

Words are not just words: the social acquisition of abstract words

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Abstract Language is usually considered as a set of arbitrary symbols that convey subjacent internal concepts. According to this traditional approach words are only words, mere external signals of internal processes. In contrast, we propose that Words are social Tools (WAT). This view allows us address one of the critical problems embodied views face, the problem of how abstract words are acquired and represented. Indeed, we argue that the role of sensorimotor engagement varies depending on the considered domain. In the case of the acquisition of concrete word meanings, categories are grounded primarily in perception and action systems, and linguistic labels contribute in constraining the boundaries of grounded categories. In the use of abstract words, the opposite mechanism might be adopted. Abstract words are more difficult to learn because they activate a much more complex set of situations, objects, human activities and so on. The linguistic labels help us group and assemble this variety of experiences. In addition, diversity of languages has more of an impact on abstract words as opposed to concrete word meaning.

Keywords: embodied cognition; language comprehension; social cognition; abstract words; extended cognition

1. Introduction

We are accustomed to consider words and sentences as *simply* words, i.e. as a medium with which we refer to objects, actions or to internal concepts. In this paper we argue that words are not mere *signals* of something, they are not empty boxes whose only function is to be filled up by an external or internal content (objects or concepts). Rather, using words and sentences is a kind of experience (AUSTIN 1962); in addition, language is a social fact (for a similar view, see HALLIDAY 1978). This is the core claim of our WAT (Words as Tools) proposal. Following Wittgenstein, we conceive words of a language as a set of *tools* that allow the user to perform a given *activity*: «think of the tools in a tool-box: there might be a hammer, pliers, a saw, a screw-driver, a rule, a glue-pot, nails and screws. The functions of words are as diverse as the functions of these objects... Of course, what confuses us is the uniform appearance of words when we hear them spoken or when we meet them in script and print.» (*Philosophical Investigations*, I, § 11). We argue that conceiving words as tools can help us solve the problems posed by the meaning of so called abstract words, such as “freedom”.

The framework we adopt is that of embodied and grounded cognition. In contrast with the idea that higher and lower processes are separated, the embodied and grounded view proposes that there is a continuity between cognition, perception and action systems (BARSALOU 2008; BORGHI 2005; GLENBERG 1997; BERTHOZ 1997; PRINZ 1997). It follows that word meanings are grounded in perception and action systems. An important impulse linked with this idea has been delivered through studies suggestive of a connection between the systems of canonical and mirror neuron systems (RIZZOLATTI & CRAIGHERO 2004) and language processing (for reviews see GALLESE 2008; GENTILUCCI 2003; KEMMERER & GONZALES CASTILLO 2010; JIRAK et al 2011; WILLEMS & HAGOORT 2007). In the last 10-15 years much evidence favouring the embodied view has been collected. Given the mainly theoretical stance of this paper, we will not review this evidence here (for reviews see BARSALOU 2008; FISCHER & ZWAAN 2008; MARTIN 2007; PECHNE & ZWAAN 2005; TONI et al 2008). Despite the amount of evidence, embodied views of concepts and language are still faced with a number of problems.

Here we will focus on one of the most important: how embodied theories can develop a complete account of the meaning of abstract words (BORGHI & PECHER 2011; DOVE 2009; 2010; PECHER & BOOT 2011; PECHER, BOOR & VAN DANZIG 2011). The problem is clearly introduced by Barsalou (2008 p. 634): “Abstract concepts pose a classic challenge for grounded cognition. How can theories that focus on modal simulations explain concepts that do not appear modal?”. In our view this issue cannot be solved by simply collecting further experimental evidence but requires reframing current embodied theories. Below we will try to sketch how our WAT proposal can help address it.

1.1. The problem of abstract words meanings

The most common means of defining concrete and abstract concepts is to refer to their perceivability. According to Paivio (1986; PAIVIOa, YUILLE, & MADIGAN 1968), concrete words refer to objects that can be experienced through the senses, while abstract words refer to entities lacking in physical attributes. Along the same line, Barsalou (2003) proposes that concepts become increasingly abstract (e.g., from HAT to COURAGE) as they become more detached from physical experience, and more associated with mental states. These definitions stress that there is not a concrete-abstract dichotomy. In fact, we consider the dimension of concreteness and abstractness as a continuum. According to Keil (1989), at one extreme of this continuum there are pure natural kind concepts (DOG), followed by complex artifacts (TRAIN), by simple artifacts (HAMMER), and then by nominal concepts of the social role category (TEACHER). At the other extreme there are the pure nominal concepts, the content of which is established by definition, like ODD NUMBER.

Given that we believe that language plays a role in the representation of both concrete and abstract concepts, we will replace the notion of abstract and concrete concepts, currently used in the literature, with the notion of *meanings* of abstract words (from now on MAWs) and of concrete words (MCWs). Hereafter we will use double quotations to refer to word meanings (e.g., the notation “cat” refers to the meaning of the word).

