Gábor Győri:
Categorizing processes, motions and actions: What is basic about basic level verbs?
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Abstract

Basic level categorization relies heavily on perceptual characteristics of objects and such attributes play a crucial role in forming the meanings of basic level nouns and in arranging them in a taxonomic hierarchy. Verbs cannot be described on a perceptual basis in this straightforward manner. However, the characterization of basic level terms as being the first learnt and most used and useful ones in everyday linguistic communication applies not only to nouns but also to verbs. Thus, it is obviously justified to speak not only of basic level nouns but also of basic level verbs. The present paper takes a look at the question how basic level verbs can be identified on the basis of not only linguistic but also cognitive criteria. The question is whether there is a basic level in the categorization of processes, motions and actions at which we recognize particular instances of them and whether such a level is comparable to the basic level in the categorization of objects. Related to this question the paper examines how verbs, if at all, can be arranged into taxonomic hierarchies.
Keywords: categorization, perception, motor cognition, basic level verbs, verbal hyponymy

1 Introduction

In general, categories can be ordered into a taxonomic hierarchy with regard to their inclusiveness. From the bottom up, categories become more and more inclusive in the hierarchy, which also means that categories stand in a super- and subordinating relation to each other, like for instance ANIMAL – DOG – POODLE. In this hierarchy a level has been identified which is the most inclusive level at which a category can be defined on the basis of information about physical characteristics, "objective similarity in shape, and identifiability of averaged shapes" (Rosch 1978: 31). This level has been termed the basic level (Rosch et al. 1976; Rosch 1978). Categorization at this level appears to be the most natural cognitively as it is based on the processing of physical attributes that are the most salient in our perception as we interact with our environment (Archambault et al. 2000; Mohan & Arun 2012). In the above example the category that is at the basic level is the category DOG. If we inspect its superordinate, the category ANIMAL, it appears to be obvious that recognizing entities as belonging to this category and trying to interact with the environment purely on the basis of this knowledge would not be very efficient. Furthermore, it is hardly possible to define a set of perceptual attributes that is characteristic for all entities in the world that can be categorized as ANIMAL. If we take a look at the subordinates of DOG, one of them being the category POODLE, it is rather obvious that the knowledge of the diverse perceptual attributes that

characterize the various breeds of dogs is much less common in a speech community than the knowledge of perceptual characteristics for recognizing dogs as such. Furthermore, the knowledge contained in basic level categories represents the cognitively most efficient and economical way of grouping parts of reality for our everyday physical interaction with the world. Therefore, the terms corresponding to these categories appear to be the most relevant part of the lexicon of a language, since they are the most necessary for communicating about our physical activities in and awareness of our surroundings. Rosch (1978) pointed out that for this reason these are the words that are the most often used by adults to name entities and also the ones that children learn first during language acquisition. She also assumed that in the history of a language these terms emerge prior to terms naming categories higher or lower in the taxonomic hierarchy of objects. From these three implications of the basic level for language, as Rosch (1978: 35) called them, research was primarily done in the area of child language acquisition demonstrating Rosch's claim (e.g. Golinkoff et al. 1995; Pruden et al. 2006; Waxman & Lidz 2006). These findings indirectly verify also the assumption of the two other implications.

Research on categorization has mostly dealt with object categories because perceptual attributes, which are easily studied, characterize primarily physical entities. Categorization – the most basic process of cognition – starts with the processing of sensory information from the environment in the perceptual system, which involves the selective filtering of the incoming information according to how the different parts of reality function in the regular behavior of an organism (Goodson 2003: 116, 263). Due to this primacy of perception in identifying the basic level, Rosch's implications for language concern object categories, i.e., nouns denoting basic level object categories. However, in spite of the fact that basic level categorization has been studied mainly in experiments involving perceptual object categorization tasks based on object naming (e.g. Archambault et al. 2000), as far as the structure of the lexicon of a language is concerned, basic level terms have also been distinguished among verbs just like in the case of nouns (e.g. Verschueren 1981; Lakoff 1987: 270-271; Goossens 1990; Vulchanova & Martinez 2013; Vulchanova et al. 2013). If we start out from Rosch's three implications of the basic level for language and not from the definition of this level based on perceptual attributes, then this distinction appears to be theoretically justified.

