Metaphor and Embodiment:
How The Neural Theory of Metaphor Explains Embodied Cognition Results

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Conceptual metaphor theory took a giant step forward in 1997 with Narayanan's neural theory of metaphor. It took another step forward in 2011 with Narayanan's explanation of metaphor directionality on the basis of spike time dependent plasticity at the neural level. On this account, primary metaphors are asymmetric neural circuits, fixed in the brain, physically linking embodied source frame circuits to embodied target frame circuits. Composite metaphors are circuits neurally binding primary metaphors together to form general metaphorical mappings.

Between the mid-1990's and the present, experimental psychologists have discovered correlations between metaphors and actual behavior, in what is called embodied cognition.

The neural theory of conceptual metaphor *explains* the results of embodied cognition experiments. In each case, either the source or target frame of the metaphor serves as a prime in the experiment. The experiment presents two choices, one that fits the metaphor and one that does not. Subjects then tend overwhelmingly to behave in accordance with the metaphor.

The explanation follows from the neural theory. The prime activates either the source or target frame of the metaphor circuit in the subject's brain. There are two choices, one of which activates the other frame in the metaphor circuit, thereby activating the metaphor circuit as a whole. Since the metaphor is a brain circuit, its activation will tend to activate a behavioral choice that fits the metaphor. Here are some examples:

Lera Boroditsky gave subjects a prime from the source domain of one of the two motion metaphors for time. She then mentioned a meeting scheduled on a Wednesday that had been "moved ahead two days." Was the meeting now to be on Monday or Friday? The answer depended on which prime was given — a moving object or a moving observer. The metaphors predicted the answers.

Teenie Matlock gave subjects various instances of Len Talmy's Fictive Motion metaphor where the target frame is a line or road and the source is motion tracing that line — examples like *the road runs through the valley* vs *the road meanders through the valley.* Subjects took longer to recognize *meander*, which suggests that they were mentally simulating a meander as opposed to a run.

Yale subjects were first given either a warm or cold cup of coffee, then asked to imagine meeting someone and to describe that person. The warm-coffee subjects tended to describe friendly people, while the cold-coffee tend to describe unfriendly people. This is explained by Affection Is Warmth as a neural circuit.

Toronto subjects were asked either to describe an experience in which they were either socially accepted or snubbed. They were then asked to guess the temperature of the room. The socially accepted subjects guessed the room was on the average 5 degrees warmer than those who were snubbed.

Bergen (2011) cites over 200 such experiments. There is logic of explanation. When theory A explains data B, data B supports theory A. The neural theory of metaphor explains the embodied cognition experimental data. Therefore the experimental data from embodied cognition experiments support the neural theory of metaphor.

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