Being able to explain abstract word meanings is a major challenge for embodied theories. Embodied accounts assume that abstract concepts, just as concrete ones, are

grounded in perception and action. Within this general framework, at least three different explanations of abstraction have been proposed (see a review in GLENBERG, SATO, CATTANEO, RIGGIO, PALUMBO & BUCCINO 2008). The most classical explanation is based on metaphors (LAKOFF & JOHNSON 1980; 1999; GIBB 2003). The theory describes that image-schemas derived from sensorimotor experience can be transferred to experience which is not truly sensorimotor in nature. Evidence in favour of this view, though compelling, is confined to specific domains (e.g., BOOT & PECHER 2009; BORODITSKY & RAMSCAR 2002; CASASANTO & BORODITSKY 2008; FLUSBERG, THIBODEAU, STERNBERG, and GLICK 2011; SCHUBERT, WALDZUS, & SEIBT 2008). According to a more radically action-based view the motor system is recruited during comprehension of abstract words. Evidence in favour of this view is mainly based on compatibility effects. Glenberg and colleagues found evidence of the action sentence compatibility (ACE) effect with both concrete and abstract transfer sentences, using both behavioural and TMS methods (GLENBERG & KASCHANK 2002; GLENBERG et al. 2008; GLENBERG, Sato & CATTANEO 2008). According to a third view (BARSALOU 2003; BARSALOU & WIEMER-HASTINGS 2005), abstract concepts differ from concrete ones as they are reliant on simulations of internal rather than of external states. Feature listing tasks demonstrate that abstract concepts such as TRUTH, FREEDOM, and INVENTION rely on introspective and contextual information more than concrete concepts.

Overall, the evidence pertaining the grounding of abstract concepts is still scarce and not sufficient. However, the main problem is not only the scarcity of evidence collected so far, but the fact that it is hard to imagine how far this evidence can be extended beyond specific domains (for a similar critique, see DOVE 2009; GOLDMAN & DE VIGNEMONT 2009). For example, it has been shown that the abstract notion of space is understood by referring to the experiential notion of time (BORODITSKY & RAMSCAR 2002), that abstract concepts such as God and Evil evoke vertical metaphors (up vs. down) (MEIER, HAUSER, ROBINSON, KELLAND FRIESEN, & SCHJEDAHN 2007), and that the notion of similarity is represented metaphorically referring to contiguity (BOOT & PECHER 2009). This evidence reveals that at least a subset of abstract concepts are understood on the basis of a mechanism based on metaphorical mapping. However, it is hard to foresee how far and to which domains can this mechanism be extended: it would be quite difficult to explain the meaning of words like “philosophy” or “freedom” solely on the basis of the metaphorical mapping hypothesis, or of the other explanations we illustrated.

2. The proposal: Words as Social Tools

If we add the social component and the idea that words are instruments to perform actions to the original embodied theory of language we can attempt to solve the problem of abstract words. Within embodied theories language is mainly referred to in its referential aspects. For example, it is claimed that sentences such as “kick the ball” are grounded in sensorimotor experience, thus they activate the experience of kicking a ball (for reviews, see CHERSI, THILL, ZIEMKE & BORGHI 2010). We propose, instead, that words are not only carriers of experiences but that they are also experiences in their own right. In this sense words are not just words. A word as “freedom” is a modal entity, as it can be acoustically or visually perceived, when we hear it or when we read it on a print page. It is modal in a further way: because it activates a variety of visual, acoustic, and tactile experiences linked to its meaning,

that is it activates a number of modal situations. So far, our proposal does not depart substantially from embodied and grounded views of cognition. It extends these views, however, as we argue that words are embodied also because they are social tools, a special kind of bodily extension that allow us to operate in an individual (self directed internal language) and social context (for discussion on how words, similarly to tools, contribute in enlarging our peripersonal space, see BORGHI & CIMATTI 2010; for work on words as tools see also CLARK 1998; 2006; MIROLLI & PARISI 2011 and TYLÈN, WEED, WALLENTIN, ROEPSTORFF, & FRITH 2010). This is true for all words, even if it is particularly evident when we say or hear expressions such as “Stop!” or “Leave!”. The WAT proposal extends this view assigning a central relevance to how words are used, not only to how words are represented. Naming an object means to make an action on it, selecting and emphasizing some of its features and de-emphasizing others (CLARK 2008; ELMAN 2004). It follows that meaning is accessed not only through grounding words in perception, action, and emotional systems, but also through grounding words in the context of other words – propositions, discourses etc. In addition, whereas the use of tools like hammers does not necessarily imply the presence of other individuals, the use of the second kind of tools, that is words, is an intrinsically social activity (BORODITSKY & PRINZ 2008; SEMIN & SMITH 2008; TOMASELLO 2005).

On this basis the classical distinction between concrete and abstract words can be reframed. MAWs are more difficult to learn than concrete ones because they are part of a much more complex array of situations, objects, human activities. Language is necessary to bind this variety of experiences. This does not imply that language does not play a role in the acquisition of MCWs, but suggests that non-linguistic sensorimotor experiences play a major role in the acquisition of abstract words. The possible experiences of truth are so variable that the linguistic label “truth” provides a necessary support to bind them; this is not necessarily the case for MCWs, for example “spoon”. In line with this hypothesis, evidence obtained with habituation and preferential looking showed that pre-verbal children form prelinguistic categories limited to “concrete” objects (for reviews see CLARK 2004; MANDLER 2004).

Two consequences follow from this view:

- a. different mechanisms might underline the construction of MCWs and MAWs, as MAWs are mostly acquired through other words;
- b. word use varies depending on the spoken language and on culture. This dependency on the different spoken language might be higher for MAWs than for MCWs.

2.1. Different acquisition of concrete and abstract words meanings (MCWs and MAWs)

Word acquisition may be described as the learning of associations between different kinds of experiences. MCWs are simpler to learn: in many cases it is sufficient to associate a new linguistic label (e.g., “bottle”) to a previous category formed on the basis of sensorimotor experience. This new association changes our notion of BOTTLE, as it helps us to better distinguish bottles from other containers. This means that the concept BOTTLE of a non linguistic animal can be very different from the MCW “bottle” of an organism possessing language.