If the lexicon of a language contains verbs that can be considered basic level verbs, then it should be possible to unambiguously place them between super- and subordinate levels in a taxonomic hierarchy. In the case of object categorization the basic level is defined independently of language, purely on the basis of how our perceptual system processes the incoming information from our sensory system because "it would hardly be reasonable to suppose that in perception of the world, objects were first categorized either at the most abstract or at the most concrete level possible" (Rosch 1978: 34). This perception based categorical division might be reflected cross-linguistically in different ways due to various conceptual, semantic and cultural factors. The fact that taxonomies often do not completely overlap across languages can only be explained satisfactorily if we strictly distinguish between perceptual basic level categories arising prelinguistically in our perceptual system, and linguistic categories, which are based on the former but heavily influenced by the semantic structure – relying on encyclopedic world knowledge – of the particular language (Győri 2017). However, the super- and subordinate relations in object taxonomies with regard to the basic level are quite unambiguous within one language. In the present paper I will be concerned with how verbs can be placed in a taxonomic hierarchy, what justifies a certain verb to be

considered a basic level verb, and whether in the case of verbs super- and subordination can be defined in terms of class inclusion.

These questions are related to the issue of perception, i.e., whether basic level verbs can be identified on the basis of not only linguistic but also of perceptual criteria because the inclusion relationship must rely on the perceptual characteristics of the basic level, as it in fact does in the case of object categories and the nouns denoting them. In other words, the question is whether there is a basic level in the categorization of processes and motions which is not linguistically defined and at which we recognize particular processes and motions comparable to the basic level in the categorization of objects. This question is important because many authors identify basic level verbs purely on the basis of linguistic criteria, as for instance Vulchanova and Martinez (2013: 150) also do:

> […] it is expected that the lexical items expressing the default settings of each biological motion category will be the most widely used ones when describing scenes belonging to that category. This is why we dub them basic-level lexical items for that category.

However, in the case of object categories perceptual categorization precedes linguistic categorization, which is the natural and necessary state of affairs in cognitive processing because natural categories arise in perception based on sensory experience while we physically interact with the environment. The workings of our perceptual system give rise to the primary "operational definitions of the basic level of abstraction: attributes in common, motor movements in common, objective similarity in shape, and identifiability of averaged shapes" (Rosch 1978: 34). The previously listed linguistic behaviors of words denoting basic level categories are only implications of basic level categorization for language on the basis of which "we would expect" those behaviors (Rosch 1978: 35). They are not the real indicators of the basic level because in themselves they could not account for class inclusion, i.e., super- and subordinate relations between categories. The basic level as the most natural level of categorization derives from our categorizing behavior based on perceiving real world phenomena with regard to their function in our interaction with the environment, and this cannot be separated from the fact that motion perception is a crucial factor in experiencing objects in space and time (Kanai et al. 2007: 944). According to Gallese and Lakoff (2005: 446), "words for basic-level categories tend to be recognisable via gestalt perception". This cannot relate only to object categories because a basic level verb (like *fall* for instance) denotes a category of real physical motion and "motion is [also] perceived as a single, coherent gestalt" (Kanai et al. 2007: 942), which is vital for being capable of proper interaction with the environment.

Based on these considerations my analysis will first focus on the question what those processes and motions might be that could be considered basic level categories based on perceptual characteristics as in the case of basic level objects. Then I will examine whether the characteristics of process and motion categories meet the criteria for being convincingly ranked in a taxonomic hierarchy and whether the verbs denoting them unmistakably exhibit the semantic relation of hyponymy in the lexicon.

2 Perception and the basic level in the case of verbs

The function of perception is to enable us to stay in contact with our environment by analyzing and processing the data supplied by our sensory system during interaction with our surroundings and interpreting these data in terms of categories. Perceiving the world in a categorical way, i.e., recognizing phenomena of the world according to their structural similarities, which determine the functions they serve, is crucial in our interaction with the environment (Harnad 2005). Categorization is not only about entities because our interaction with the environment cannot be based on the perception of the pure existence of objects but also on the way we perceive their motions (Kanai et al. 2007: 937). Interaction involves by definition the processes and motions we or the entities around us undergo or perform and also the effects and influences we and other entities have on each other through these processes and motions. It is self evident therefore that these are just as salient in our perception and cognitive processing as the objects themselves. We recognize processes and motions in terms of their commonalities and similarities, though we do not recognize them in themselves but as 'behaviors' of entities, in other words, they do not exist without entities 'behaving' in particular ways. We perceive them through entities undergoing processes and performing motions, and we categorize them by abstracting their similarities and commonalities from the 'behaviors' of particular entities through generalization, decontextualization and schematization.

Recognizing what is going on around us in the world by means of categories and interacting with our environment in the way directed by the categorical processing of this information in our cognitive system has principally nothing to do with language (Tomasello 1999: 58, 125; Mascalzoni & Regolin 2011: 113). But as social beings it is also crucial for us to communicate about our experiences with reality in the form of categories for the sake of cooperative interaction with our environment. Language is a system that enables us to implement this communication with the help of symbols, which have the function to denote the categories that are important for us to communicate about while operating in the world (Tomasello 1999: 8).

