

STUDI

The Particularity of Emotional Words: A Grounded Approach

Claudia Mazzuca^(α), Laura Barca^(β) & Anna M. Borghi^{(β),(γ)}

Ricevuto: 28 febbraio 2017; accettato: 29 luglio 2017

Abstract This work focuses on emotional concepts. We define concepts as patterns of neural activation that re-enact a given external or internal experience, for example the interoceptive experience related to fear. Concepts are mediated and expressed through words. In the following, we will use “words” to refer to word meanings, assuming that words mediate underlying concepts. Since emotional concepts and the words that mediate them are less related to the physical environment than concrete ones, at first sight they might be depicted as abstract concepts. Evidence coming from several studies shows, instead, that the issue is more complex. In this work, we will briefly outline the debate and illustrate results from recent studies on comprehension of concrete, emotional and abstract words in children and adults. We will argue that emotional words can be accounted for from a grounded perspective and will contend that emotional words represent a particular set of words that differs from both the concrete and purely abstract ones.

KEYWORDS: Embodied and Grounded Cognition; Abstract Concepts; Emotional Words; Language Acquisition; Language Processing

Riassunto *La peculiarità delle parole emotive: un approccio basato sulla grounded cognition* – Questo lavoro si incentra sui concetti emotivi. Intendiamo qui per concetti i *pattern* di attivazione neurali che riattivano un’esperienza interna o esterna, per esempio le esperienze interocettive collegate alla paura. I concetti sono mediati ed espressi dalle parole. Di seguito, useremo “parole” in riferimento al significato delle parole, assumendo le parole come veicolo dei concetti. I concetti emotivi e le parole che li esprimono, dal momento che sono meno legati all’ambiente fisico rispetto a quelli concreti, potrebbero essere a tutta prima classificati come concetti astratti. Molti studi invece mostrano come la questione sia più complessa. In questo lavoro illustreremo brevemente il dibattito e i risultati di recenti studi sulla comprensione di parole astratte, concrete ed emotive in bambini e adulti, per mostrare come una prospettiva *grounded* possa rendere conto delle parole emotive, sostenendo che queste rappresentano un insieme particolare di parole, diverse sia da quelle concrete che da quelle puramente astratte.

PAROLE CHIAVE: Embodied and Grounded Cognition; Concetti astratti; Parole emotive; Acquisizione del linguaggio; Processamento del linguaggio

^(α)Dipartimento di Filosofia e Comunicazione, Università degli Studi di Bologna, via Azzo Gardino, 23 - 40122 Bologna (I)

^(β)Istituto di Scienze e Tecnologie della Cognizione, CNR Roma, via San Martino della Battaglia, 44 - 00185 Roma (I)

^(γ)Dipartimento di Psicologia Clinica e Dinamica, Università degli Studi "Sapienza", via degli Apuli, 1 - 00185 Roma (I)

E-mail: mazzuca.claudia@gmail.com (✉); laura.barca@istc.cnr.it; anna.borghi@uniroma1.it



Emotions and embodiment

WHAT HAPPENS WHEN WE HEAR, read and produce a word like “happiness”? Does the word induce in us an emotional experience? Do we feel happy and joyful? In this paper, we focus on emotional words starting from an embodied and grounded perspective, i.e. from a perspective according to which the body and the environment shape and constrain our cognitive activity.¹ In line with such a view, we will argue that using a word like “happiness” implies a partial re-enactment of what we have learned to be the feeling of happiness. Furthermore, we will highlight the particularity of emotional words with respect to concrete and abstract words (e.g. “bottle” and “justice”), referring to recent data found in the literature and to recent results obtained in our lab. Compared to concrete words, abstract words typically do not refer to a concrete, single, and specific object/entity, they are more detached from sensorimotor experience, and they are characterized by higher variability both within and across subjects. Emotional words are sometimes considered to be a kind of abstract word, as “freedom” and “fantasy”. We will argue instead that they have a special status and differ from both concrete and from purely abstract words.