As for MAWs (e.g., “freedom”, “truth”), the mechanism could be different. It is primarily the linguistic experience that helps us in collecting a variety of bodily states, internal and external experiences, etc. These states and experiences are explicitly recognized and categorized once they are named. We do not intend to imply that, during the acquisition of MAWs, linguistic experience precedes perception and action. To clarify: we might run on the grass, perceive the breeze and climb a mountain; once we learn the word “freedom” – and possibly are explained its meaning -, we might re-categorize these different experiences and states as instantiations of FREEDOM. Thus the MAW “freedom” is grounded in perception and action experiences, exactly as the MCW “bottle”. However, for the acquisition of the MAW “freedom” the linguistic label might be more crucial than it is for the acquisition of the MCW “bottle”. Indeed, the acquisition of MAWs, due to their complexity, typically requires a long-lasting social interaction, and it often implies complex linguistic explanations and repetitions. In contrast, the process by which children learn MCWs appears effortless and often occurs within a single episode of hearing the word spoken in context (e.g. CAREY 1978). This has the consequence that, even if for both MCWs and MAWs sensorimotor and linguistic experience are crucial, we rely more on language to understand MAWs, whereas in order to understand MCWs we rely more on non-linguistic sensorimotor experience (for a study on acquisition demonstrating this, see BORGHI, FLUMINI, CIMATTI, MAROCCO & SCOROLLI 2011). The mechanism working for MAWs might extend to emotions as well (CIMATTI 2009), even though we think emotion words represent a special case we will not address here (ALTARRIBA, BAUER, & BENVENUTO 1999).

This view can explain many empirical findings. Regarding word acquisition, our proposal can help explain why MAWs are acquired by children much later than MCWs (MCGHEE-BIDLACK 1991). In addition, it sides with recent studies on Mode of Acquisition (MOA) (WAUTERS, TELLINGS, VAN BON & VAN HAAFTEN 2003) according to which word meanings can be acquired perceptually, linguistically, or by some combination of both. The authors clarify that the meaning of a word like “ball” is acquired through perception, because every time the child hears the word, he/she sees a real ball, or a picture of it. The meaning of a word like “grammar”, instead, has to be explained linguistically, therefore it is particularly difficult to learn for deaf children. Finally, the meaning of a word like “tundra” can be acquired in both ways, depending on the environment where it is learned. Importantly, MOA ratings, which correlate but are not totally explained by age of acquisition, concreteness and imageability (ELLIS, BURANI, IZURA, BROMILEY, & VENNERI 2006), gradually change over grades. In the first grades acquisition is mainly perceptual, later it is mainly linguistic. In our view, MAWs need to be acquired mainly linguistically because they do not refer to a single element but to complex relations. Further evidence on adults is in line with our proposal. Papafragou, Cassidy, and Gleitman (2007) showed that learning of belief abstract verbs (e.g., “think, believe, imagine”) is strongly facilitated by linguistic information. Finally, our proposal helps to account for the results of neuropsychological and behavioural studies showing that MCWs and MAWs are characterized by qualitatively different principles of organization. MAWs rely more on semantic associations, MCWs rely more on semantic (categorical) similarity (e.g., CRUTCH & WARRINGTON, 2005 on semantic refractory access dysphasia; DUÑABEITIA, AVILÉS, AFONSO, SCHEEPERS, & CARREIRAS 2009).

With regard to studies on knowledge representation in the brain, since decades the neural representation of concrete and abstract words has been the topic of intensive investigation. However, given that the majority of the studies were performed using lexical decision tasks, and that meaning abstractness is often treated as synonymous of word imageability, further brain imaging studies involving deeper comprehension tasks of MCWs and MAWs and sentences are required. An exhaustive analysis of this literature is beyond the scope of the present paper (for a review see SABSEVITZ, MEDLER, SEIDENBERG, & BINDER 2005); we will make just an example to clarify our point. Desai, Binder, Conant, and Seidenberg (2010) showed with fMRI that abstract sentences, differently from motor and visual ones, strongly activated the superior/anterior temporal and inferior frontal areas. In line with WAT, this suggests that MAWs may be represented primarily through verbal associations with other words. The difference between Paivio's view and embodied multiple representation views such as WAT is that, according to the last, both sensorimotor and linguistic information are crucial for both MAWs and MCWs, even if the distribution of the two information sources differs (see SCOROLLI, BINKOFKI, BUCCINO, NICOLETTI, RIGGIO & BORGHI 2011).

2.2. Different word use depending on the spoken language and the culture.

This proposal helps to highlight the variable and cultural dependency of word use rather than its universal aspects (PUGLISI, BARONCHELLI, LORETO 2008). For example, the English word "bottle" is part of a particular semantic network of words, while the Spanish word "botella" is part of a different semantic network. The two semantic networks have many similarities and overlapping areas, but they also have idiosyncratic aspects that reflect the differences between the communities that have used those words (e.g., MALT, SLOMAN, GENNARI, SHI, WANG 1999).

In keeping with this view, few recent studies, starting from an embodied perspective have demonstrated that languages influence the way in which humans organize categories. On the theoretical side, Gentner and Boroditsky (2001) distinguished between linguistic and cognitive dominance. We have cognitive dominance when concepts are formed on sensorimotor basis, and language intervenes later, whereas linguistic dominance is present when language is a constitutive part of the process of conceptual formation. As argued by the authors, the two kinds of dominance are differently distributed depending on the kind of words: concrete nouns are examples of cognitive dominance, verbs are in between, and closed class terms such as determiners and conjunctions are examples of linguistic dominance. On the experimental side, in line with our proposal evidence suggests that the influence of spoken language is stronger for MAWs than for MCWs. Here we will refer to evidence on MCWs, such as "container", and MAWs, such as meanings of words referring to conceptual domains such as time, causality, number, and so on. Consider MCWs referring to containers: the objects designated by the English term "bottle", the Spanish word "botella", the French word "bouteille" and the Dutch word "fles" only partially overlap. Malt et al. (1999) showed participants novel kinds of containers and asked them to perform a naming and a sorting task. They found differences in labelling between speakers of Chinese, Spanish and English; however, the sorting task was not heavily influenced by linguistic diversity. In the same vein, Malt, Sloman and Gennari (2003) investigated the influence of perceptual and linguistic-cultural aspects on 60 categories of common containers in Chinese, Spanish, and English. They found a complex pattern, indicating that languages share

