

## Embodied Semantics and Abstract Concepts

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One of the most challenging topics for embodied semantics is that of abstract concepts. It has been frequently maintained that the alleged impossibility of grounding abstract concepts in modal information is what prevents embodied semantics from developing a complete theory of concept formation and language use (e.g. Mahon & Caramazza, 2008). Several theories have tried to fill the gap by providing accounts of how this grounding might take place, especially focusing on language and emotional valence (Borghgi & Binkofski, 2014; Barsalou, Wiemer Hastings *et al.*, 2005; Barsalou, Santos *et al.*, 2008; Vigliocco, Kousta & Della Rosa, 2014). However, several problems can be found in the current debate.

Firstly, the misleading implicit assumption underlying part of the literature is that abstract concepts can be treated as a homogeneous domain. To make this claim, however, implies ignoring the great variety of concepts that we tend to categorise as abstract: as a matter of fact, the domain contains heterogeneous concepts (e.g. “five”, “joy”, “agreement”) characterised by quite different features and uses. It might, then, be reasonably maintained that the modal component of each of these concepts, if any, is quite different from that of the others, as they seem to be related to different encoding.

Secondly, a positive definition of what exactly “abstract” means is rarely provided, as abstract concepts are mainly defined in contrast with concrete ones. Even though some work has been done to try to define the property of abstractness (Borghgi & Binkofski, 2014; Barsalou, 2003), there is no shared understanding of the notion; this is true especially as far as the empirical work is concerned, which causes several difficulties in interpreting the results.

Finally, another issue seems to arise as far as specific kinds of concepts are considered: for instance, it might be considered disputable to classify concepts referring to emotions (e.g. “rage”, “fear”) as completely abstract, at least if compared to concepts like “democracy” or “justice” that seem considerably more distant from standard concrete concepts (e.g. chair, kick, etc).

These issues will be considered and developed in the present paper. Firstly, I will consider the issue of the definition of abstract concepts and of how abstractness should be treated. This will include a brief critical assessment of Dual Coding Theory (Paivio, 1971) and Contextual Availability Theory (Schwanenflugel, Hasnishfeger & Stowe, 1988) as the two main examples of attempts to distinguish between concrete and abstract concepts in Psychology. These approaches will be discarded in light of empirical data (Lynott & Connel, 2009; Kousta, Vigliocco, Vinson & Andrews, 2009), in favour of a view that sees abstractness as a continuum, avoiding a clear-cut binary division (Borghgi & Binkofski, 2014). Subsequently, I will propose a sub-classification of the abstract domain, trying to identify the most relevant categories. In particular, emotional, social, abstract artefacts,

mental states, mathematical and temporal concepts will be considered. These categories will also be related to the mentioned continuous scale and some evidence supporting the idea that these sub-groups should be considered will also be presented (Ghio, Vaghi & Tettamanti, 2013; Roversi, Borghi & Tummolini, 2013; Setti & Caramelli 2005).

Finally, I will consider the available empirical literature, showing which of the mentioned categories have been investigated and the related results, and I will assess the current state of the debate as far as the possibility of grounding abstract concepts is concerned. The resulting picture will show that, while some of the categories have been completely overlooked, interesting results confirming embodied semantics predictions can be identified, especially as far as emotional, mathematical and temporal concepts are concerned. Additionally, it will be shown that, given the available evidence, the theories that can be considered best equipped to explain abstract concepts in embodied terms are the so called “hybrid embodied theories”, which highlight the role of language along with that of sensory-motor information in semantic processing.

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