The theoretical framework for our work is constituted by theories of embodied and grounded cognition, which have largely investigated the relation between language processing and multi-modal representations and which have provided various accounts of the connection between emotions and cognition.

Following this perspective, emotion processing seems to be strictly related to the bodily expression of emotion itself,² hence the role of the sensorimotor system in experiencing emotions is crucial. The mechanism of reenactment of multimodal features is at the core of embodied theories that account for the acquisition and elaboration of emotions and emotional language. Such theories have emphasized through experimental stud-

ies that both perceiving and recognizing an emotion, as well as understanding emotional language rely on embodied representations.

Following the embodied interpretation, when we perceive “fear”, e.g. while looking at a barking dog, we form a simulation, in which different perception modalities co-occur. Our cognitive and perceptual systems are entirely involved, starting from the visual processes that register and impress on our retina the aspect of the dog, its shape and color for example, continuing through the auditory system that perceives the dog barking, and ending with what is typically called the emotion of fear, i.e. the sensation of being scared by something, which can result in the physiological phenomena of accelerated heart beating and sweating. When thinking about fear, all the past experiences that we have collected and conceptualized as “fear” are reactivated, through the re-enactment of all the perceptual and multi-sensory features that were involved in those experiences. In this sense, theories of embodied and grounded cognition on language processing and acquisition are clearly denying the idea of universal concepts, and underscoring the importance of the cultural and environmental context in the shaping and formation of concepts through the re-enactment of experiences. The idea of simulation assumes a powerful explanatory strength in theories of embodied cognition, and it accounts for many phenomena – for example, it underlies both the experience of emotions and the experience of using words that refer to emotions such as “love”, “fear” and “anger”. Obviously, simulating is not acting, since it implies some form of inhibition at some level, even if our neural system is activated so as to react to the emotion itself. Simulation is thought to be at the basis of situated conceptualization, and is defined as the partial re-enactment of modal states acquired through experiences with the environment. This is an unconscious process, and it accounts for the mechanisms of conceptualization that otherwise would be difficult to clarify in absence of a direct stimulus.³

■ Language comprehension in an embodied and grounded perspective

Embodied and grounded theorists have proposed that in comprehending and processing language we recruit the same mechanisms involved in perceiving and elaborating physical information. Evidence has shown, for example, that when comprehending action-based words, such as “grasping”, and words referring to concrete objects, such as “ball”, we activate the same bodily patterns that are elicited during the action of grasping and during interactions with these objects.⁴ Hence, word processing must be grounded in the sensorimotor system through a simulation process.

While the evidence on sensorimotor grounding of action words and concrete nouns is varied and compelling, the issue of how we represent abstract and emotional words is still a problematic point for a simulation-based theory. Consider the difference between concrete, abstract and emotional concepts. If we think about a very prototypical concrete concept such as “bottle”, the embodied approach can easily predict which perceptual and motor features will be re-activated during the elaboration of the word referring to the concept: a multimodal representation of the bottle will include the activation of the neural circuits underlying its shape, dimension, color and the experience of grasping it. If we think about a prototypical abstract concept such as “freedom”, it is clearly more difficult to predict which sensorimotor features will be re-enacted in the processing of the related word. The case of prototypical emotional words such as “love” is more complex than that of concrete words, since the former do not possess an object as referent; in spite of this, an embodied approach can predict that during the processing of emotional words the neural circuits and the bodily expressions subtending the corresponding emotions will be activated.

Emotional language comprehension activates a simulation, as shown by a number of

recent studies. Moseley and collaborators⁵ found that the passive reading of emotional words activates the same part of the premotor cortex that is also involved in the processing of face related and arm-hand related words, used generally to speak about overt actions. Notably, the same areas are also activated by highly abstract related emotional words such as “spite” which are more detached from bodily experiences than emotional words like “scream”. The results of this study clearly provide evidence for an embodied and grounded theory of emotions, that is also able to account for the process of abstraction implied in the learning and in the representation of a word meaning.