linguistic categories when the stimulus space is rather structured, but where it is not, then the different languages partition the stimulus space in different ways. These results are consistent with our hypothesis that, for concrete nouns, the effect of linguistic differences on non linguistic tasks, such as the sorting one, is not as strong as it is in abstract domains, because with MCWs the world structure provides more constraints on how categories are assigned than with MAWs.

Consider now space and events. Both space and events cannot be conceived of as immediately concrete categories, as argued by Chatterjee, (2010): “The link between spatial concepts and specific sensory-motor attributes is less clear than it might be for concrete objects. A lion and a child may be running, but which attributes contribute to ‘running?’ Such dynamic events are also transient. The perceptual referent cannot be returned to in the same way that one can return to a static object.” (2010; p. 92). Many studies show that spatial relations are conceptualized differently depending on the kind of spoken language. For example, Bowerman and collaborators have demonstrated linguistic variability in the use of spatial relations (for a review, MAJIID, BOWERMAN, KITA, HAUN, LEVINSON 2004). Choi, McDonough, Bowerman and Mandler (1999) demonstrated with both production and preferential looking paradigms that English and Korean children respond differently to spatial relations such as containment and adherence. Regarding locomotion events, Malt, Gennari, Imai, Ameer, Tsuda e Majid (2008) found that in different languages (English, Japanese, Spanish and Dutch) locomotion verbs are distinguished in two macro-categories, to walk and to run. Biology imposes biomechanical constraints which are valid across different languages, but every single language partitions locomotion events into different sub-categories (e.g., the English words “jog”, “run”, and “sprint” correspond to a single Japanese word).

The story is more complex for MAWs referring to abstract domains such as those of time, causality, and number. Boroditsky (2001) has shown that the fact that Mandarin speakers tend to organize time vertically, as opposed to English speakers who organize time horizontally, influences the way in which spatial relations are represented. As for MAWs referring to causal relations, Wolff, Jeon and Li (2009) have shown that causal relations are interpreted differently in *initiator* languages, such as Korean, which requires that causers are able to generate their own energy, compared to *non-initiator* languages, such as English and Chinese, that do not require this (for example, in English and Chinese inanimate entities are accepted as causers, whereas this is more difficult in different languages). Further evidence has revealed the high linguistic variability of abstract verbs such as “to think” (GODDARD 2003); in addition, studies with a variety of numerical tasks have shown that numerical cognition varies consistently across languages depending on whether they have a counting system or not (e.g., GELMAN & GALLISTEL 2004; GORDON 2004). Thus, the diversity of meanings across languages is pervasive, and it holds across different domains (MALT & WOLFF 2010). However, this diversity of meaning, and the impact of the different spoken languages on thought, is stronger for MAWs than for MCWs. This is perfectly in line with the WAT proposal, according to which, given that MAWs rely more than MCWs on linguistic information, they are more influenced by linguistic variability.

2.3. Differences between WAT and other proposals

In this section we will distinguish our position from similar positions in the literature. We will focus on proposals suggesting that multiple systems represent knowledge, based both on sensorimotor and on linguistic experience (see also ANDREWS, VIGLIOCCO, VINSON 2009).

Representational pluralism. Dove (2009; 2011) proposes that perceptual symbols can explain how we represent concrete concepts, but to account for abstract concepts amodal symbols are necessary. It is true that evidence on abstract words favouring embodied views is circumscribed. However, we do not think amodal symbols are necessary to represent MAWs. The productivity and combinatorial properties of symbols do not characterize only amodal symbols but grounded symbols as well (BARSALOU 1999). Dove argues that a labelling strategy cannot explain polysemy and synonymy. But if we anchor words to their use, then we don't see why polysemy and synonymy represent a problem: polysemic words and synonyms are related to different, but similar, associated experiences, which are simultaneously linguistic and sensorimotor.

Symbol interdependency hypothesis. Louwerse and Jeuniaux (2008) propose that language comprehension is BOTH embodied and symbolic (LOUWERSE & COLLINS, 2011). The core of their proposal lies in the claim that symbols CAN BE, but ARE NOT NECESSARILY grounded. They claim that demonstrations of language grounding are mainly obtained with tasks that involve deep semantic processing or when the motor system is activated, not in tasks that involve superficial semantic processing, such as semantic decision tasks. Accordingly, when words activate a given modality (for example, the visual or the tactile one), there is no need to postulate a transduction process from modal into abstract and amodal symbols. Similarly, in the case of shallow semantic processing no transduction in a code other than the linguistic one is necessary, thus implying that no grounding is necessary. In our view the claim that most evidence on language grounding is obtained with deep processing tasks is not supported by data. Recent experimental work shows that the motor system is activated very quickly with tasks implying shallow semantic processing, such as lexical decision (for reviews, PULVERMÜLLER 2005). In addition, even studies performed with tasks that require deep semantic processing typically focus on dimensions that were not relevant to the task, demonstrating that they automatically influenced the performance (e.g., STANFIELD & ZWAAN 2001). The proposal by Louwerse and Jeniaux captures an important point: the value of semantic relations between words for explanations of psychological phenomena. However, we do not share the view that symbols are not necessarily grounded. Together with many authors (e.g., HARNAD 1990; CANGELOSI & HARNDA 2000, BARSALOU et al. 2008; PEZZULO & CASTELFRANCHI 2007) and along with a number of experimental results, we believe that MAWs cannot be explained solely on the basis of word associations, and that not only concrete but also abstract words are grounded. Thus, the word "freedom" would activate a network of associated words, but also a variety of experiences (e.g. exiting a prison, running on the grass, etc.). This is true also for concrete words, but to a different degree, given that the objects, situations, and experiences kept together by the label "bottle" are less variable and diverse than those kept together by the word "freedom".

