



Words As Tools (WAT) and the problem of abstract words meanings

anna m. borghi^{1,2} & felice cimatti³

1 Department of Psychology, University of Bologna

2 Institute of Science and Technology of Cognition, CNR, Rome

3 Department of Philosophy, University of Calabria



annamaria.borghi@unibo.it, felice.cimatti@tin.it

Web-site: <http://laral.istc.cnr.it/borghi>

[Amsterdam, COGSCI2009, August 1st](#)

PRESENTATION OUTLINE

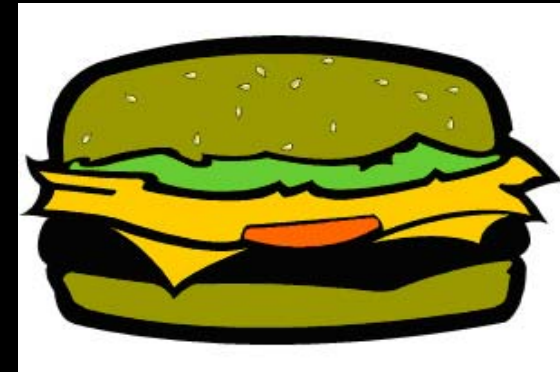
- a. embodied theories of word meanings, some limits / need for extensions
- b. the proposal: Words as social Tools (WAT)
- c. how the proposal deals with abstract words meanings
 - relationship with other theories
 - findings it accounts for
 - evidence needed



a. EMBODIED THEORIES (EC)

traditional view sandwich

Action
Cognition
Perception

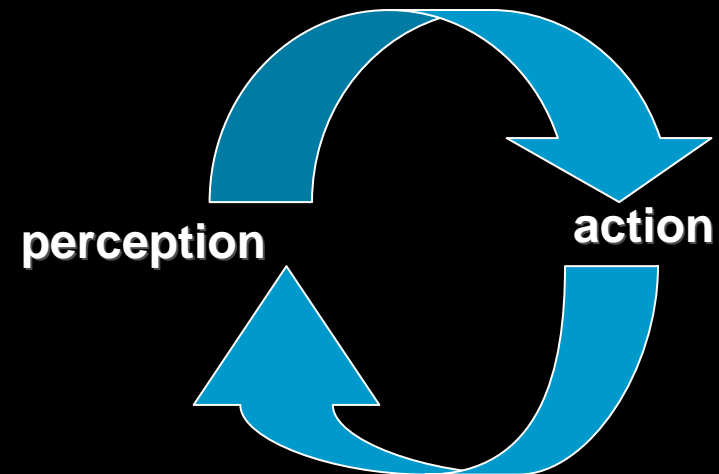


embodied cognition view

cognition “grounded” in the sensorimotor
processes.

Knowledge is for acting. (M. Wilson, 2002)

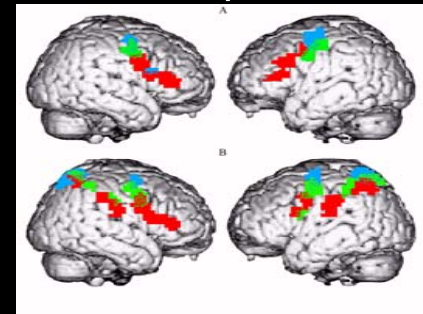
Being there (A. Clark, 1999)



a. EMBODIED THEORIES AND SIMULATION

Simulating: “offline recruitment of the neural networks involved in specific operations such as perceiving and acting”
(Jeannerod, 2007; Barsalou, 1999; Gallese, 2007; 2009)

E.g., while observing objects. But:
Simulation is not doing:



- ✿ weaker activation;

- ✿ simultaneous activation of a “blocking” mechanism;

- ✿ no movement, thus no **sensory feedback**.