Since the basic level is founded in perception, it is obvious that real physical objects occur at this level in a taxonomic hierarchy, and these are the entities that basic level nouns in language denote. Studies on basic level categorization in connection with verbs focus almost exclusively on action categories and action verbs (e.g. Hemeren 2008; van Dam et al. 2010; Vulchanova & Martinez 2013; Vulchanova et al. 2013). However, one of the most conspicuous differences between basic level nouns and basic level verbs is that the former denote only one type of categories, namely object categories, while the latter do not denote one general type but different types of categories, not only action categories. Based on our sensory experience of physical interaction with the environment we can distinguish processes and motions of entities. But in this interaction it is also crucial that we distinguish two types of motions, mechanical motions of objects and motions performed by animate beings, i.e., biological motion, which we interpret as actions. It is in the taxonomic categorization of our perceptual experiences with processes and these two types of motions in the physical world where we should be able to distinguish a basic level (just as in the categorization of physical entities). Sometimes processes, motions and actions are considered together as events but it may not be correct to regard events as a more general category subsuming the three because "events represent a potentially larger unit of analysis […] that consists of various actions" as parts of and not kinds of events (Hemeren 2008: 13; cf. also Verschueren 1981: 75).

Before turning to basic level verbs themselves, let us take a closer look at the general categories of PROCESS, MOTION and ACTION because the basic level, as the level of natural categorization, hinges on what it is that can be perceived as clues for categorizing phenomena in the world. In the case of object categories the basic level can be identified rather unambiguously on perceptual grounds, i.e., the different object categories share relatively obvious sets of perceptual attributes and shape characteristics on the basis of which objects can be sorted into individual categories (e.g. CHAIR, TREE, CAT, etc.). However, in the case of process, motion and action categories it is not an easy task to define them unambiguously purely in terms of perception, which would be the primary requirement for identifying a level in a taxonomy as the basic one. Since this is the level directly linked to physical interaction with the environment, only perceptible real-world physical processes, motions and actions have the potential to give rise to taxonomies in which natural basic level categories can occur. Before examining possible taxonomies in these domains and what the categories are which occur at the basic level within them, let us take a brief look at the relations between process, motion and action categories.

A process, in the basic physical sense, involves any change of state of an object through time, e.g. the processes of burning, glowing, melting, freezing, boiling, shining, growing, etc. As these categories derive from experience with the physical world, perception (based on information from one or several of the senses) is always involved. Certain processes also entail motion, like for instance the process of boiling (e.g. of water) is accompanied by motion in the form of bubbles of vapor rising to the surface of the water and bringing it in motion. Conversely, motion is a process by nature as it always entails some change of state of an entity. But motion categories are different from process categories due to the perceptual salience of movement, mostly in the form of change in position or location, e.g. roll, slide, fall, bend, break (in the sense of 'come apart'), flow, etc. As already mentioned, motion as such is a general category including both mechanical motion and biological motion (and within that also locomotion). Mechanical motion is for instance the motion of falling (i.e., moving, usually fast, from a more elevated level to a lower one while no control is involved). Thus, motion is not necessarily an action but an action necessarily involves motion (and is thus also a process by nature), namely biological motion with the intention of achieving a goal, as denoted by basic level action verbs like *walk*, *eat*, *hit*, *speak*, etc. As we can see, these very general categorical distinctions are not unambiguous and the categories overlap. In terms of perception process is the most general category, which may involve motion, and motion, if biological, may be an action. Thus, an action necessarily involves motion and is therefore essentially a process, while any kind of motion is a process but not necessarily an action, and a process may or may not involve (perceptible) motion. In our physical experience we recognize and categorize processes, motions and actions separately because this is how they are functional in our interaction with the world. Motor cognition is the capacity which enables human beings (and also other primates) to differentiate between mechanical and biological motion and recognize an action as intentional (Gallese et al. 2009: 104). The basic level in the categorization of processes, motions and actions is determined, among others, by this capacity relying on perception.

Within our general biological-cognitive ability to perceive motion on the basis of visual information about elements of reality changing their position, the capacity for "motor cognition provides both human and nonhuman primates with a direct, prereflexive understanding of biological actions that match their own action repertoire" (Gallese et al. 2009: 103). The detection of the difference in natural categorization between mechanical motion and action

(biological motion) relies on this capacity. However, this capacity is not enough for categorizing them in language at the basic level. Looking at their differences with regard to linguistic categorization, we can find cases where the capacity to recognize biological motion and understanding it as intentional action must be supplemented by encyclopedic world knowledge for properly categorizing a type of motion. For instance, if an object descends through the air without control, it is simply a kind of mechanical motion which fits into the category FALL. But perceptually the same motion can also fit into the action category DIVE, corresponding to the meaning of the word *dive* in the following sense: "(of an aircraft or bird) plunge steeply downwards through the air" (Oxford Dictionaries). Recognizing and understanding the intention and the goal detectable in the motion fitting into the action category DIVE cannot be explained on the basis of perceptual clues and the "neural substrate in brain areas involved in matching action perception and action execution (the mirror neuron system)" (Gallese et al. 2009: 103). In addition to motor cognition, the recognition of the observed motion in question as intentional action, be it a bird or an aircraft, requires the non-linguistic knowledge of the behavior of birds and the workings of aircrafts.

