

## Is Thinking all Language?

*“the basic biological brain is fantastically empowered by some of its strangest and modest recent creations: words in the air, symbols on the printed page”*  
(Clark 1998, p. 178)

At high school during an English lesson, I was first confronted with the idea that language is something characteristically human. I found that idea stupid because for me any creature appeared to speak a language, not necessarily consisting of sounds, admittedly. I regarded the fact that we are unable to learn the barking of dogs simply as a result of the problem that nobody was able to translate it into our language or teach us how to bark coherently. Maybe this was childish.

But before someone—like the author of our textbook<sup>1</sup>—can draw the conclusion that language is responsible for the capacities of thinking and consciousness she has to give very good reasons.

Whether or not thought is indeed possible without language<sup>2</sup> has been an issue to debate for centuries—and it still is today. My aim is not to solve the problem in just a few pages but to show that language is one possible among other mechanisms that enhances (human) cognitive abilities.

If language is necessary for having thoughts then there can be no thoughts without language. My claim in the first section will be that this is not true: there *is* thought at the non-linguistic level. But what role does language play if it does not make us thinking beings? How linguistic creatures can benefit from using language will be topic of section 2. According to an argument due to José Bermúdez, language might not be

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<sup>1</sup> The title of the text was “The defining characteristics of language”. Unfortunately, I did not find out about the author’s name or the title of the book our teacher copied from.

<sup>2</sup> For the purpose of this essay let us assume language to be a compositional communication system constructing complex symbols out of simple ones; compositionality requires at least one out of two kinds of recombination—either sequential (successive) formation or hierarchical formation using re-iterable operators. In the latter case the meaning of the mere symbols of a sequence does not suffice to encounter the meaning of the entire expression. Note that, however, linguistic activity is based not on icons but on *symbols*, which means that the link between the sign and its meaning has to be absolutely arbitrary, a convention.

necessary for thinking in general, but it is necessary at least for some kind of thought, viz., higher order thought—thinking about thoughts. I agree that public language, our natural language, can have an impact on human thinking—but I do not agree with Bermúdez that language is *needed* for higher order thinking. In section 3, I will present his argument and I will argue that there are other “vehicles of thought”, i.e., ways to store or transport what we are thinking, enabling a creature to consider its thoughts—to think reflexively. Finally, in section 5, I will turn to my own account of language as a cognitive tool. I will be arguing that language is indeed powerful but that it is not irreplaceable.

### 1. Thinking without words?

Let us begin our considerations with a simple everyday example: when I think about the postcard I just received from a friend being on holiday in Austria, I hear myself reading out the sentences he wrote. I can—in a sense—listen to his words, although it is all just going on in my mind.

Experiences like these, where language and thought are going hand in hand, might have led to the common assumption that thought and language are completely intertwined. But what role does language really play in our thoughts and how does it contribute to human cognition in general?

Assuming language functions as a cognitive tool—which is indeed quite a plausible statement as we will see in section 2—we have to consider in how far it improves our cognitive capacities and what kind of thoughts it enables us to have.

In “Magic Words” (1998) Clark elucidates six ways in which using language facilitates human cognition. Bermúdez later argues in his book “Thinking without Words” (2003) that all of these constraints can also be implemented without language. This is effectively no counter-argument since Clark never claimed his six constraints could be fulfilled *exclusively* by language. There might still be other cognitive tools enabling their users to deal with cognitive tasks at least as effectively as linguistic creatures do when applying language.

I will shortly present the six tool-functions here in order to illustrate how linguistic as well as non-linguistic mechanisms can enhance our cognitive abilities:

First, cognition is enhanced by language-driven *memory augmentation*. Linguistically, memory capacities are enlarged just by external storage of data. Think of the memoirs of Robinson Crusoe for instance, the internet or the daily newspapers. On the non-linguistic level, memory augmentation can take the form of imitative learning: children learn how to perform a golf stroke rather by imitating adults than by following their trainer's instructions and great apes learn how to use a tool from observing others working with it.

As a second facilitating function, we can consider *environmental simplification*—structuring our environment and defining equivalence classes enlarges our storage capacities. Linguistically we can find environmental simplification in labels—for example doorplates (entry, lecture hall, office, meeting room, fire exit etc.) or directories (station, museum, city center). On the non-linguistic level, we find traffic lights as well as examples from the animal kingdom: vervet monkeys possess three different alarm calls, one for eagles, a second for snakes and a third for leopards. Every single call is a simple symbol, viz., it cannot—unlike the complex symbols language consists of—be combined hierarchically or sequentially with others, and is thus non-linguistic. Still each call stands for a class of dangers—the appropriate predator—by which the environment is categorized or simplified, as Bermúdez correctly reports. Thus, the first two characteristic functions in which language improves our mental capacities can also be found at the non-linguistic level.