LASS (Language and Situated Simulation) theory (BARSALOU et al 2008; SIMMONS, HAMANN, HARENSKI, HU, BARSALOU 2008). We agree with Barsalou et al. (2008) when they state that multiple systems represent knowledge, and that linguistic forms and situated simulations interact during concept processing. The primary difference between our proposal and theirs is that according to LASS

simulations represent deep conceptual information, whereas linguistic representations are useful but more superficial. Following this line of reasoning, the authors claim that “language plays central roles in cognition and conceptualization. Nevertheless, experience plays a role that is at least as central”. In particular they assume that “simulations provide the meanings of linguistic forms”, that is, experiences “are required for implementing symbolic operations”, because “language *per se* cannot represent a concept”. Our view differs from LASS as it ascribes more relevance to language and it stresses the importance of being immersed in a linguistic social context. In our view sensorimotor linguistic and non linguistic experiences do not have a different status and do not differ in depth. During language comprehension a combination of both experiences is activated, their weight might vary depending on the task and on the kind of words we consider (i.e. linguistic information is more important for MCWs than for MAWs, because it was more crucial for their acquisition). Differently from LASS, we propose that using language is an experience in itself, as in the typical cases of performative verbs (AUSTIN 1962): when I say “I swear it” I am *doing* something, I am not simply reporting an internal decision. Word tracking. The word tracking strategy proposed by Prinz (2002) presents many similarities to our view. Prinz proposes that an abstract word such as “democracy” is grasped in part associating concrete images to democracy and in part through verbal skills. These skills can be used to track definitions used by other members of our community, and can help reference them. Our view is in keeping with this approach and extends it by proposing that words are tools, i.e. not mere vehicles of pre-existing experiences but also actions/experiences in their own right.

3. Conclusion

Along with the embodied cognition views, we have argued that abstract words are grounded similarly to concrete words. However, expanding current embodied views, we propose that the kind of grounding might differ, because for the meanings of abstract words the experience of being immersed in a linguistic context and of using words as tools is more crucial than for concrete words, as for the first linguistic labels can represent a powerful means to collect a variety of sparse bodily and situational experiences. Even though recent embodied theories recognize the importance of language and argue in favour of multiple representations, sometimes they risk limiting linguistic experience to a burst of word associations. They do not fully recognize the richness of language, which is acquired in an experiential, social and normative fashion. Instead, we believe that conceptual content emerges through relations between words, and through relations between words and their referents. Words are combined in sentences and texts, and meaning arises from these linkages between words, as well as from the linkages between words and the structures they are embedded and the social and perceptual world (HALLIDAY, 1978), This implies combining an embodied with an extended view of words (e.g., BORGHI & CIMATTI 2010; VAN ELK, SLORS, BEKKERING 2010; for a review, see KIVERSTEIN & CLARK 2009). In addition, it implies reconciling the idea that words are grounded in perception and action, and the idea that words are sorts of actions. In order to reconcile them both of them have to be extended. In this sense words are not just words, they are not just signals for expressing internal and private concepts; words are social and external entities as well.

Bibliography

ALTARRIBA, J., BAUER, L. M., & BENVENUTO, C. (1999), «Concreteness, context availability, and imageability ratings and word associations for abstract, concrete, and emotion words», in *Behavior Research Methods, Instruments, & Computers*, n. 31, pp. 578-602.

ANDREWS, M., VIGLIOCCO, G., & VINSON (2009), «Integrating experiential and distributional data to learn semantic representation», in *Psychological Review*, n. 116, pp. 463-98.

AUSTIN, J. (1962), *How to Do Things with Words*, Oxford, Clarendon Press.

BARSALOU, L. W. (1999), «Perceptual Symbol Systems», in *Behavioral and Brain Sciences*, n. 22, pp. 577-609.

BARSALOU, L.W. (2003), «Abstraction in Perceptual Symbol Systems», in *Philosophical Transactions of Royal Society, B*, n. 358, pp. 1177-1187.

BARSALOU, L.W. (2008), «Grounded Cognition», in *Annual Review of Psychology*, n. 59, pp. 617-645.

BARSALOU, L.W., WIEMER-HASTINGS, K. (2005), «Situating abstract concepts», in D. Pecher, R. Zwaan [Eds.], *Grounding cognition: The role of perception and action in memory, language, and thought* (pp. 129-163), New York, Cambridge University Press.

BARSALOU, L.W., SANTOS, A., SIMMONS, K.W., WILSON C.D. (2008), «Language and Simulations in Conceptual Processing» in M. De Vega, A.M. Glenberg, A.C. Graesser (eds.), *Symbols, Embodiment and Meaning*.(pp. 245-283), Oxford, Oxford University Press.

BERTHOZ, A. (1997), *Le sens du mouvement*, Paris, Odile Jacob.

BOOT, I., PECHER, D. (2009), «Similarity is closeness: Metaphorical Mapping in a Conceptual Task», in *Quarterly Journal of Experimental Psychology*, n. 29, pp. 1-13.