The role of simulation in the comprehension of emotional language has also been explored in behavioral studies. Havas and colleagues⁶ injected botulinum toxin in the forehead of participants, to consider whether the understanding of an emotional sentence involves the simulation of its content. If reading emotion sentences activated a simulation, the inability to involuntarily move the facial muscles due to Botox toxin should be reflected in slower response times during emotion language processing. Havas and colleagues displayed an experiment in which they presented a set of happy, sad and angry sentences to participants, both before injecting the Botox toxin and after the injection. The results showed that the understanding of an emotional sentence, especially sad and angry sentences, was hindered by the impairment of the facial mimicry induced by botulinum. This was reflected in a reduction in response times when sad and angry utterances were processed after the injection. This finding indicates that embodied simulation can also account for the processing of emotion-related language.

■ Grounding abstraction and emotions in language: The specificity of emotional words

While there is clear evidence that emotion

words activate a simulation, the debate on whether emotional words can be considered a particular kind of abstract words or not is still open. The growing scientific literature on emotional words has expanded this discussion, by supplying contentious evidence.

According to some scholars⁷ emotional concepts can be considered as means for the acquisition of more abstract concepts, since they represent the first concepts acquired without the mediation of a specific and single concrete referent. Their results show, among other things, that abstract words are processed faster than concrete ones; this is explained by the authors on the basis of the greater affective connotation of abstract words compared to concrete nouns. Emotional valence was proved to modulate word processing: words judged to have positive or negative emotional connotation were processed faster than words with an emotionally neutral meaning. Crucially, abstract words tended to be rated as highly emotionally valenced. In a recent study, Ponari and colleagues⁸ asked adults to evaluate the age of acquisition of abstract and concrete words, including positive, negative and neutral emotional words. They found that positive and negative abstract words were acquired earlier than neutral ones, and that both abstract and concrete positive words tended to be acquired earlier than other words. In a further lexical decision task they asked children aged 6 to 12 to discriminate positive, negative and neutral abstract and concrete words. Results showed that accuracy increased with age and valence interacted with age for abstract but not for concrete nouns: children aged 8-9, the age in which abstract vocabulary increases, were more accurate with positive abstract words compared to neutral words. Overall, studies such as these insist on the idea that emotional aspects characterize all abstract concepts and that emotional words are a subset of abstract words and concepts.

Other studies have instead claimed that emotional concepts are to be considered distinct from both concrete and abstract ones.

In their studies, Altarriba and colleagues⁹ have demonstrated that emotional concepts are recalled more accurately than concrete and abstract ones, and that they are rated differently with respect to psycholinguistic criteria such as concreteness, imageability and contextual availability. The results obtained by Setti and Caramelli¹⁰ using a rating and a definition production task, also suggest that the conceptual knowledge related to emotional concepts is markedly different from that related to both concrete and abstract ones. Mazzuca and Borghi¹¹ also compared concrete, abstract and emotional words. Participants had to perform a lexical decision task followed by a word recognition task; responses were given by pressing a pedal while holding a key with the hand or with the mouth. In the lexical decision task response times for concrete and emotional words did not differ, while responses to abstract words were slower. The analysis on accuracy in the recognition task revealed that responses to abstract words were more accurate than those to emotive words and tended to be more accurate than those to concrete ones. The interaction between the effector involved (hand, mouth) and the kind of word showed that recognition was facilitated by the mouth for abstract and emotive words, while facilitated by the hand for concrete words. The results of this study in both the lexical decision and the word recognition task are clearly difficult to reconcile with the view that emotional and abstract concepts are of the same kind.

Crucially for a perspective that emphasizes the role of the body in cognition, another recent study has shown that emotion related sentences are rated as associated with the mouth and with other bodily effectors. Ghio and colleagues¹² asked participants to rate associations with the mouth, hand/arm or leg/foot of sentences related to mental states (e. g. "she remembers the past"), to emotions (e.g. "she shows her disappointment") and to mathematics (e.g. "she determines the sum"). Ratings for the mouth scale indicated that

emotional sentences were significantly more associated with mouth actions than were either mental states or mathematical sentences; ratings for the hand scale revealed that mathematical sentences and emotional sentences were significantly more associated with hand actions than were mental state utterances. As for the leg scale, emotional sentences were significantly more associated with leg actions than the other two kinds of sentences. These results support the idea that emotions are more grounded in bodily states, including embodied multi-modal representations, than other kinds of abstract concepts (mental concepts and numbers).