A third way in which we can apply language as a tool is *coordination*. We can interpret this linguistically and think of planning, organizing a meeting and thereby explicitly giving commands, spoken or written ones, to coordinate multiple processes. Non-linguistic resource allocation and communal activity are common instances of coordination found in animals like honey-bees, elephants and birds, for instance. Just think of the highly organized bird migration every autumn or the worker honey bees that stay in the hive while their fellows search for food. These

are all definitely non-linguistic processes but still they serve as a tool the same way linguistic behavior does.

Another feature of language that improves our cognitive abilities is what Clark calls *taming path-dependent learning*. The term describes that we do not necessarily need to go along the whole path of a learning procedure for ourselves, but can also learn from experiences of others or use the findings of other members of our community in order to learn further things and acquire new abilities. Using language, it is easy to preserve ideas and migrate them between individuals, but this is also possible without language. Bermúdez once again uses the example of the honey bees to illustrate this: the members of a hive do not need to seek for food in areas from which their con-specifics already returned empty-handed. They can use the experience of those who found something desirable and just fly into the direction the backs of the others point at during their dances.

The profit they make is as path-independent as the profit pupils in a math-class can make from the Pythagorean theorem—they both did not need to search for a solution to some basic problem themselves. And whether or not language is used for communicating the acquired knowledge does not affect the path-independency.

Further, we can consider *control loops* which function in a facilitating manner for cognition. Linguistically, we can implement a control loop just by externalizing a command, a quick reminder to hand in this essay next Monday or not to forget our meeting with the dentist this afternoon. Control loops are also used to regulate group behavior—and here we can revisit the alarm calls of vervet monkeys. The instructions—the call or the written note—are set outside the mind and remember us of what to do, they control our future behavior when repeated by our fellows or recognized by ourselves. Note that at this point the emphasis is not on *externalizing* memory but on *controlling* future behavior by focusing attention. To elaborate on this, let us consider a girl learning how to plait. Once she got the instructions which yarn to cross to the contralateral side at which time she is rehearsing them over and over to better focus on what she has to do. Thereby the girl *controls* her own behavior. Also in the vervet monkeys the key is to drive the others'

attention to a particular thing or action in the environment, i.e. warn them about the approaching predator. Once again, language is useful but not needed to establish a function facilitating cognition.

Let us finally come to the point of data *manipulation and representation*. In linguistic creatures, I think this point is so obvious that it does not need a single word of explanation, especially as you are reading this text right now (which is, of course, an instance of data representation and which you might manipulate in order to better understand what I am saying). Besides, that something is represented and somehow manipulated could be used as a characterization for thinking in general. An alarm call represents a danger of a certain kind, a scribbled note represents our intention to do so and so. At this point, I completely agree with Bermúdez' statement that we just cannot run into problems at any level of thought, be it non-linguistic or other, by claiming it involves data-representation.

In the course of this first section we have seen that non-linguistic activity can fulfill the same characteristic cognitive augmentations as language is said to bring about. None of the instrumental functions of linguistic processes considered here de facto requires language. There is nothing special about language so far. Memory augmentation, environmental simplification, coordination, taming path-dependent learning, control loops and also data manipulation and representation can all be found at the non-linguistic level as well. If we take the above six constraints to be characterizing thought, we can conclude that thinking is very well possible without language.

## 2. What we gain from language use

But why then do we use language? It cannot just be a medium for information processing. If we contribute a whole partition of our brain to language use, there must be something special about it, otherwise we would have to regard it as a failure of evolution—an inefficient mechanism using so much of our energy consuming cognitive apparatus. In this section, I will try to point to some benefits linguistic creatures can make using language, besides those already presented in the last section.

Are there, perhaps, unique and distinct functions of a linguistic capacity?  
What does speaking a language pay us?

