EMBODIED SEMANTICS AND ABSTRACT CONCEPTS

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"How do we form an image of justice? Perhaps we form an image of a particular just act and ignore those features that make it unique. But what features remain? What part of the image of a just act can stand in for all instances of justice?"

(Jesse Prinz, 2002)

Outline

Justice

Fear

Yesterday

Friendship

Thinking

What is an abstract concept?

Property

Five

Infinite

Abstract concepts are usually

- Defined in negative terms

- Treated as an homogeneous domain (whereas concrete ones are usually divided in subcategories)

- **My claim: understood in this light, the category of "abstract concepts" is not useful to understand their embodied component.**

- Concreteness Effect: concrete words are processed faster (Walker and Charles, 1999)

- Dual Coding Theory (DC): semantic interpretation (Pavio, 1971): imageability

- Contextual Availability Theory (CAT): structural interpretation: context availability

DC or CAT?

- In Lynott and Connell (2009) perceptual strength was positively correlated with contextual diversity

- In Kousta et al. (2009) concreteness and imageability have been shown to be independent

The solution I adopt is that suggested by Borghi and Binkofsky (2014) of a solution in terms of **perceptual strength** and recalls Barsalou's idea of abstract concepts as *more related to "mental events" and concrete ones to "physical events"* (Barsalou, 2003).

Also, I apply this to the idea of a continuum between concrete and abstract concepts.

One advantage of this method is that it is possible to apply it to solve the problem of homogeneity: assuming it is possible to divide abstract concepts in subcategories that can be placed along the spectrum.

Perceptual Strength

- Concrete concepts: usually divided in the literature in different categories (instruments, hand actions, feet actions, objects)

- Abstract concepts can also be divided in several semantic categories.

- Categories can be then placed along a spectrum of perceptual strength.

The right question:

"What is, if any, the role of embodied representations considering concepts of the sub-category x?"
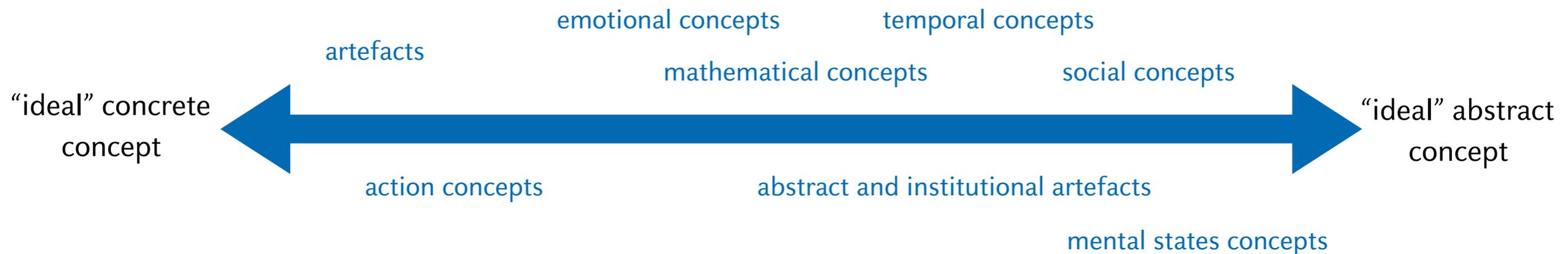
rather than

"Do abstract concepts have an embodied component?"

- Mathematical concepts (e.g. \five\, \integral\)

- Emotional concepts (e.g. \fear\, \happiness\, \rage\)

- Social concepts (e.g. \friendship \, \justice\)

- Abstract (and Institutional) Artefacts concepts (e.g. \project \,\poetry\,\association\)

- Temporal concepts (e.g. \before \,\infinite\)

- Mental states and processes concepts (e.g. \thought\, \belief \, \contemplate\, \desire\)

Problematic categories

Some categories seem to be "middle way"

- Are emotions entirely abstract?
- What about numbers?

Rating studies suggesting:

- mathematical sentences being related to hand movement, with higher scores for concreteness and contextual availability (Ghio, Vaghi and Tettamanti, 2013)

- emotion sentences related to hand, arm and leg movement (Ghio, Vaghi and Tettamanti, 2013)

- different types of definitions (adults) used for emotional concepts and mental states concepts (Setti and Caramelli, 2005)

Rating studies suggesting:

- different kinds of definitions (children) for social role concepts and emotional concepts (Caramelli, Borghi and Setti, 2006)

- social entities associated with contextual information and institutional artefacts with normative relations and exemplifications (Roversi, Borghi, and Tummolini, 2013).

- different types of definitions (adults) used for emotional concepts and artefacts (Setti and Caramelli, 2005)

- Results for **finger counting** related to *mathematical concepts*

- Results for **metaphorical mapping in concrete domains** for *social and temporal concepts*

- Results regarding **motor information** and *emotional concepts*

Evidence for emotional concepts

## Relation with emotion-expressing actions

("A Role for the Motor System in Binding Abstract Emotional Meaning", Mosely, Carota, Hauk, Mohr and Pulvermüller, 2012)

- **hypothesis**: actions that express emotions allow to learn the link between word forms and emotions.