As highlighted by our brief overview of the literature, interpreting data on emotional words is still a controversial matter. Considering the complexity of the theoretical and empirical evidence about emotion related words, in our view emotional concepts represent a particular and intriguing case. Moving from an embodied and grounded approach, we will here contend that emotional concepts hold a special status with respect to concrete and to purely abstract ones.

On the one hand the direct involvement of the body in emotional representations mediated by words could render them similar to concrete concepts, although concrete words (with some exceptions, such as concrete words referring to food) usually activate neural areas related to the actions performed with manipulable objects (e.g. hand or arms), while emotional words elicit a more general bodily activation.

On the other hand, there are reasons for including emotional concepts and words in the semantic domain of abstract concepts. Like abstract concepts, emotional concepts are characterized by a high intra- and inter-personal variability connected to the assignment of meaning: since they lack a single and concrete referent, they are more subject to variation across people and spaces than concrete concepts. There are other similarities between emotional and abstract concepts that can be taken into account. An important

similarity concerns the fact that, like abstract words, emotional ones seem to strongly involve not only the hand/arm but also the mouth motor system. Different mechanisms could subtend this activation of the mouth.

A first mechanism might be the fact that emotions involve our body in its wholeness. A second might be the activation of linguistically conveyed information. This mechanism, which in our view is highly critical for abstract words, is not so crucial for emotional words, but might play some role especially for more abstract emotional terms. Even though basic emotional words like “anger” and “fear” activate a clear bodily pattern, suggesting that they are experienced and stored in conceptual knowledge as complex and multiple representations, other kinds of emotional words are indeed more abstract and not so clearly bounded. For these concepts, similarly to what happens with abstract words¹³ the mouth activation could be due to the activation of linguistically conveyed information, contributing to shape and delimit the meaning of some emotional concepts. Consider for example a term like “love” and how language contributes to contextualize its meaning. It is reasonable to think that a child’s first experience with “love”, whatever it might be – i.e. the love of her/his parents – is considerably different from her/his subsequent experiences with that feeling. With increased experience and linguistic competence, the child will presumably learn that the feeling that relates to her/his parents, or the affection for her/his dog, are all occurrences that can be collected under the linguistic label of “love”, even though they have different hues. The word helps to collect and put together different representations of “love”. In that view, we can consider the relationship between language and simulation as a bidirectional one, viz. a relation in which both terms are mutually influenced one by another. In any case, the importance of language in delimiting their meaning and their association with the mouth is not sufficient to completely embrace a vision of

emotional terms as a subset of abstract ones. Certainly, language may play a role in the conceptualization of emotional words, by providing a frame in which to ground all the emotional experiences, but the activation of the mouth effector can have other implications, for example it could be a consequence of more general bodily activation.

In sum: we propose to reconsider the relation between concrete and abstract concepts, not as a dichotomy, but as a *continuum*, in which concepts are organized and represented at a different level of abstractness, and in which emotional concepts represent a particular kind of concept. In line with the suggestion of the *Words as Social Tools* proposal,¹⁴ multimodal representations are involved both in the comprehension of a concrete term, and in the comprehension of an abstract one. Words should be considered as social tools, that is, as having a performative aspect, as being useful tools to use in order to operate distinctions in the environment, and to cooperate in society.¹⁵ According to this proposal, linguistic explanations provided by competent speakers could be the basis for the acquisition of abstract meanings, helping to glue the linguistic label to the experience. If concrete words mostly activate the sensorimotor system while abstract words also rely heavily on linguistic and social experience, what happens with emotional words? We propose that emotional words first of all activate an embodied simulation, leading to a re-enactment of the original emotional experience. However, social and linguistically conveyed information can also contribute to shaping emotional concepts, especially those related to more complex and sophisticated emotions like “shame”. As the studies mentioned in the previous sections show, emotional words and sentences seem to activate both the hand and arm areas and the mouth; the mouth activation can be either a byproduct of the whole bodily activation or can be due to the activation of the linguistic system. In conclusion, emotional terms seem to be an intermediate level between concrete and ab-