From observations made in language learning children who performed better in cognitive tasks when using self-directed commands, psychologist Lev Vygotsky concluded that language enhances our cognitive problem-solving capacities (see Vygotsky 1986). A good example of such a cognitive task is learning how to make a paper ship. First the child gets instructions by an adult telling which parts of the sheet have to be folded into what directions in which order. Later on, when the child is on her own and has to remember the different parts of the newly learned complex task, she (perhaps internally) repeats the conversation previously had with the instructor during training. Using language to help us understand and focus on what we are doing is something we can not only find in children. Even mathematicians often murmur to themselves when trying to solve difficult problems. Either way, these self-directed linguistic commands are an instance of a control-loop. As such, they can in principle be found at the non-linguistic level as well (as I have outlined in section 1).

Christopher Gauker, a philosopher, developed another view on language functioning as tool: he claims that linguistic behavior is a *cause-effect analysis* (Gauker 1990). The main idea behind this term is that language as a cognitive tool rather serves to effect environmental changes than for representing thoughts. The relations between linguistic utterances and subsequently occurring events are learned during language acquisition. Learning a language is, for Gauker, similar to training a perceptron network. Given a certain signal a certain reaction can be observed—these ‘pairs’ correspond to ‘training patterns’ consisting of input and output values. Using a learning algorithm, weighted connections within the hidden layers of the network are adjusted such that the network can finally predict the effect of a given cause. A competent speaker of a language has learned about these relations between the occurring of an event and its subsequent effects; and he can apply his knowledge to the environment accordingly.

Using a word is—according to Gauker’s view—intended to alter our environment, make it better suited to our intentions. Taking evidence

from Savage-Rumbaugh's chimpanzees<sup>3</sup> and how they learn to use symbols on a lexigram keyboard, he suggests that “language learning in humans might be conceptualized along similar lines” (Gauker 1990, p. 31). Consider for instance Kanzi, who presses a button with a certain (simple) symbol—a lexigram, let us say with the meaning of the word “banana”—in order to obtain a banana. Kanzi does so because he often observed that pressing this one button favors the arrival of a banana, i.e. he has discovered a cause-effect-relation between the pressing of the banana lexigram and obtaining a banana. Our understanding of linguistic expressions is then similar to the ape’s understanding of a symbol on a board, Gauker suggests: we grasp the causal relations by experience and later can apply them in a goal-directed way. Again we find language to be a useful tool with which we can change our environment but—as the lexigrams of the great apes shows—it is not necessary.

Another proponent of the view that language is a cognitive tool is David Rumelhart (Rumelhart et al. 1986). He takes thinking to be a way of internally modeling and manipulating our environment. The form our thoughts take depends on what we imagine ourselves doing. Thus, instructing ourselves how to make a paper ship is identical to imagining instructing somebody of how to make a paper ship. Giving the instructions, internally or externally, we intend environmental changes. Rumelhart takes language to be just one possible format of such representations of our thoughts and describes it as an internalized way of coding originally invented to process information, i.e., for instance, to communicate how to make a paper ship or how to obtain a banana. Because this coding turned out to be perfectly suited for computational processes, we use it also directed at ourselves and thereby enhance our mental capacities: putting a problem into words or writing a

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<sup>3</sup> I guess most readers will know the famous bonobo Kanzi. Born in October 1980, Kanzi grew up accompanying his mother to sessions of language learning through a keyboard of lexigrams. The infant ape did not show much interest in these lessons, but later he could competently use the signs for communication on his own although he was never trained directly. Especially surprising were his abilities to learn words his mother could not be taught. Kanzi also invented new “words” (such as combining “blueberry” and “hand” lexigrams to refer to a blue glove) and was able to understand spoken language sentences and match them to the appropriate lexigrams or actions. Thereby Kanzi has been the first great ape demonstrating the ability to use elements of language.

multiplication task down, we create an environment which we can manipulate in simple steps. The same holds if we just imagine ourselves spelling out the problem—since the representational format is suited for finding a solution quickly, linguistic thinking enhances our mental (problem-solving) capacities.

You might already have recognized the similarity to Vygotsky's theory: in both cases language directed at ourselves enhances our innate cognitive capacities. While Vygotsky was unable to explain his findings, Rumelhart establishes a reason for the cognitive enhancement provided by linguistic activity: it is the representational format which increases our performance in cognitive tasks—similar to an mp3-file which does not need as many resources on your computer as the original wav.

Up to this point we basically got to know two interpretations of the function of language in human thinking and cognition: either language is seen as a cognitive enhancer that works via 'optimization' of the format our thoughts are coded in, or it is considered as something that 'customize' our environment and can be applied to it in order to do so.