Furthermore, it may not always be easy to recognize the difference between two intentional actions based on very similar motor movements by relying only on our capacity to recognize biological motion as intentional. Linguistic categorization at the basic level often requires invoking encyclopedic world knowledge even in the case of actions for a categorical distinction between two similar intentional motions. For instance, if we compare the basic level action categories KNOCK and HIT, they are clearly different from each other, but it is not easy to define the difference between them unambiguously on purely perceptual grounds because what we can observe in both cases appear to be very much alike. Looking at the meanings denoting the above two categories, we find that *Oxford Dictionaries* defines the verb *knock* as 'strike a surface noisily to attract attention, especially when waiting to be let in through a door' and *hit* as 'bring one's hand or a tool or weapon into contact with (someone or something) quickly and forcefully.' What could be the difference between the two categories, when both involve making a sudden and energetic contact with an object using one's hand or another object held in one's hand? Our understanding of the perceived biological motions helps us recognize both as intentional actions, but that would not be enough for understanding what these actions really are if our capacity of action understanding did not include also the ability to recognize the goals of actions (Gallese et al. 2009: 104–105). This means that knowing the difference when perceiving an action characterizable as 'making a sudden and energetic contact with an object using one's hand or another object held in one's hand' requires the calculation of intention and of the goal of the action from perceptual clues. However, beside the knowledge deriving in this way from motor cognition, taking contextual information into account based on encyclopedic world knowledge appears to be indispensible. Without this knowledge a proper understanding of the goal of the action and thus recognizing it as knocking or hitting cannot be reached in actual cases of intentionally touching an entity with force and with a quick and dynamic movement. Cultural knowledge seems to be especially crucial in the case of the category KNOCK, as suggested by the above dictionary definition of the verb *knock*.

As we have seen above, in the case of many explicitly perceptible real-world physical processes, motions and actions, perceptual information and action understanding alone may not totally suffice to recognize particular types of these categories and we must rely on encyclopedic world knowledge. Looking at actions which are denoted by verbs definitely meeting the linguistic criteria for basic level terms (based on Rosch's implications), we find

that many such verbs very often depend even more heavily on encyclopedic world knowledge and inference based on such knowledge beside the perceptual clues and action understanding. In fact, this latter factor may play a smaller role than the previous one. The verb *say*, for instance, is unquestionably a basic level verb based on the linguistic characteristics for this level. No other verb in Levin's (1993: 209) list of "say verbs" can compete for this status. These verbs are the following: *announce*, *articulate*, *blab*, *blurt*, *claim*, *confess*, *confide*, *convey*, *declare*, *mention*, *note*, *observe*, *proclaim*, *propose*, *recount*, *reiterate*, *relate*, *remark*, *repeat*, *report*, *reveal*, *say*, *state*, *suggest*. It is obvious that a child will hardly start using another verb from this list before learning and using the verb *say*. According to the *OED Online* (s.v. *say*), in present-day English it belongs to the group of words with the highest frequency score, which means more than one thousand occurrences per one million words. Also, the fact that the verb *say* derives from a Proto-Indo European root with the same meaning, namely PIE **sekw*- 'to say, utter' (Mallory & Adams 1997: 536), is a further indication for its basic level status. Thus, the question arises whether the perception of motion and action is enough to identify SAY as a basic level category. Motion is obviously perceived and intention inferred based on motor cognition, therefore it is interpreted as action. Hearing and recognizing human speech sounds is also a perceptual clue, but a person acting in this way may still not be saying anything but only uttering sounds randomly. In order to recognize that such an action is really an instance of the category SAY, we must have various kinds of conceptual knowledge about human behavior, human culture, and probably even about the particular language.

