviors with critical ethological value, such as self-feeding, are represented as motor primitives in the precentral gyrus (PrG). In humans, such primitives have not yet been described. This could reflect well-known interspecies differences in the organization of sensorimotor regions (including PrG) or the difficulty of identifying complex neural representations in peroperative settings. To settle this alternative, we focused on the neural bases of hand/mouth synergies, a prominent example of human behavior with high ethological value. By recording motor- and somatosensory-evoked potentials in the PrG of patients undergoing brain surgery (2–60 y), we show that two complex nested neural representations can mediate hand/mouth actions within this structure: (i) a motor representation, resembling self-feeding, where electrical stimulation causes the closing hand to approach the opening mouth, and (ii) a motor–sensory representation, likely associated with perioral exploration, where cross-signal integration is accomplished at a cortical site that generates hand/arm actions while receiving mouth sensory inputs. The first finding extends to humans' previous observations in monkeys. The second provides evidence that complex neural representations also exist for perioral exploration, a finely tuned skill requiring the combination of

motor and sensory signals within a common control loop. These representations likely underlie the ability of human children and newborns to accurately produce coordinated hand/mouth movements, in an otherwise general context of motor immaturity.