Andy Clark suggests, similar to Gauker, Vygotsky and Rumelhart, that language is a tool facilitating human cognition and enhancing the computational power of our brains—but not the only one. As we have seen in the first section, instrumental functions of language can also be fulfilled by non-linguistic mechanisms.

Language, according to Clark, has evolved to transform computational spaces (see Clark 1998). This means it allows us to reshape a highly complex problem into a simpler one. To get the flavor, consider the reformulation of a mathematical function  $f$  into a new function  $f^*$  such that multiplication steps are reduced. Calculating  $f^*(x)$  on a computer is much less time consuming than calculating  $f(x)$  although they both describe the same mapping ( $f: x \rightarrow y$ ,  $f^*: x \rightarrow y$  for all  $x$ ). Calculation of  $y$  is now much more efficient and can easily be performed by a machine that could not handle the function  $f$ . By performing such a kind of transformation, language enables our biological brains to handle problems that would be intractable otherwise, i.e., without using the tool of language. Clark's perspective contradicts

other authors—like Fodor, Dennett and Carruthers—who argue that our thinking takes place *in* a particular language, not *with* language. Thinking *in* a language would require that everything we formulate in public language is already coded internally in a language, a language of thought for example. The nature of our thought would then be entirely linguistic. Thinking *with* a language, on the contrary, requires that we apply language to some of our thoughts—not knowing what their real nature is—giving them the form of linguistic utterances. Language then is a tool for thinking; it can be used to transform our thoughts into another representation better suited for solving a cognitive task or passing on information among individuals.

An account of language as a cognitive tool requires that we put this particular tool to work if we want to benefit from it—just as we nail the picture to the wall *with* a hammer, *viz.*, by using the hammer. With this concept of language use Clark holds that applying language does not alter our biological equipment—contrary to an assumption made earlier by Dennett, Whorf and others—, it rather enables us to better use our given resources. Treating our brain as computational machinery, we can compare language with a plug-in, *viz.*, another algorithm that does not change the hardware but enhances computational performance.

But still, there is nothing extraordinary about language as just one possible tool or plug-in among others. It remains to consider whether we can find something that really requires language and can only be done or brought about by natural language. What might that be?

Bermúdez and Clark both claim that natural language has an important role in undertaking what Clark terms “second order cognitive dynamics”. This expression refers to “a cluster of powerful capacities involving self-evaluation, self-criticism and finely honed remedial responses” (Clark 1998, p. 173)—in other words: thinking about thinking. While Bermúdez argues that *only* language can be used for this venture, Clark does not make such a strong claim. We will take a closer look at his considerations in section 3.

For the moment let us just note that the crucial point lies in the nature of the target thought, *viz.*, the initial thought at which other thoughts will be directed: it has to be stabilized in order to become an

object of further thinking—we must be able to grasp it. Linguistic creatures can employ language for this task of *freezing* their own thoughts. They wrap them into a memorable and considerable format—a natural language sentence—to be able to evaluate their thoughts later on and relate them to other thoughts. But in order to memorize something, photographs or simple signs like the snitch in your tissue might do as well.

What other purposes can language serve? Of course, language is a medium of communication, we can use it to migrate ideas—even the most abstract ones—among individuals of the same language community and—with the help of translations—even further. But data storage and communication do not necessarily have to be linguistic, as we have seen in section 1.

Admittedly, matters turn out to be a little more complicated when we consider communication about abstract terms such like, for example, ‘God’, ‘love’, ‘peace’ or ‘time’. This requires a capacity for thinking about things which cannot be represented by any object or action in front of us—an ability linguists call ‘displaced speech’. It means that we can, e.g., speak (and also think) about Spain although we are not there, have perhaps never been there, and we can speak about an apple although it is not placed in front of us.

Since thinking about something which is not present requires it—this object we want to think about—to be represented in our head, I think it is best to take ‘displaced speech’ as second order thinking. If you think about Spain for example, without having ever been there, your thought is a simple imagination constituted of thoughts of parts of the scene—the veldt, Andalusian horses, the hot sun, a blue sky and so on. In putting all these first-order thoughts together, you already manipulate them, think about them. Thus, it is rather thinking about thoughts than thinking about concrete objects in the real world (at least as long as these are not present). We will see whether or not we need language for higher order thoughts in the following section.

A further benefit from language use could be our abilities to set up and use ‘universe of discourse’. But this characteristic, I think, need not be questioned for any communication system, be it linguistic or not. We

always need a set of terms through which we communicate, this can be words, icons, gestures, or something completely different.