- **prediction**: activation in face and arm related areas of the cortex during processing of abstract emotional words

Evidence for emotional concepts

- Activation of the motor system for emotion-related words and arm-related ones

- Activation overlapping with arm and face action areas

- Activation in areas devoted to language processing

- Idea I: activation regards effectors used to express emotional states

- Idea II: formation of hebbian-like mechanisms

[...]semantic representations consist of limbic circuits relating to the internal states the words are used to speak about plus, crucially, the motor circuits programming action schemes for expressing these same emotions, through which the link between emotion word and feeling can be made. (Moseley and Pulvermüller 2014, p. 1642)
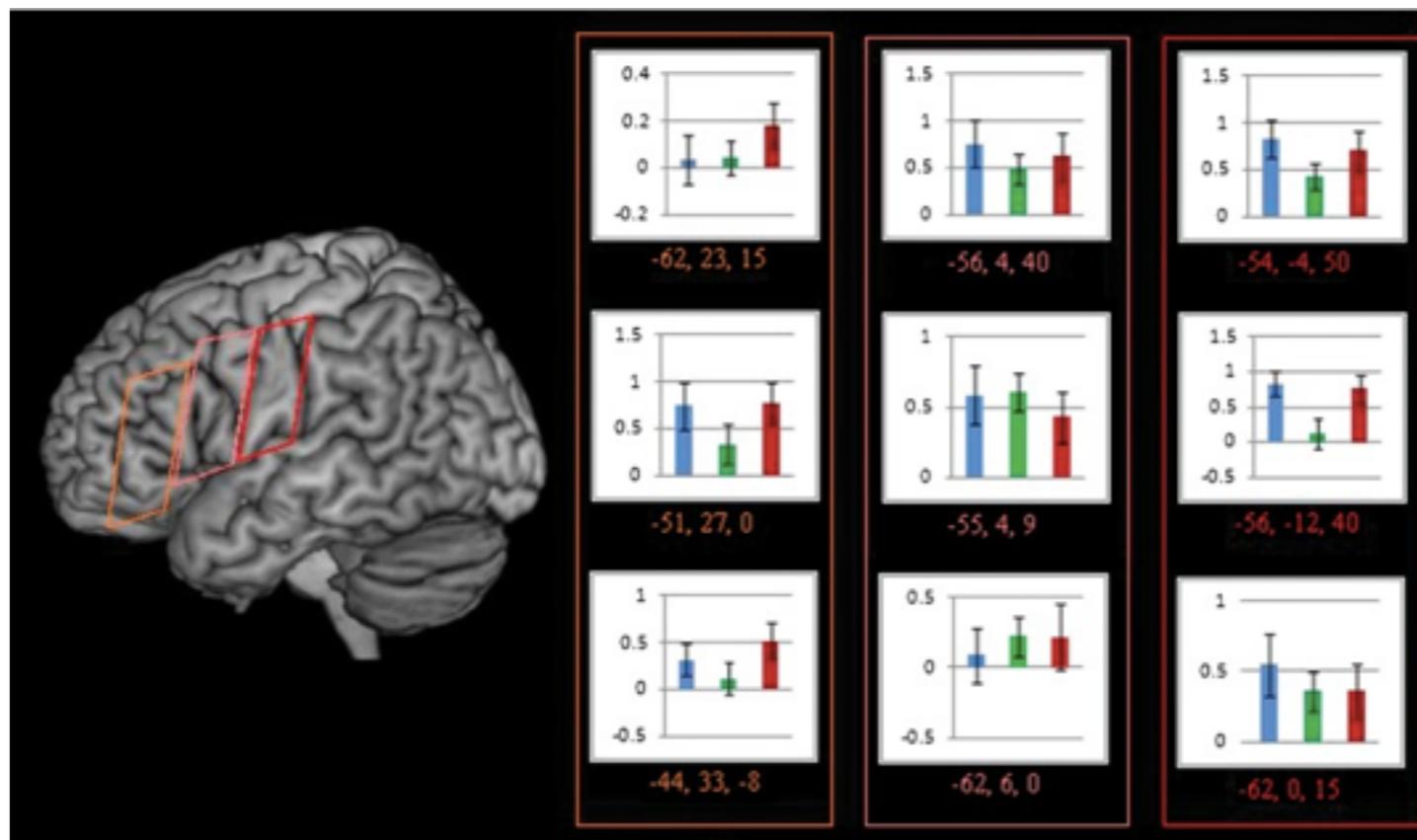
Evidence for emotional concepts

Lost for emotion words: what motor and limbic brain activity reveals about autism and semantic theory.
Moseley, Shtyrov, Mohr, Lombardo, Baron-Cohen, Pulvermüller, 2015

- Reduced brain activation in ASC for emotion words in motor areas and limbic areas specifically

- Hypo-activity of motor activation for emotion words correlating with autistic traits according to Autism Spectrum Quotient.

- Reduced activity in the limbic system (areas active in TC for emotion words) correlating with reduced activity in the motor system

- Overcoming the dichotomy abstract-concrete

- Perceptual strength degrees

- Subclassification to identify the relevant information

- Fine-grained investigation of the subdomains

Thanks!

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