BORGHI, A.M. (2005), «Object concepts and action», in D. Pecher & R.A. Zwaan [Eds.], *Grounding Cognition: The role of perception and action in memory, language, and thinking*, Cambridge, Cambridge University Press.

BORGHI, A.M., CIMATTI, F. (2010), «Embodied cognition and beyond: Acting and sensing the body», in *Neuropsychologia*, n. 48, pp. 763-773.

BORGHI, A.M., FLUMINI, A., CIMATTI, F., MAROCCO, D., SCOROLLI, C. (2011), «Manipulating objects and telling words: A study on concrete and abstract words acquisition», in *Frontiers in Psychology*, n. 2:15, doi:

10.3389/fpsyg.2011.00015,
<http://www.frontiersin.org/cognition/10.3389/fpsyg.2011.00015/full>.

BORGHI, A.M., PECHER, D. (2011), «Introduction to the special topic Embodied and Grounded Cognition», *Frontiers in Psychology*, n. 2, 187, doi: 10.3389/fpsyg.2011.00187, <http://www.frontiersin.org/cognition/10.3389/fpsyg.2011.00187/full>.

BORODITSKY, L. (2001), «Does language shape thought? English and Mandarin speakers' conceptions of time», in *Cognitive Psychology*, n. 43, pp. 1-22.

BORODITSKY, L., PRINZ, J. (2008), «What thoughts are made of», in Semin, G., Smith, E., [Eds.], *Embodied grounding: Social, cognitive, affective, and neuroscientific approaches*, New York, Cambridge University Press.

BORODITSKY, L., RAMSCAR, M. (2002), «The roles of body and mind in abstract thought», in *Psychological Science*, n. 13, pp. 185-188.

CANGELOSI, A., HARNAD, S. (2000), «The adaptive advantage of symbolic theft over sensorimotor toil: Grounding language in perceptual categories», in *Evolution of Communication*, n. 4, pp. 117-142.

CAREY, S. (1978), «The child as a word learner», in M. Halle, J. Bresnan, G. Millen [Eds.], *Linguistic Theory and Psychological Reality* (pp. 264-293), Cambridge, MA, MIT Press.

CASASANTO, D., BORODITSKY, L. (2008), «Time in the mind: Using space to think about time», in *Cognition*, n. 106, pp. 579-593.

CHATTERJEE, A. (2010), «Disembodying cognition», in *Language and Cognition*, 2-1, 79-116.

CHERSI, F., THILL, S., ZIEMKE, T., BORGHI, A.M. (2010), «Sentence processing: linking language to motor chains», in *Frontiers in neurorobotics*, n. 4: 4, doi: 10.3389/fnbot.2010.00004, <http://www.frontiersin.org/neurorobotics/10.3389/fnbot.2010.00004/full>.

CHOI, S. MCDONOUGH, L. BOWERMAN, M., MANDLER, J.M. (1999), «Early sensitivity to language-specific spatial categories in English and Korean», in *Cognitive Development*, n. 14, pp. 241-268.

CIMATTI, F. (2009), «Dentro il corpo, fuori del corpo. La biologia artificiale delle emozioni», in F. Cimatti (Ed.), *Linguaggio ed emozioni*, numero monografico del *Bollettino filosofico del Dipartimento di Filosofia dell'Università della Calabria*, XXIV, pp. 37-54.

CLARK, A. (1998), «Magic words: How language augments human computation», in P. Carruthers, J. Boucher [Eds.], *Language and thought: Interdisciplinary themes*, Cambridge, Cambridge University Press.

CLARK, A. (2006), «Material Symbols», *Philosophical Psychology*, n. 19, pp. 1-17.

CLARK, A. (2008), *Supersizing the mind. Embodiment, action, and cognitive extension*, Oxford, Oxford University Press.

CLARK, E. (2004), «How language acquisition builds on cognitive development», in *Trends in Cognitive Science*, n. 8, pp. 472-478.

CLARK, H. (1996), *Using language*, Cambridge, Cambridge University Press.

CRUTCH, S.J. WARRINGTON, E.K. (2005), «Abstract and concrete concepts have structurally different representational framework», in *Brain*, n. 128, pp. 615-627.

DESAI, R.H., BINDER, G.R., CONANT, L.L., SEIDENBERG, M.S. (2010), «Activation of sensory-motor areas in sentence comprehension», in *Cerebral Cortex*, n. 20, pp. 468-478.

DOVE, G. (2009), «Beyond Conceptual Symbols. A Call for Representational Pluralism», in *Cognition*, n. 110, pp. 412-431.

DOVE, G. (2011), «On the need for embodied and disembodied cognition», in *Frontiers in Psychology*, n. 1:242, doi: 10.3389/fpsyg.2010.00242, <http://www.frontiersin.org/cognition/10.3389/fpsyg.2010.00242/full>.

DUÑABEITIA, J.A., AVILÉS, A., AFONSO, O., SCHEEPERS, C., CARREIRAS, M. (2009), «Qualitative differences in the representation of abstract versus concrete words: Evidence from the visual-world paradigm», in *Cognition*, n. 110, pp. 284-292.

ELLIS, A.W., BURANI, C., IZURA, C., BROMILEY, A., VENNERI, A. (2006), «Traces of vocabulary acquisition in the brain: Evidence from covert object naming», in *NeuroImage*, n. 33, pp. 958-968.

ELMAN, J. (2004), «An alternative view of the mental lexicon», in *Trends in Cognitive Sciences*, n. 8, pp. 301-306.