One thing that is plausibly pointed out by Clark is that when we use language as a cognitive tool, it is not necessarily obvious that we are using a tool. When you want to put up a picture on the wall you will need to use a hammer in order to nail the nail into the wall. It is obvious you are using a tool. But when you *think* this is usually not the case. Thinking is not only private and thus relatively invisible; we also use language so naturally, so easily there, that we ourselves do not even recognize it. We—as linguistic creatures—are used to employing language where it makes our thinking easier, we use the tool often but mostly without attending. Our internalized natural language has become a part of us. However, I think it is plausible to assume that using a non-linguistic cognitive tool can remain unnoticed to the users of that tool and their community as well, thus it is not a distinct feature of language that its use remains unnoticed. Neither it is that it becomes part of a person.

Up to now, we have found no good reason to establish language as a cognitive tool that has a distinct property. And I do not see any other claim that would not reduce to one of those already made in this or the previous section. Therefore I can give no explanation for the great number of brain cells involved in language processing at this point. One candidate, however, I did not discuss: Bermúdez' proposal that higher order thought is only possible using natural language. I will now come to that point in section 3.

### 3. Reflexive thinking—for language users only?

From every possible mechanism—or tool—that allows us to think about thoughts we demand that it can efficiently process information, to ourselves as well as to others. This is the crucial point in higher order thinking: to vehicle—or process—our thoughts fixes them and thus further thoughts can be directed at what we think. Only if we can grasp our thinking, we are able to think about it. We have to be conscious of our thoughts—be able to attend to them—in order to apply mental

operations (like criticism, reflection or stabilizing abstraction) to them. The ‘making accessible’ of our thoughts is ‘making it an object’. That is what our tool has to be a tool for.<sup>4</sup>

Moreover, the ability to think about thinking provides us with the ability to better structure our inner and outer world, to consider things through and through and to re-adjust our attitudes and intentions—an ability that is said to be a general marker for intelligent agents. So, perhaps using language makes us what we call ‘intelligent’.

The key for the process of reflexive thinking is to provide ourselves with what we think. To plot that out, Clark nicely draws an analogy between higher order thinking and mangrove forests:

The mangrove grows from a floating seed which establishes itself in the water, rooting in shallow mud flats. The seedling sends complex vertical roots through the surface of the water, [which] soon traps floating soil, weed and debris. After a time, the accumulation of trapped matter forms a small island. As more time passes, the island grows larger and larger. [...] Throughout this process, and despite our prior intuitions, it is the land which is progressively built by the trees. (Clark 1998, p. 173)

Mangroves consists of what they bring about; to make a mangrove forest grow it needs no more than the forest itself (or at least a first seed), without it is impossible. In meta-cognition—or higher order cognitive dynamics—we need a basic kind of cognition, that is simple thought, to cogitate about. And the process of thinking itself is the process that provides us with such an object.

Public language and the inner rehearsal of sentences would, on this model, act like the aerial roots of the Mangrove tree—the words would serve as fixed points capable of attracting and

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<sup>4</sup> Note that the function described here is slightly different from the initially described enhancement of our cognitive abilities. Still, it belongs to the functions by which language improves our cognitive capacities—reflection and abstraction are crucial in many problem solving tasks. Perhaps this more complex feature of cognition is a rather distinct (or human) one.

positioning additional intellectual matter, creating the islands of second-order thought [...].

It is easy to see, in broad outline, how this might come about. For as soon as we formulate a thought in words (or on paper), it becomes an object for both ourselves and for others. As an object, it is the kind of thing we can have thoughts about. In creating the object, we need have no thoughts about thoughts—but once it is there, the opportunity immediately exists to attend to it as an object in its own right. (Clark 1998, p. 174)

Now that we know there must be something that makes our thoughts an object, we know that our thoughts need to have a “vehicle”, they must be transported in some format to the next stage of thinking. The question is what vehicles can we apply? Is there an alternative to natural language? This is exactly the question Bermúdez addresses in the second part of chapter eight in “Thinking without Words”. But before we turn to his considerations, keep in mind that

Andy Clark presents language as an ideal key for the purpose of making thoughts objects of further thinking; but he does at no point exclude that even more powerful mechanisms for thinking and cognition might already exist or enter the game with ongoing evolution. This statement thus goes along with Heil’s suggestion in “Language and Thought” (2008) that all thought is just some kind of imagery. There is nothing special about language as such, linguistic thinking is—in essence—verbal imagery.