stract ones, sharing properties of both, but at the same time maintaining a peculiar status, and being irreducible to either of these categories. In the next section we will report recent evidence supporting this view.

Concrete, abstract and emotion words: Some empirical results

As we have seen in the previous chapters, the debate on whether emotion words can be considered a subset of abstract words or not is far from being settled. We will now briefly report some recent results on word acquisition and word processing we have obtained which contrast the three kinds of words.

In line with the scientific literature that has outlined the relation between abstract and emotional words and the activation or the engagement of the mouth effector, we predicted that linguistic information together with experiential and sensorimotor information, is at the basis of the acquisition of abstract and emotional concepts. In our view, if linguistic and social input can be considered crucial for assessing memories of abstract and emotional terms, its embodied counterpart is represented by the mouth. Numerous studies have assessed the importance of the mouth effector for the processing of abstract words;¹⁶ this could either be due to the particular way in which abstract terms are acquired, that is strictly related to linguistic explanations¹⁷ which can be re-enacted during the processing of abstract words, or due to the need for re-explaining the meaning of abstract terms through a form of inner talk, given their complexity. Both of these explanations are contemplated here.

As for emotional terms, it has been claimed that alterations of facial mimicry in adults imply a reduction in emotional skills, also related to emotional language processing. Recent studies on the relation between a pacifier and emotional competence have emphasized the negative impact of the device on the development of emotional

skills,¹⁸ while the role of the pacifier on the acquisition of emotional language has not been explored.

We hence investigated the possibility that a forced reduction of mouth and face movements caused by the overuse of an oral device such as a pacifier during infancy could modulate the acquisition of abstract and emotional concepts more than that of concrete ones.

We thus conducted two different studies, aimed at verifying if and how the extended use of an oral device, such as a pacifier, could impact the acquisition and consolidation in memory of abstract and emotional words in children. More importantly, we wanted to verify if abstract and emotional concepts differ in terms of the conceptual relations they elicit and response times they require to be processed, in order to examine the different nature of these two types of concepts. For this purpose, we tested children with different levels of education, on two different tasks.

For the first study¹⁹ we asked 7-year-old children to provide oral definitions for a set of selected abstract, emotional and concrete words. Children who participated in the research had used a pacifier for different periods, on a scale from never to three years or more. The definitions provided were analyzed and rated using two scoring systems, the first pertaining to the accuracy of responses (a three-point scale in which “2” corresponded to totally correct, “1” to partially correct and “0” to incorrect or no response), the second focusing on the conceptual properties. The definitions produced were parsed in conceptual components and the different relations produced were coded by two independent researchers. The categories used included among others “perceptual features”, “emotion”, “experiential” (referred to direct experiences with the concept), “interaction” and “taxonomic” (referred to the higher or lower level of a taxonomy).

Results showed that abstract words are more difficult to define, producing more frequently inaccurate definitions, compared to emotional and concrete words. As for the