In the above case Gallese et al.'s (2009) motor cognition hypothesis may still be of some help in recognizing that someone's behavior can be fitted into the category SAY, since action understanding also involves the understanding of communicative intention, though not of the intended message (Gallese et al. 2009: 105; Rizzolatti & Sinigaglia 2010: 270). But if we take the verb *ask*, which Goossens (1990) discusses as a basic level verb, and which it definitely is based on the linguistic behavior of the term, it appears to be even more difficult to recognize the category ASK perceptually though still not impossible on the basis of the motor cognition hypothesis, which – combined with the perceptual clue of intonation – may in fact be of help (ignoring the fact now for argument's sake that intonation may not be necessary for the action of asking). However, if we look at the verb *write*, it would be strange to claim that it is not a basic level verb. But is it possible to recognize an action as the category WRITE perceptually and via the understanding of the persons intention based on neural mechanisms (Gallese et al. 2009; Rizzolatti & Sinigaglia 2010)? It is definitely not because the person in question might be making any kind of marks on a surface that are not orthographical signs. We would have to recognize the marks as such signs of one of the many orthographical systems used by mankind, which cannot be handled by the mirror mechanism of the brain. This recognition absolutely requires encyclopedic world knowledge, cultural knowledge, and theoretically also specialized knowledge of the particular writing system. This is of course not to deny the major role of inductive inference in most of such cases and thus the correct assumption of the type of the action (just as in the case of SAY and ASK). However, the action category WRITE can therefore only be a basic level category in the linguistic sense and not as a natural category, which is naturally not to deny the role of perception of biological motion and its understanding as intentional action in its recognition.

Thus, processes, motions and actions cannot be categorized in themselves on a purely perceptual basis in the way objects can, but we possess the neural mechanisms for motion perception and motor cognition for recognizing and differentiating between them, i.e.,

categorizing them. This is crucial in our bodily interaction with the environment. These categories fit the definition of the basic level because they arise in our experience with the physical world during this interaction. This state of affairs suggests the possibility of organizing process, motion and action categories into taxonomic hierarchies, since a basic level presupposes the existence of at least two other levels, one superordinate and one subordinate to it. In the case of object categories this clearly implies class inclusion, which relation between the levels is the criterion for a valid taxonomic hierarchy (Rosch 1978: 30). This, however, does not contradict the fact already noted by Brown (1958: 17) that in the case of non-basic levels "[w]e are even likely to feel that these recategorizations are acts of imagination, whereas the major categorization is a kind of passive recognition of the true character of the referent." Categorizations at the superordinate and subordinate levels often seem to be "acts of imagination" indeed, mostly in the case of human artifacts. The superordinate category FURNITURE is obviously not based on common attributes of its basic level categories but on cultural conventions about what is to be considered as items furnishing a place of dwelling. Items like cushion, rug, vase, telephone, etc., listed as kinds of furniture in Rosch and Mervis's (1975: 579) experiment, are definitely not considered as such by speakers of many other languages. Even for a kitchen chair it is not necessary to have specific perceptual attributes, but class inclusion in its case can simply rest on the idea that it is a chair for use in the kitchen.

In the next section I will examine whether class inclusion works for verbs and whether on this basis they can be placed in taxonomic hierarchies. In connection with this I will also take a look at how verbs considered to be at the basic level cognitively relate to their possible super- and subordinates.

3 Can verbs be arranged into taxonomic hierarchies?

Basic level terms in the lexicon of a language denote natural categories, which arise in our perceptual system via our sensory experience with reality and which are directly necessary for interaction with our environment. Basic level nouns denote categories based on perceptual attributes and shape characteristics or the gestalt structure of objects (Rosch 1978: 34; Gallese & Lakoff 2005: 446). Basic level verbs denote categories of processes and motion also based on sensory information processed by our perceptual system coupled with our capacity of detecting motion and of motor cognition for distinguishing biological motion and recognizing intentional action (Kanai et al. 2007; Gallese et al. 2009). However, we also have the cognitive capacity to form categories not directly based on sensory experience and not directly crucial for basic physical interaction with our environment. These categories are only indirectly related to this experience and interaction by being either more or less inclusive of instances than natural categories are. Thus we get a categorical representation of phenomena in the world on a scale of class inclusion, which means that less inclusive categories inherit the properties of more inclusive ones while adding their own. In other words, we get a taxonomic hierarchy of categories in which there are categories superordinate and subordinate to the level of natural categories.

The super- and subordinate relations between categories in a taxonomic hierarchy based on the downward inheritance of properties resulting in class inclusion is an established fact for object categories, although only in a culture dependent form and not in some kind of objective and true way of categorizing things in the world (cf. Hemeren 2008: 29). Based on this state

of affairs it is generally assumed that such relations also hold for basic level verbs and the categories denoted by them (e.g. Lakoff 1987: 271; Vulchanova et al. 2013: 13). Since these categories emerge on the basis of perceptual experience during basic physical interaction just like categories denoted by basic level nouns, the assumption appears to be justified. Thus, Vulchanova et al. (2013: 13) claim, for instance, the verb *go* to be a superordinate level term, *walk* a basic level one, and *strut* and *stroll* subordinate ones. On the one hand this seems absolutely logical, especially from the point of view of the organization of the lexicon. The verb *go* expresses a very general form of locomotion while *strut* and *stroll* express rather specific ones, and thus *walk* appears to express a relatively neutral form. However, from these verbs it is the verb *go*, which conforms more to implications of basic level categorization for language, e.g. acquired earlier by children and used with a greater frequency, and this is not characteristic for superordinate categories due to their too general scope of meaning (Rosch 1978: 35). Also, if we look at the action category GO, it seems to be the most neutral category with respect to perceiving and experiencing biological motion, in this case locomotion, in our physical interaction with the environment, which defines the basic level in a taxonomy.