Although José Bermúdez claims to be supporting Clark’s position, viz., that language is a cognitive tool among others, it turns out that he has a slightly different view on these issues. For Bermúdez, it must—contrary to Clark and Heil—inevitably be natural language that carries out the function which allows for second order cognitive dynamics. Put briefly, this is because thoughts are, according to Bermúdez, nothing but potential natural language sentences expressing our thoughts (and can be nothing else). His argument goes as follows:

Starting with the assumption that our thoughts are what our thinking is directed at, higher order thoughts are reflexive insofar as they concern lower order thoughts as their objects. This point is unproblematic, I think, because a higher order instance of any entity always concerns a lower order instance of the same entity. By the way, this is compatible with the proposals made by Clark and Heil.

Then Bermúdez claims that target thoughts have to have vehicles, viz., the thoughts we are going to think about have to be “transported” somehow, their content must be made available. This is also an unproblematic claim. We have already seen that we cannot think about something we cannot access—at least not consciously.<sup>5</sup>

With the claim established that we need direct conscious access to our thoughts in order to think about them, Bermúdez reaches the conclusion that the vehicle he is searching for has evidently to be “at the personal level”:<sup>6</sup> observable and conscious to the thinking being.

With this argument he tries to put aside Fodor’s Mentalese as a possible candidate for the vehicle of thought:<sup>7</sup> because the “Language of Thought” is sub-personal (unconscious and unavailable to the thinker), it cannot be the language in which we monitor and regulate our own thoughts, Bermúdez claims. Since subconscious thought shall not be the matter of consideration in this essay, I think that we can continue by just having in mind that Bermúdez takes Mentalese to be inappropriate for second order thought.

At this point, we know that our target thoughts have to take personal level vehicles, i.e., we must be able to access our thoughts if we want to think about them consciously.

But what kind of vehicles can we use for this purpose? Bermúdez proceeds by elimination to finally find public language sentences to be the only reasonable possibility. Let us go through his argument stepwise:

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<sup>5</sup> For the purpose of this essay, let us put unconscious thoughts aside—it would go beyond the scope of my considerations here

<sup>6</sup> Note that Bermúdez claims there are vehicles at the sub-personal level as well. I think it is best to read him like excluding those because they are inaccessible for us—thus not suited for second order cognitive dynamics which involve conscious consideration (as described in the beginning of this section).

<sup>7</sup> According to Fodor’s language of thought hypothesis, what we formulate in public language is already coded internally in the language of thought—Mentalese.

First Bermúdez considers *complex symbols of natural language* as a candidate for being the vehicle of thought.

A thought would be represented, therefore, through its linguistic expression and would appear as a potential object of thought *qua* linguistic entity. (Bermúdez 2003, p. 301)

In this case, thinking about thought would be thinking about the single words we used to formulate it rather than the content of the thought. We would then consider the words describing our thoughts but not the thoughts as such. Let us accept that—after all, you do not consider the wood a box is made of if you want to carry home your groceries.

Second, one could claim that our thoughts are represented through a pictorial model. The vehicle it (our thought) then takes is a spatial representation of the state of affairs we are thinking about. According to Bermúdez, such a pictorial representation needs to be isomorphic to what it represents: it has to show the same basic structure and the relations of the model's elements have to resemble the relation of the objects represented by them. Moreover, the pictorial model has to be built up according to identifiable combinatorial rules such that we can recursively apply them until we arrive at the most basic units the model consists of. Otherwise, Bermúdez states, these models are inappropriate for higher order thought. At this point I do not agree. It seems to me that Bermúdez is already searching for something that resembles language in all its characteristics—a hierarchical structure for instance. In my opinion another vehicle of thought is allowed to show entirely different properties.

But let us see, how he proceeds: we still have severe problems to apply inferential relations (which are highly involved in second order cognitive dynamics) to our pictorial representations, Bermúdez contends: on the one hand we could end up with mental maps—an imagined arrangement of objects—to which we can apply only a restricted set of operations since they are lacking the compositional structure. Bermúdez gains support for this statement by Braddon-Michell and Jackson:

[T]here is no preferred way of dividing the map into basic representational units. There are many jigsaw puzzles you might make out of the map, but no one would have a claim to have pieces that were all and only the most basic units. (Braddon-Mitchell and Jackson, 1996, 180).