Buccino et al., 2001

a. EMBODIED THEORIES, SIMULATION and WORDS

Language comprehension: **simulation** of the action / situation described

Neural underpinnings: MIRROR NEURON SYSTEM
(Rizzolatti & Craighero, 2004; Gallese, 2009)

Evidence (reviews: Barsalou, 2008; Fischer & Zwaan, 2008; Martin, 2007; Pulvermüller, 2005; Toni, de Lange, Noordzij, & Hagoort, 2008):
behavioral, neurophysiological, brain imaging:
early somatotopic activation of motor and premotor cortices during language comprehension



Simulation
sensitive to the
EFFECTOR
involved

a. EMBODIED THEORIES, SIMULATION and WORDS



“kick the ball”

“throw the ball”

Buccino, Riggio et al., 2005

Scorolli & Borghi, 2007

Borghi & Scorolli, 2009

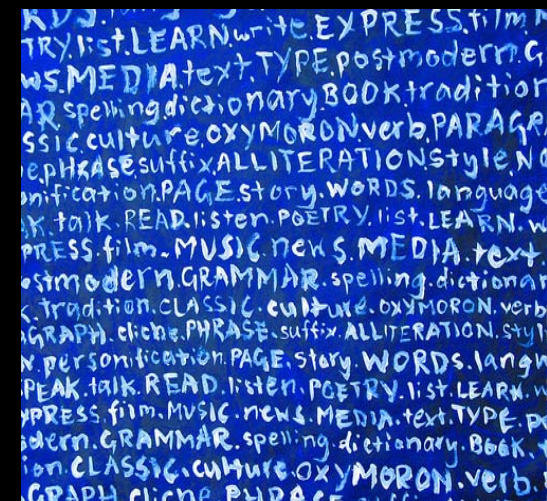
a. EMBODIED THEORIES: LIMITS

Limitations of EC theories:

☀ 1. social nature of language?

☀ 2. abstract words and logical elements of language?

Working hypothesis: intending words as social tools might help to account for abstract words





a. EMBODIED THEORIES: LIMITS

1. Focus only on grounding, on referential aspects of language. How about **social nature of language**?
 - ✿ Role of the embodied and social experience of being exposed to language?
 - ✿ Impact of this experience on individual cognitive activities?
 - ✿ Embodied robotics. Social neuroscience. Why not in cognitive (neuro)science focused on language?
 - ✿ Mirror neurons: new light on the role of social aspects of cognition. But: **motor resonance occurs automatically**
 - ✿ How do **conventional and mainly non individual** (psychological) aspects of language influence cognition? **Social NORMS**, which I can follow or not.



b. A THOROUGH EC THEORY NEEDS...

To develop a thorough embodied theory of language we need embodied theories:

- a. of human *individual* experience;
- b. of human *collective* action  Mirror Neurons;
- c. of language as a *social fact*  social norms;
- d. of impact of language on individual cognition.



c. WAT and THE PROBLEM OF ABSTRACT WORDS

✿ The way we represent abstract words is crucial as test-bed for embodied theories of language comprehension

✿ Why focus only on grounding?

✿ Words as social tools: words as acquired in a social context (Vygotskij, 1934)

✿ Words as tools: words as actions (e.g., Austin, 1962; Clark, 1998; Wittgenstein, 2001)



c. WAT and THE PROBLEM OF ABSTRACT WORDS

- ☀ E.g. word **bottle**: sensorimotor experience can precede the linguistic experience, and linguistic labels contribute in constraining the boundaries of grounded categories. / role of embodied individual experience
- ☀ E.g., word **freedom**, or **justice**, or **logic**, or **God**: the linguistic experience that helps us in collecting a variety of bodily states, internal and external experiences, etc. These bodily states and introspective experiences emerge and are recognized once they are named. / role of embodied social experience / source outside the individual mind



Not dichotomy!

“**grounding problem**” not only the problem of how to attach words to things, but also as the problem of **what we do with words**, because words are actions.

c. WAT and THE PROBLEM OF ABSTRACT WORDS

- ☀ **Consequences: cross-cultural.** Stress on variability and cultural dependency of our word use rather than universality
- ☀ This cultural and linguistic dependence should be particularly strong for abstract words: e.g., word GOD (English) vs. word DIO (Italian)



c. WAT and THE PROBLEM OF ABSTRACT WORDS

- ☀ **Consequences: developmental.** Different acquisition process: abstract words are acquired mainly through linguistic input (social-interactive experience more relevant than pure sensorimotor experience).
- ☀ **Consequences: neural.** Different brain areas activated: more linguistic social emotional areas for abstract words and more sensorimotor areas and canonical neurons for concrete words? Areas of overlap: e.g., Broca

- ☀ Note: both linguistic and other sensorimotor experiences are embodied, both concrete and abstract words are modal



c. MAIN EC THEORIES OF ABSTRACT WORDS

Fully modal, EC theories. Behavioral evidence:

