Abstract and concrete sentences in German and Italian

claudia.scorolli2@unibo.it

Claudia Scorolli°, Ferdinand Binkofski#, Giovanni Buccino^, Roberto Nicoletti°, Lucia Riggio§, Anna M. Borghi°*

The investigation of the way we represent abstract nouns/verbs is crucial as test-bed for "embodied theories". Recently some authors highlighted that the empirical evidence cited in support of embodied theories is compelling with respect to concrete or highly imageable words but has limited reach with respect to abstract ones (Louwerse & Jeuniaux, 2008; Borghi & Cimatti, 2009, submitted; Dove, 2009).

Three major approaches can be identified: one proposes that concepts are generally couched in perceptual or motor representations (Barsalou, 1999; Glenberg 1997; Prinz, 2002). A second one reaffirms the orthodox view that concepts are couched in amodal representations (Caramazza, Hillis, Rapp, & Romani, 1990; Pylyshyn, 1981). A third proposal by Dove (2009) posits the existence of both amodal and modal conceptual representations in conceptual processing. The author proposes a "representational pluralism", that is a "multiple semantic code" approach, holding that perceptual simulations play an important role in highly imageable concepts while amodal linguistic representations play a crucial role in abstract concepts (independent levels of semantic representation).

Recently two proposals have been advanced to account for the specificity of abstract concepts. Barsalou, Santos, Simmons and Wilson (2008) propose the Language and Situated Simulation Theory (LASS) as a preliminary framework for integrating them. The authors focus on two interacting sources of knowledge: the linguistic forms in the brain's language systems, and the situated simulations in the brain's modal systems. When superficial linguistic processing is sufficient to support adequate task performance, processing may rely mostly on the linguistic system and little on simulation. However the authors ascribe a limited role to language to the linguistic system and an important role to the simulation.

The other proposal, by Borghi and Cimatti (2009, submitted), suggests to extend the embodied view of cognition in order to consider not only language grounding but also the social and normative aspects of cognition. More specifically, the authors focus on the fact that abstract word meanings rely more than concrete word meanings on language and conventions/norms. This reflects a different acquisition mechanism for concrete and abstract words (Borghi & Cimatti, 2009, submitted): in the first case the sensorimotor experience "precedes" the linguistic one. That is, with concrete words firstly we experience the concrete entities (e.g., book) and then we tag their referents using linguist labels (we learn the name "book"). In the case of abstract word meaning, instead, we initially learn a word (the label) and then we "tag" it with our sensori-motor experience, that is we use the word to assemble a set of experiences (e.g., I probably assemble different experiences of freedom once I have learned the word "freedom").

Aim of the study

The aim of the present study is to investigate the comprehension of abstract language using very simple sentences, where concrete nouns and concrete verbs are contrasted with abstract nouns and abstract verbs.

Participants: 38 students of the University of Hamburg and 38 students of the University of Bologna.

Materials: materials consisted of word pairs composed by a transitive verb and a concept noun. We invented 192 sentences (48 quadruples) in German language and 192 sentences in Italian language. Each quadruple was constructed by pairing a concrete verb (e.g. *to grasp*) both with a concrete noun (e.g. *an apple*) and an abstract noun (e.g. *a concept*); and by pairing an abstract verb (e.g. *to think*) both with the same concrete and abstract noun previously used. Due to the different syntax of German and Italian language, the German sentences were composed by a noun followed by a verb; instead the Italian ones were composed by a verb followed by a noun.

Procedure: participants looked at a fixation cross, after 1000 ms a verb-noun pair appeared on the screen for 2600 ms. Participants in the first group were asked to respond "yes" with their left hand and "no" with their right hand; participants in the other group were required to do the opposite.

Results: response times were submitted to a 2 (kind of Noun: Concrete *vs.* Abstract) X 2 (kind of Verb: Concrete *vs.* Abstract) X 2 (Mapping: yes-right / no-left vs. yes-left / no-right) X 2 (Language: German vs. Italian) mixed factor ANOVA.

Interaction 1. Crucially we found a significant interaction between the kind of Noun and the kind of Verb.
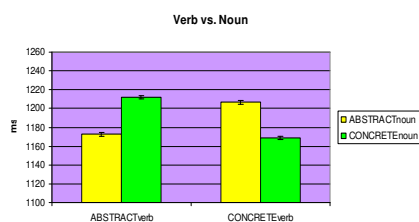
Interaction 2. We found also a significant three ways interaction between the kind of Language.
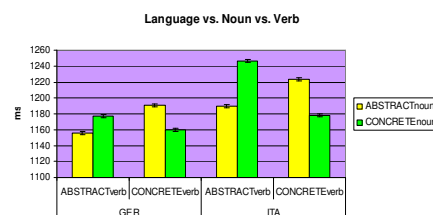
Interaction 1.

It seems that the advantage for the Concrete Verb–Concrete Noun combination could be mainly explained resting on its high imageability, low metaphoricity rate and precocious age of acquisition. But the same evaluations cannot account for the advantage of Abstract Verb–Abstract Noun combination. According to a strictly modal theory results on response times should be explained by imageability rating. An approach more based on metaphors (Lakoff, 1987) should account for the behavioral results resting on literality ratings. Both the hypotheses are not verified by our results on Abstract Verb–Abstract Noun condition. An amodal theory would account for response times resting on association rate between verbs and nouns combinations. Analyses on familiarity scores averages show that the advantage of both Concrete V–Concrete N and Abstract V–Abstract N combinations on the mixed pairs is not explained by a supposed higher familiarity.

Theories based on multiple types of representation -Representational pluralism, LASS, WAT theory- could explain the advantage of congruent pairs more easily assuming it is due to different underlying mechanisms. Namely, they assume that the fast RTs obtained with the C-C pair are due to the fact that both words rely on sensorimotor simulations, and the equally fast RTs obtained with A-A pairs are due to the fact that both activate linguistic processing.

Interaction 2.

In order to disentangle these three proposals, the most critical result is the advantage we found when the first word was a concrete one. Representational pluralism theory has difficulties in explaining this result: since the task used in the present study is a linguistic one, why should it be easier to process concrete words first, rather than abstract words first, which according to representational pluralism activate sensorimotor rather than linguistic information? LASS poses a similar difficulty. However, the LASS theory could explain the result, arguing that, even if the task is a linguistic one, it requires deep semantic processing, and activating a simulation might require more time for abstract rather than for concrete words.

The WAT theory, assuming that both linguistic and sensorimotor processing have the same status, hypothesizes two possible reasons explaining the advantage of concrete words when presented first. The first relies on language acquisition data. The second reason relies on the idea that two different acquisition mechanisms underlie concrete and abstract words. According to WAT (Borghi & Cimatti, submitted), the Modality of Acquisition and the different distribution of linguistic and other sensorimotor information in concrete and abstract words could account for our results: in the mixed combinations participants are facilitated when the first word is a concrete one, that is when it was acquired *perceptually* rather than linguistically.