It is not surprising, therefore, that there is no consensus as to the existence of a clear taxonomic hierarchy in the case of verbs, be it only in comparison to nouns, or only depending on the types of verbs, or with respect to the identifiability of a basic level (e.g. Rice 1997: 98; Fellbaum 1998: 79; Hemeren 2008: 32, 63; Childers & Tomasello 2006: 325). Fellbaum (1998: 79) and Fellbaum and Miller (1990: 566) explain hyponymy among verbs as not based on "a kind of" relation, which is responsible for hierarchical relations among nouns, but as based on troponymy, a relation of manner, i.e., "a manner of" relation. Although it is true "that the semantic distinction between two verbs is different from the features that distinguish two nouns in a hyponymic relation" (Fellbaum 1998: 79), the basic level in categorization, whether of objects, processes, motions or actions, is not based on and does not derive from the linguistic behavior of terms which we call basic level terms. The basic level status of these terms in language derives from non-linguistic cognitive processes, namely the sensory experience during physical interaction with the environment processed categorically by our perceptual system.

Let us now take a look at verb taxonomies in more detail. Comparing e.g. verbs of ingestion (*ingest, consume, nibble, devour, eat,* etc.), we find that the verb *eat* is the one in the list that is the basic level verb. It is learnt and used earlier by children and is a more useful name (as compared to the others) for the particular activity, i.e., it is used more often in everyday speech and it evolved earlier in the history of English (Eng. *eat* < PIE root **ed*- 'to eat'). Thus, it is absolutely justifiable to claim that *eat* is a basic level verb and EAT is a basic level category. In addition, the category EAT can truly be regarded as the generalization of an action based on perceptual clues in terms of action "understanding […] mediated by the parieto-frontal mirror mechanism" in the brain (Rizzolatti & Sinigaglia 2010: 271). This latter fact implies that EAT is an action category included in a more general category and including at the same time less general categories, which is a characteristic of perceptually based categorization. Figure 1 shows how this state of affairs materializes in hyponymy relations of the verb *eat,* which itself appears at the basic level in the taxonomy.

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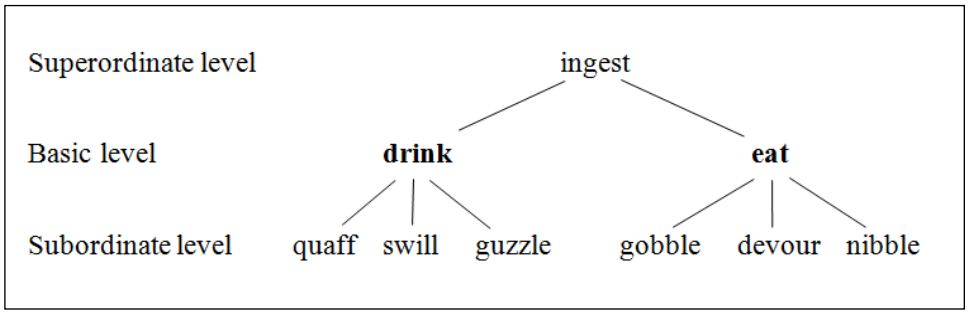

Figure 1. The hyponymy relations of eat *and its place in the taxonomic hierarchy.*

As we can see in Figure 1, the verb *eat* is a co-hyponym of *drink* under their shared hypernym *ingest*, both having their own hyponyms (or subordinates) illustrated here with a few examples. It is a relatively common characteristic of object categories that members of the categories subordinate to the basic level are recognized on the basis of more specific perceptual attributes than the ones of the basic level category, which means that their subcategorization is based on class inclusion. Thus, for example, the category POODLE shows all the perceptual attributes of the DOG category plus some others characteristic only of the POODLE category. In the same vein, the action category EAT exhibits certain perceptual attributes on the basis of which particular actions belong to this category. Its subordinates exhibit these same attributes plus certain specific others, as for example GOBBLE, having the attributes of EAT, which action is accompanied by the attributes 'haste' and 'absence of proper chewing'. These additional attributes appear to be perceptual ones just like the additional attribute 'small bites' in the case of NIBBLE beside the attributes of EAT. In the case of DEVOUR the additional attribute which makes it a subcategory of EAT is a type of behavior characterizable as 'greedy' in a physical sense, which may be understandable via the mirror mechanisms of the brain responsible for the understanding of intention and goal in perceived action (cf. Gallese et al. 2009; Rizzolatti & Sinigaglia 2010).