conceptual relations elicited by the three types of concepts, emotional and concrete words clearly differed: concrete concepts were more linked to perceptual features and to taxonomic and functional relations, while emotional concepts elicited more emotion, interactive and experiential definitions among all children. As for the relations elicited by abstract and emotional words, the former elicited a higher percentage of free associations, while emotional words yielded a higher percentage of interactional and emotional relations. Despite these differences, abstract and emotional words showed some commonality: they were both affected by the prolonged use of a pacifier, especially compared to concrete words. This could be explained by the fact that abstract words and concepts rely more on linguistic information and simulation, while emotional words seem to involve more interactional and social aspects; in both cases, by the way, the static position of the facial and oral muscles induced by the overuse of a pacifier during social and linguistic interaction, could have played a role, causing a less accurate conceptual structuring. We suggest two different mechanisms that can account for that phenomenon, both stressing the centrality of the mouth effector in the acquisition and elaboration of abstract and emotional language; on the one hand, it is possible that the extensive use of a pacifier might have impeded children for a long time from simulating the word meaning, and consequently from re-enacting the linguistic experience connected to its acquisition, or it might have inhibited the process of re-explaining the meaning through inner talk, both of which are crucial aspects for the acquisition of abstract words. On the other hand, the pacifier could have hindered facial expressions and the social and interactional aspects connected to the development of emotional competence. One could also speculate that the pacifier might play the role of transitional object,²⁰ helping the baby to dissect reality, and to gradually acquire competence in understanding what is in the internal

and what is in the external world. While until age 2 this does not represent a problem, its overuse could somehow interfere with the processes connected to the acquisition of language, if we consider language as the other elected tool that operates distinctions between ourselves and the world, and thus the pacifier might also interfere with the development of social and emotional processes.

Overall, the results of this study suggest that emotional words cannot be assimilated under concrete nor abstract words. Like concrete words, emotional ones yield more accurate definitions than abstract words. Like abstract ones, the conceptual relations they elicit are influenced by the long-term use of a pacifier.

In the second study,²¹ we intended to test whether the influence of the pacifier found in the first study is extended in time. For that reason, we asked 9 year-old children to perform a categorization task. As in the previous study, children who participated had used a pacifier for different periods, on a scale from never to three years or more. Children were requested to decide if the words presented on the screen of the laptop were words that referred to animals or not. In the first case, they had to press the key 1, otherwise they had to press the key 0. Children were divided into two groups, the first performing the task with the “animal” key 1, and the second with the “animal” key 0. Non-animal words were a set of selected abstract, emotional and concrete words; response times and accuracy were recorded, in order to investigate if the overuse of a pacifier has an impact on the processing speed and accuracy of abstract, emotional and concrete words. Results showed that responses to emotional words were faster than those to concrete ones, which also tended to be faster than responses to abstract ones. As for the effect of pacifier, children who had used one until the age of three years (or more) responded more slowly than all the other children to abstract words. The theoretical implications of these results are quite surprising; even if the interaction

between the overuse of an oral device and the acquisition and consolidation of abstract and emotional concepts still needs to be clarified, it seems plausible to assume that the pacifier has an impact on the process of acquiring language. More importantly, this is a long term influence, as demonstrated by the results of our last study.

Overall, our results outline a complex framework, that could be interpreted as follows: abstract concepts, and their related words, are in general more complex to define, and are strictly bounded to linguistic and social information. This is clearly underlined by the results of our first study, which shows how children that have been less in contact with the linguistic environment, due to the overuse of a pacifier, are less accurate in defining abstract concepts. In line with an embodied and grounded perspective on the acquisition and development of language, impairments in accuracy related to the extensive use of the device can be ascribed to decreases in the articulatory movement of the mouth. As for the conceptual features elicited by the words, emotional concepts show a distinct pattern especially if compared to concrete words, but also to abstract ones. They seem to be characterized more by experiential and interactional properties, while concrete words evoke more taxonomic and spatial or functional relations. If combined with the results of the second study, the distinction between abstract and emotional words appears to be even more relevant: in fact, emotional words were shown to be processed faster than all other kinds of words, thus emphasizing the difference between emotional and abstract concepts, with the latter always showing the slowest responses.

Discussion and further directions

Altogether, our results indicate that overall emotional and abstract concepts should be treated as distinct entities, distributed along a *continuum*. The notion of *continuum* is here employed to outline the idea that cate-

gories such as those of abstract, concrete and emotional concepts differ in terms of abstractness level, and is corroborated by empirical findings demonstrating that people perceive some words to be more/less abstract than others.