FISCHER, M., ZWAAN, R. (2008), «Embodied Language: A Review of the Role of the Motor System in Language Comprehension», in *The Quarterly Journal of Experimental Psychology*, n. 61, pp. 825-850.

FLUSBERG, S. J., THIBODEAU, P. H., STERNBERG, D. A., GLICK, J. J. (2010), «A connectionist approach to embodied conceptual metaphor», in *Frontiers in Psychology*, n. 1:197, doi:10.3389/fpsyg.2010.00197, <http://www.frontiersin.org/cognition/10.3389/fpsyg.2010.00197/full>.

GALLESE, V. (2008), «Mirror neurons and the social nature of language: The neural exploitation hypothesis», in *Social Neuroscience*, n. 3, pp. 317-333.

GELMAN, R., GALLISTEL, C.R. (2004), «Language and the origins of numerical concepts», in *Science*, n. 306, pp. 441-443.

GENTILUCCI, M. (2003), «Object motor representation and language», in *Experimental Brain Research*, n. 153, pp. 260-265.

Gentner, D., Boroditsky, L. (2001), «Individuation, relativity and early word learning», in M. Bowerman, S. Levinson, [Eds.], *Language acquisition and conceptual development* (pp. 215-256), Cambridge, Cambridge University Press.

GIBBS, R.W.(2003), «Embodied experience and linguistic meaning», in *Brain and Language*, n. 84, pp. 1-15.

GLENBERG, A.M. (1997), «What memory is for», in *Behavioral and Brain Sciences*, n. 20, pp. 1-55.

GLENBERG, A.M., SATO, M., CATTANEO, L. (2008), «Use-induced motor plasticity affects the processing of abstract and concrete language», in *Current Biology*, n. 18, 7, pp. R1-R2.

GLENBERG, A.M., SATO, M., CATTANEO, L., RIGGIO, L., PALUMBO, D., BUCCINO, G. (2008), «Processing Abstract Language Modulates Motor System Activity», in *The Quarterly Journal of Experimental Psychology*, n. 61, pp. 905-919.

GOLDMAN, A., DE VIGNEMONT, F. (2009), «Is social cognition embodied?» in *Trends in Cognitive Science*, n. 13, pp. 154-159.

GORDON, P. (2004), «Numerical cognition without words: Evidence from Amazonia», in *Science*, n. 306, pp. 496-499.

HALLIDAY, M. A. K. (1978), *Language as social semiotic: The social interpretation of language and meaning*, Maryland, University Park Press.

JIRAK, D., MENZ, M., BUCCINO, G., BORGHI, A.M., BINKOFSKI, F. (2010), «Grasping language. A short story on embodiment», in *Consciousness and Cognition*, n. 19, pp. 711-720.

KEIL, F. C. (1989), *Concepts, kinds and cognitive development*, London, MIT Press.

KEMMERER, D., GONZALES-CASTILLO, J. (2010), «The two-level theory of verb meaning: An approach to integrating the semantics of action with the mirror neuron system», in *Brain and Language*, n. 112, pp. 54-76.

KIVERSTEIN, J., CLARK, A. (2009), «Introduction: Mind Embodied, Embedded, Enacted: One Church or Many?», in *Topoi*, n. 28, pp. 1-7.

LAKOFF, G., JOHNSON, M. (1980), *Metaphors we live by*, Chicago, University of Chicago Press.

LAKOFF, G., JOHNSON, M. (1999), *Philosophy In The Flesh: the Embodied Mind and its Challenge to Western Thought*, New York, Basic Books.

LOUWERSE, M.M., CONNELL, L. (2011), «A taste of words: Linguistic context and perceptual simulation predict the modality of words», in *Cognitive Science*, n. 35, pp. 381-398.

LOUWERSE, M.M., JEAUNIAUX, P. (2008), «Language comprehension is both embodied and symbolic», in de Vega, M., Glenberg, A., Graesser, A.C. [Eds.], *Symbols and embodiment: Debates on meaning and cognition* (pp. 309-326), Oxford, Oxford University Press.

MAJID, A., BOWERMAN, M., KITA, S., HAUN D.B.M, LEVINSON, S.C. (2004), «Can language restructure cognition? The case for space», in *Trends in cognitive science*, n. 8, pp. 108-114.

MALT, B.C., GENNARI, S., IMAI, M., AMEEL, E., TSUDA, N., MAJID, A. (2008), «Talking about walking: Biomechanics and the language of locomotion», in *Psychological Science*, n. 19, pp. 232-240.

MALT, B.C., SLOMAN, S.A., GENNARI, S., SHI, M., WANG, Y. (1999), «Knowing versus naming: Similarity and the linguistic categorization of artifacts», in *Journal of Memory and Language*, n. 40, pp. 230-262.

MALT, B.C., SLOMAN, S.A., GENNARI, S. (2003), «Universality and language specificity in object naming», in *Journal of Memory and Language*, n. 49, pp. 20-42.

MALT, B.C., WOLFF, S. (2010), *Words and the mind. How words capture new experience*, New York, Oxford University Press.

MANDLER, J.M. (2004), «Thought before language», in *Trends in Cognitive Sciences*, n. 11, pp. 508-513.

MCGHEE-BIDLACK, B. (1991), «The development of noun definitions: a metalinguistic analysis», in *Journal of Child Language*, n. 18, pp. 417-434.

MEIER, B.P., HAUSER, D.J., ROBINSON, M.D., FRIESEN, C.K., SCHJELDAHL, K. (2007), «What's "up" with God? Vertical space as a representation of the divine», in *Journal of Personality and Social Psychology*, n. 93, pp. 699-710.

MIROLLI, M., PARISI, D. (2011), «Towards a Vygotskian Cognitive Robotics: The role of language as a cognitive tool», in *New Ideas in Psychology*, n. 29, pp. 298-311.