The attributes listed for the subordinate categories of EAT are taken from the meanings given by *WordNet* for the verbs listed as troponyms of *eat*, i.e., *gobble*, *nibble* and *devour* (among others). As already mentioned, troponymy, as termed by Fellbaum & Miller (1990: 566), is a semantic relation between a verb expressing the manner of an action denoted by a more general verb and the more general verb, and therefore, it is a relation similar to hyponymy in the case of nouns (Miller 1991: 228, 1999: 7). Fellbaum (1998: 79) talks about "verb hyponyms" and Riemer (2010: 275) says that "[t]he verbal equivalent of hyponymy/taxonomy is troponymy". If we subject the hyponymic relations of verbs of ingestion to a semantic entailment test (cf. Fellbaum 1998: 80), a clear taxonomic hierarchy seems to crystallize, which even shows class inclusion. Sentences (1) and (2) prove this relation between the basic level term *eat* and its subordinates *devour* and *nibble*, while sentence (3) proves the same relation between *eat* and its superordinate *ingest* because all three sentences contain true statements and the reasoning in them cannot be turned around.

(1) If someone *devours* something, then the person *eats*.
(2) If someone *nibbles* (something), then the person *eats*.
(3) If someone *eats* (something), then the person *ingests* something.

Although Riemer's (2010: 275) claim of equivalence between hyponymy and troponymy appears to hold in the above description of *eat* as a basic level verb in the taxonomy of verbs of ingestion, verbal hyponymy still seems to have its peculiarities and problematic issues. Staying with the verbs of ingestion, one such issue is that of synonymy. For instance, in the case of *eat* and *drink*, several of their hypernyms and their troponyms/hyponyms listed in WordNet, are also the synonyms of these basic level terms according to Oxford Dictionaries. Thus, we have *consume, devour, ingest, partake of, gobble, gobble down, gobble up, gulp, gulp down, bolt, bolt down, wolf, wolf down, cram down, finish, finish off* as synonyms of *eat*, and *swallow, gulp down, quaff, swill, guzzle, sup, imbibe, partake of, sip, consume, take, drain, toss off* as synonyms of *drink*. Also, for several hyponyms of *eat* and *drink* WordNet gives the same meanings, suggesting that they are exact synonyms. Thus, for instance the hyponyms of *drink*, the verbs *gulp, quaff, swig*, listed as its troponyms, all mean 'to swallow hurriedly or greedily or in one draught', and the hyponyms of *eat*, the verbs *devour, guttle, raven, pig*, i.e., its troponyms, all mean 'eat greedily'.

The above considerations seem to reveal a contradiction, which is that various levels in a taxonomic hierarchy are also coordinated as they stand in synonymic relations to each other. This raises the question how troponymy can be equated with hyponymy if it entails synonymy at the same time. In other words, how can subordination in the case of verbs be explained with troponymy if it also leads to coordination in a taxonomy in the form of synonymy? If we compare this situation with a taxonomic hierarchy of concrete nouns, we find that synonymy and hyponymy are separate relations. While the meaning of *nibble* 'eat intermittently; take small bites of', hyponym of *drink*, i.e., its troponym, can be illustrated with the sentence *She never eats a full meal – she just nibbles* (WordNet), the sentence *I don't have a table – I just have a kitchen table* is logically incorrect because of the taxonomic relation between *table* and *kitchen table*. However, the sentence *I don't have a table – I just have a desk* does not appear to be defective in this way due to the synonymic relation between *table* and *desk*. In the case of nouns super- and subordinate terms cannot be synonymous with the basic level term. *Furniture* as the superordinate of *table* and a term subordinate to it, for instance *dining table*, are not its synonyms. The synonyms of *table* are actually its coordinates, i.e., other basic level terms subordinate to furniture: *bench, counter, desk, stand*, etc. (Oxford Dictionaries).

Newman's (2009: 30) claim that "the concepts of *sit, stand*, and *lie* are good candidates for 'basic level categories'" is absolutely convincing. WordNet gives the following hypernyms and troponyms of *sit, stand, lie*. Starting with *sit*, it is interesting to note that WordNet does not provide a hypernym for this verb but lists the following troponyms of *sit*:

lounge (sit or recline comfortably)
sprawl (sit or lie with one's limbs spread out)
perch, roost, rest (sit, as on a branch)
squat, crouch, scrunch, scrunch up, hunker, hunker down (sit on one's heels)

The hypernym of *stand* given by WordNet is *rest* 'not move; be in a resting position', while its troponyms are:

ramp (stand with arms or forelegs raised, as if menacing)
stand back (stand away from an object or person)
line up, queue up, queue (form a queue, form a line, stand in line)