We have outlined that linguistic experience, combined with sensorimotor experience, is the salient feature for the acquisition of abstract terms in children, and in our findings emotional concepts reveal conceptual properties related to social and interactive experience. Moreover, data on response times indicate faster responses to emotional than concrete words, although the latter usually exhibit faster responses compared to abstract words. This result confirms the idea of a direct activation of all the bodily experience related to emotional terms. In our view, those findings drop a hint for considering emotional concepts as an independent category, with its distinctive traits.

Further research is needed to investigate the bodily grounding of emotional words both from a developmental and from a behavioral perspective. In addition, further studies are needed to determine if and how linguistic and social experiences can ground emotional words, as demonstrated for abstract words. In our studies, emotional terms are characterized by bodily simulations and especially interactive and experiential features. Crucially, however, the words we chose did not refer to complex emotions. It is possible that complex emotional terms like “shame” are processed or acquired differently from basic emotional words like “fear”, and that the role of language in the acquisition of the former is more important than for the acquisition of words referring to basic emotions. This would be in line with the data showing that, the higher is the abstractness level of emotional words, the later they are acquired.

In any case, this explanation would also highlight the necessity to investigate fine-grained distinctions among kinds of concepts, not only in the domain of concrete but also of abstract and emotional concepts.

Notes

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¹⁵ See A.M. BORGHI, C. SCOROLLI, D. CALIGIORE, G. BALDASSARRE, L. TUMMOLINI, *The Embodied Mind Extended: Words as Social Tools*, in: «Frontiers in Psychology», vol. IV, 2013, Art.Nr. 214 - doi: 10.3389/fpsyg.2013.00214.

¹⁶ See C. GRANITO, C. SCOROLLI, A.M. BORGHI, *Naming a Lego World. The Role of Language in the Acquisition of Abstract Concepts*, in: «PLoSOne», vol. X, n. 1, 2015, Art.Nr. e0114615; A.M. BORGHI, E. ZARCONI, *Grounding Abstractness*, cit.; S. TOPO-LINSKI, F. STRACK, *Motormouth: Mere Exposure Depends on Stimulus-Specific Motor Simulations*, in: «Journal of Experimental Psychology: Learning, Memory, and Cognition», vol. XXXV, n. 2, 2009, pp. 423-433.

¹⁷ For a review on the modality of acquisition of abstract and concrete words see L.N. WAUTERS, A.E. TELLINGS, W.H. VAN BON, A.W. VAN HAAFTEN, *Mode of Acquisition of Word Meanings: The Viability of a Theoretical Construct*, in: «Applied Psycholinguistics», vol. XXIV, n. 3, 2005, pp. 385-406.

¹⁸ See P.M. NIEDENTHAL, M. AUGUSTINOVA, M. RYCHLOWSKA, S. DROIT-VOLET, L. ZINNER, A. KNFO, M. BRAUER, *Negative Relations between Pacifier Use and Emotional Competence*, in: «Basic and Applied Social Psychology», vol. XXXIV, n. 5, 2012, pp. 387-394; M. RYCHLOWSKA, S. KORB, M. BRAUER, S. DROIT-VOLET, M. AUGUSTINOVA, L. ZINNER, P. M. NIEDENTHAL, *Pacifiers Disrupt Adults' Responses to Infants' Emotions*, in: «Basic and Applied Social Psychology», vol. XXXVI, n. 4, 2014, pp. 299-308.

¹⁹ L. BARCA, C. MAZZUCA, A.M. BORGHI, *Pacifier Use Modulates Conceptual Relations of Abstract and Emotional Concepts*, Paper presented at AIP Conference, Rome, September 2016.

²⁰ D. WINNICOTT, *Transitional Objects and Transitional Phenomena*, in: D. WINNICOTT, *Playing and Reality*, Basic Books, New York 1971, pp. 1-25.

²¹ L. BARCA, C. MAZZUCA, A.M. BORGHI, *The Influence of Pacifier on Conceptual Acquisition: A Multimodal Approach*, poster presentation at the Conference *Language as a form of Action Conference*, Rome, June 2017.