The problem with mental maps is that their meanings cannot be specified recursively in terms of the meanings of their parts, because the basic building blocks cannot be identified. Therefore, we cannot apply all those kinds of inferential relations between mental maps we need in undertaking second order cognitive dynamics.

On the other hand—in considering mental models—we just get a model of possible inferences instead of a vehicle of thought: mental models are intended to resemble a kind of mental logic and are in themselves restricted to the syntactic level. Using these we can draw any kind of inferences between any kind of encoded propositions. But without having access to the propositions under consideration, our mental models remain an empty formula, no more than a skeleton of rules in a logical calculus without any atomic propositions specified.

All in all, Bermúdez argues that we are unable to use pictorial representations as vehicles of thought. Thus, after excluding the possibilities sketched above, he claims that *only* public language sentences are left to function as vehicle of thought. They are the vehicles we need to employ for being able to think about thoughts. Publicly observable natural language is the only matter suited for second order cognition, Bermúdez assures. Evidence can be drawn from introspection—cases like the postcard for instance support the claim that we use natural language sentences when we think about thoughts.

However, I disagree for two main reasons.

First, siding with Clark again, I have to add that using language alters our experience of what we think. That I introspect myself thinking linguistically, when reading a postcard is rather due to the ease of use of our language tool than to lacking alternatives. We are used to apply

language in everyday life and what we experience there has a strong impact on what we imagine and think.

The effect might be illustrated by the phenomenon of Achromatopsia: Oliver Sucks reports the case of a painter who lost his color-vision as a result of an accident (Sucks 1988). The man reports that color is completely gone from his life; from his experiences as well as from his dreams, memories and thoughts. Even his own canvases are completely divorced from color by now. But his cognitive skills as such are unaffected. It is only that he is no longer able to recall or imagine a specific feature, a quality, in his thoughts, i.e. color. The reason why he can no longer think of the colors he once perceived is that the man lacks the capacity to experience this feature in general. His altered experience affects the painter's mental life.

Analogously, the reason why we observe our thoughts taking an utterance-like linguistic form is that we do experience natural language utterances in our environment—we use this additional feature in thinking because it resembles best our real world perceptions.

Other evidence for the claim that language alters how we experience our thoughts can be found in people migrating to a foreign country. Two years ago, a friend of mine went to Australia. Talking to me, he describes how weird it felt for him to hear—in his memories of early childhood—even his grandparents talking to him in English (although they cannot speak English at all). Once returned to Germany, he reports, that it seems to him as if he had been talking German all the time in Australia, since all his memories of Australian conversations appear to be as German as those of real German conversations. The language my friend is using throughout daily life seems to determine in what language he memorizes, thinks and dreams at a given time.

From this small excursion, we can conclude that language indeed has an impact on our thinking. At least to a certain extent it “shapes the way we think, and determines what we can think about.” (Whorf 1956, see Carroll 1962). But this is not only true for language. Anything we experience—also color-vision as we have learned from the case of the colorblind painter—influences our way of thinking and alters how we perceive our thoughts.

Therefore, that we introspect ourselves thinking linguistically when we think about a letter or a postcard can be explained by the fact that we are used to apply language in such considerations. But it does at no point exclude that there are other ways in which our thoughts could be shaped, viz., there can still be other vehicles of thought allowing even for higher order thought. Although it is a common paradigm that thinking, and especially thinking about thoughts is nothing over and above an “inner monologue”,<sup>8</sup> there is no evidence that inner speech is required to provide us with our thoughts.

The bare fact that we sometimes introspect our thoughts taking a linguistic shape is not sufficient to hold that we can *only* use language in these cases. It rather indicates that we are confronted with our thoughts similar to how we (would) experience corresponding real life situations, i.e. what we would like to say in a conversation or write down in a letter.

This favors Clark’s idea of experiences shaping our thoughts; and it is not in contradiction with his account of language as a cognitive tool, in so far as Clark never claims that language has any properties other cognitive tools—imagery for example—could not have. It is only that we are ‘trained’ to convey our thoughts using linguistic utterances, because it seems so trivial to us. Images are not that easily passed on from one participant of a conversation to the next—but admittedly we sometimes also have severe difficulties in expressing our thoughts verbally. Steven Pinker puts this point clearly:

We have all had the experience of uttering or writing a sentence, then stopping and realizing that it wasn’t exactly what we meant to say. To have that feeling, there has to be a *what we meant to say* that is different from what we said. Sometimes it isn't easy to find any words that properly convey a thought. (Pinker 1994, p.57)

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<sup>8</sup> Remember the case of the child, who learns to make a paper ship: the self-directed linguistic commands that enhance her performance in this task are some kind of “inner monologue”. But still, a deaf child can be taught how to make a paper ship by just demonstrating. And this child might internally recall the moves of the instructor (using imagery) rather than linguistic commands in order to improve her performance.