Just as for *sit*, WordNet does not provide a hypernym for the verb *lie* ('be lying, be prostrate; be in a horizontal position') but lists the following as its troponyms:

sun, sunbathe (expose one's body to the sun)
sprawl (sit or lie with one's limbs spread out)
recumb, repose, recline (lean in a comfortable resting position)
rest (be at rest)
overlie (lie upon; lie on top of)
lie awake (lie without sleeping)
repose (lie when dead)
bask (be exposed)

Taking a close and critical look at the troponyms of these three verbs, we can ascertain that the listed verbs do not express manners in which the actions expressed by *sit, stand* and *lie* can be performed, and can thus not be convincingly claimed to be their hyponyms. It is also interesting to note that the hypernym *rest* given for *stand* is listed as a troponym of both *sit* and *lie*, which in theory should make it strangely also a hypernym of both. For this reason *rest* can obviously not be a hypernym of *sit* and *lie*, which appear not to have a hypernym at all, although all three (*sit*, *stand* and *lie*) are basic posture verbs. Theoretically, the expression *assume a posture* is their conceptual superordinate, but without a lexicalized form, *sit*, *stand* and *lie* do not have a hypernym. Since they do not appear to have troponyms which could function as hyponyms either, we must establish that they cannot be placed in a taxonomic hierarchy in spite of the fact that they are the three archetypal posture verbs.

As can be seen from the lists of troponyms, they often comprise figurative descriptions of the action that the basic level verb denotes. For instance, the troponyms of *eat* are e.g. *wolf, wolf down, slurp, garbage down, gobble up, shovel in*, etc. If troponyms are synonyms at the same time, then it appears that they denote the same category from different aspects, i.e., in the above case *eat* and its troponyms are members of the same category. This can only occur if the category is a prototype category, with *eat* being the most unmarked member. This member is the most central (and thus most typical) in the category. This can be explained by figuration adding markedness to the meanings and pushing the other members more toward the periphery. The prototype effect of the troponymic relation between verbs can be illustrated with the example of the following dialogue:

A: I ate a sandwich.
B: How did you eat it? Did you devour it?
A: No, I just ate it.

Obviously, the basic level action EAT can be carried out without being characterized by any manner of the action, since it represents the most typical way of performing the action. However, in the case of true hyponymy this is not the case, as can be seen in the following dialogue as an example:

A: I have a dog.
B: What kind of a dog? Do you have a poodle?
A: *No, I just have a(n ordinary) dog.

The basic level of object categories appears to be too abstract (as regards their attributes) in many cases to serve as a prototype among its members. Even if the dog in the above example were a mixed breed, it could not be just a 'dog'. In spite of the basic level being perceptually defined for basic physical interaction with the world, its members are characterized by some additional attribute(s) which correspond to actual instances of the category. A member only possessing the attributes of the basic level category does not exist. This appears to be a major difference between true hyponymy of object nouns and verb hyponymy based on troponymic relations.

4 Conclusion

My main aim in the paper was to examine how real the basic level is in the case of verbs. On the one hand, this question relates to the issue of the extent to which basic level verbs derive from non-linguistic categorizations based on perception, and on the other, to the issue of the status of such verbs as basic level categories in a taxonomic hierarchy. In our physical experience and interaction with the environment we form perceptual categories both of real-world objects and processes and motions because without these a functional and adaptive interaction could not ensue. As social beings it is crucial for us to communicate about our experiences with reality for the sake of cooperative interaction with our environment. This communication relies on linguistic symbols denoting these categories, which state of affairs, however, entails that the perceptual basis of the denoted categories is extended with conceptualizations based on encyclopedic world knowledge both in the case of nouns and verbs. In the case of verbs, categories are formed on the basis of motion perception and the recognition of biological motion and goal directed intentional action with the help of motor cognition. Thus, in contrast to basic level object categories, which basic level nouns denote, basic level verbs denote basic level categories of processes, motions and actions. These categories serving as the bases for basic level linguistic categories, i.e., basic level verbs, appear to be supplemented by the mentioned conceptualizations even more than in the case of basic level nouns.

As for the issue of how verbs can be ordered into taxonomic hierarchies, basic level verbs do not seem to be basic with regard to their status in such a hierarchy but more in the sense of deriving from the categorization of physical experience with reality based on motion perception and motor cognition. Many process, motion and action categories do not seem to exhibit a hierarchical structure, and thus the basic level in these general categories does often not have a superordinate and subordinates. If subordinates exist for a basic level verb in the lexicon, then this hyponymic relation is based on troponymy, the relation of manner. However, these troponyms, and mostly also the hypernyms (if such exist), are simultaneously synonyms of the basic level verb. This suggests that they are more likely to be more or less peripheral members of a prototypical category, in which the basic level verb denotes the most prototypical member, than real subordinates to the basic level.

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