PAIVIO, A. (1986), *Mental representations: A dual coding approach*, New York, Oxford University.

PAIVIO, A., YUILLE, J.C., MADIGAN, S.A. (1968), «Concreteness, imagery and meaningfulness values for 925 words», in *Journal of Experimental Psychology Monograph Supplement*, n. 76 (3, part 2).

PAPAFRAGOU, A., CASSIDY, K., GLEITMAN, L. (2007), «When you think about thinking: The acquisition of belief verbs», *Cognition*, n. 105, pp. 125-165.

PECHER, D., BOOT, I. (2011), «Numbers in space: differences between concrete and abstract situations», *Frontiers in Psychology*, n. 2:121, doi: 10.3389/fpsyg.2011.00121, <http://www.frontiersin.org/Cognition/10.3389/fpsyg.2011.00121/full>.

PECHER, D., BOOT, I., VAN DANTZIG, S. (2011), «Abstract concepts: sensory-motor grounding, metaphors, and beyond», in *The Psychology of Learning and Motivation*, Vol. 54, ed. B. Ross (Burlington: Academic Press), pp. 217–248.

PECHER, D., ZWAAN, R.A. (2005), *Grounding cognition. The role of perception and action in memory, language, and thinking*, Cambridge, MA, Cambridge University Press.

PEZZULO, G., CASTELFRANCHI, C. (2007), «The symbol detachment problem», in *Cognitive Processes*, n. 8, pp. 115-131.

PRINZ, W. (1997), «Perception and action planning», in *European Journal of Cognitive Psychology*, n. 9, pp. 129-154.

PRINZ, J. (2002), *Furnishing the mind. Concepts and their perceptual basis*, Cambridge, MA, MIT.

PUGLISI, A., BARONCHELLI, A., LORETO, V. (2008), «Cultural route to the emergence of linguistic categories», in *Proceedings of the National Academy of Science*, n. 105, pp. 7936-7940.

Pulvermüller, F. (2005), «Brain mechanisms linking language and action», in *Nature Reviews Neuroscience*, n. 6, pp. 576–582.

RIZZOLATTI, G., CRAIGHERO, L. (2004), «The mirror neuron system», in *Annual Review of Neuroscience*, n. 27, pp. 169-192.

SABSEVITZ, D.S., MEDLER, D.A., SEIDENBERG, M., BINDER, J.R. (2005), «Modulation of the semantic system by word imageability», in *Neuroimage*, n. 27, pp. 188-200.

SCOROLLI, C., BINKOFSKI, F., BUCCINO, G., NICOLETTI, R., RIGGIO, L., BORGHI, A.M. (2011), «Abstract and concrete sentences, embodiment, and languages», in *Frontiers in Psychology*, n. 2: 227, doi: 10.3389/fpsyg.2011.00227, <http://www.frontiersin.org/cognition/10.3389/fpsyg.2011.00227/full>.

SCHUBERT, T., WALDZUS, S. & SEIBT, B. (2008), «The embodiment of power and communalism in space and bodily contact», in G.R. Semin, E.R. Smith (Eds.) *Embodied grounding. Social, cognitive, affective, and neuroscientific approaches*, New York, Cambridge University Press, pp. 160-183.

SEMIN, G.R., SMITH, E.R. (Eds.), *Embodied grounding: Social, cognitive, affective, and neuroscientific approaches*, New York, Cambridge University Press.

SIMMONS, K.W., HAMANN, S.B., HARENSKI, C.L., HU, X.P., BARSALOU, L.W. (2008), «fMRI evidence for word association and situated simulation in conceptual processing», in *Journal of Physiology, Paris*, n. 102, pp. 106-119.

STANFIELD, R.A., ZWAAN, R.A. (2001), «The effect of implied orientation derived from verbal context on picture recognition», in *Psychological Science*, n. 12, pp. 153-156.

TOMASELLO, M. (2005), *Constructing a language. A usage-based theory of language acquisition*, Cambridge, MA, Harvard University Press.

TONI, I., DE LANGE, F.P., NOORDZIJ, M.L., HAGOORT, P. (2008), «Language beyond action», in *Journal of Physiology, Paris*, n. 102, pp. 71-79.

TYLÈN, K., WEED, E., WALLENTIN, M., ROEPSTORFF, A., FRITH, C. D. (2010), «Language as a tool for interacting minds», in *Mind and Language*, n. 25, pp. 3-29.

VAN ELK, M., SLORS, M., BEKKERING, H. (2010), «Embodied language understanding requires an enactivist paradigm of cognition», in *Frontiers in Psychology*, n. 1:234, doi: 10.3389/fpsyg.2010.00234, <http://www.frontiersin.org/cognition/10.3389/fpsyg.2010.00234/full>.

WAUTERS, L.N., TELLINGS, A.E.J.M., VAN BON, W.H.J., VAN HAAFTEN, A.W. (2003), «Mode of acquisition of word meanings: The viability of a theoretical construct», in *Applied Psycholinguistics*, n. 24, pp. 385-406.

WILLEMS, R.M., HAGOORT, P. (2007), «Neural evidence for the interplay between language, gesture and action: a review», in *Brain and Language*, n. 101, pp. 278-289.

WITTGENSTEIN, L. (1953), *Philosophical Investigations. The German Text, with a Revised English Translation*, translated by Anscombe, G. E. M. (2001), Oxford: Blackwell Publishing.

WOLFF, P., JEON G.H., LI, Y. (2009), «Causers in English, Korean, and Chinese and the individuation of events», in *Language and Cognition*, n. 1-2, pp. 165-194.