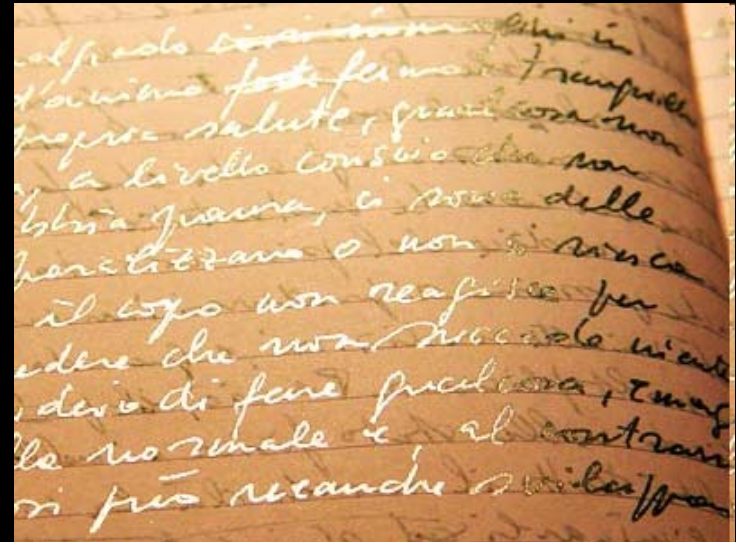
- ✿ **Grounding.** More situations and introspective properties elicited. E.g., Barsalou & Wiemer-Hastings (2005).
- ✿ **Motor.** Same phenomena with abstract transfer sentences and concrete transfer sentences (give the news vs. the pizza). E.g., Glenberg et al. (2008)
- ✿ **Metaphorical mapping** (e.g., time/space). E.g., Lakoff & Johnson, 1999, Boroditsky et al., 2003, Casasanto & Boroditsky, 2008),

PROBLEM: how to extend this compelling evidence to a variety of domains / is it really possible?

c. MULTIPLE REPRESENTATION THEORIES

✿ **Representational pluralism** (Dove, 2009): amodal format for abstract words, modal for concrete ones. Transduction process.

Limits: not economical, dualism



c. EC MULTIPLE REPRESENTATION THEORIES

EC Theories very similar to our view (both sensorimotor and linguistic – not amodal! – information)

- **LASS (Language and Situated Simulation) theory** (Barsalou et al., 2008, Simmons et al, 2008): linguistic system involved mainly during superficial linguistic processing, simulation system necessary for a deeper conceptual processing.

WAT ascribes more relevance to language (words as actions) and particularly to its social dimension.

- **Word tracking strategy** (J. Prinz, 2002): abstract words (e.g., “democracy”) are grasped in part through concrete images, in part through verbal skills. Definitions can be used to track definitions used by other members of our community, and help reference.

WAT complements this view intending words not as mere vehicles of pre-existing experiences, but also as actions / experiences by their own

c. WAT: FINDINGS IT CAN ACCOUNT FOR

- ☀ **Data** presented at **cogsci**: more **holistic processing**, more **emotional aspects** (Vigliocco) with abstract words.
- ☀ **Feature listing and definitions**. even if in feature listing tasks abstract words elicit properties that greatly differ across speakers, in quality of speakers we do converge on common definitions of abstract terms
- ☀ **Age of acquisition**. Later acquisition of abstract compared to concrete words (McGhee-Bidlack, 1991).
- ☀ **Mode of acquisition**. Studies on MOA (Wauters et al., 2003): in the first grades acquisition is mainly perceptual, later it is mainly linguistic.
- ☀ **Brain imaging**. left hemisphere areas, and especially Broca's area, are more active for abstract than for concrete words (see Sabsevitz, Medler, Seidenberg, & Binder, 2005)



c. WAT: EVIDENCE NEEDED

Need for further empirical evidence, in particular

- ✿ **Cross-linguistic, cross-cultural:** abstract words should be more variable and influenced by the different cultures and spoken languages
- ✿ **Developmental:** abstract words should be acquired more frequently in linguistic contexts compared to concrete words (different MOA).
- ✿ **Neural underpinnings:** parallel neural network? abstract words should activate more linguistic but also social and emotional areas, concrete words more sensorimotor ones. But overlap (e.g., Broca)