Although language has some shortcomings, it might still be a good medium to transport our thoughts. I guess no language user would ever claim it is completely useless. It is an appropriate tool for higher order thought, but there may be others as well—evidence from introspection is not a valid method to support the claim that higher order thinking presupposes a linguistic capacity.

Admittedly, Bermúdez' argument is not 'based' on the assumption that we know introspectively that we can only use natural language in second order thought. But it is implicit in his reasoning: he argues that "we do not have an understanding of how images can be inferentially connected to each other" (Bermúdez 2003, p. 303) and concludes from this that pictorial representations cannot serve for the same tasks as languages does. Even if I were to agree completely with all his other arguments, I do not see why *our momentary inability* to imagine how we could replace language by pictorial representations fully applicable the way we appear to use language—in a reflexive way—should in general abandon them from the field of higher order cognitive dynamics. It is insufficient to provide the basis for an argument stating 'I cannot imagine how it works'—this is no better than expecting the full score for an empty sheet in a dictation because you did not know how to write with a pen. Not to know how something can be put to work—be it a pen or a pictorial model—does not imply it cannot be put to work at all.

I agree that we—as linguistic creatures—often use language in first order thinking as well as in thinking about thoughts. And, no doubt, it is helpful to apply a linguistic reformulation to some problems in order to quickly find a solution—comparable to writing down a multiplication task. But I can see no way to ensure there is nothing else we can employ to resemble the functions of language, especially not if we consider all species on earth (and maybe even extraterrestrials).

Why should language and only language equip us with certain additional mental capacities? Evolution has brought about several kinds of visual systems and found multiple ways to build a skeleton<sup>9</sup>. So why should

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<sup>9</sup> Compare the chitin exoskeleton of insects to a bone endoskeleton of vertebrates and further consider the hollow bones of birds as compared to massive mammal

language of all things be irreplaceable? Perhaps it is just our own pride that drives us to consider our seemingly “unique human ability to speak” (Weingart 1997, p. 153) to be so important.

#### 4. Where we end up

In the last section we have found that the intuitively plausible candidate for bringing about the capacity of higher order thought, viz., public language, lacks evidence for its uniqueness. Bermúdez’ procedure by elimination does not succeed. There is no way to claim that language is the only tool enabling a creature to think about thoughts.

Still, although it has its shortcomings, language is a powerful mechanism facilitating our cognitive performance. It is an efficient way for encoding information very well suited for communication and knowledge preservation. Therefore, the evolutionary profit justifies the high energy costs for separate language areas in our brains. Yet, it will not be surprising to find all functions public language serves for realized by different mechanisms in other beings.

So far, I have shown that Bermúdez’ argument that language is the only cognitive tool allowing us to think reflexively, viz., perform higher order thinking, is not valid. Even if he was still right—if language was indeed an irreplaceable prerequisite for second order thought—we are facing severe difficulties. What about pre-linguistic infants, deaf-born and patients with aphasia? They would all lack the capacity to consider their thoughts! I assume this is highly implausible.

We might need to fulfill some preconditions in our cognitive architecture to be able to think about thoughts. And human beings, I suggest, are somehow even ‘biased’ for language use. Perhaps humans, or linguistic creatures in general, got a genetic pre-installation of a basic linguistic capacity, an instinct as Steven Pinker would call it. Recent studies in humans and songbirds revealed a possible “monogenetic locus of speech

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bones. All of these architectures are entirely different but they serve the same function, viz., they support and protect inner organs.

and language” (White et al. 2006, p. 4)—the so called FOXP2 gene has been identified as the part of our genome responsible for the ability to acquire a language “without being specific to the brain or to our own species” (Marcus 2003, p. 257). This ‘speech-gene’ turned out to be a promising candidate to further investigate the ‘innateness’ or ‘genetic hardwiring’ of a certain basic linguistic capacity—a hot debate is going on.

Whether the large amount of neurons contributed to language processing in the energy consuming human brain really develops due to the activation of a single gene, shall not concern us here. Specialized brain areas—and perhaps a distinct part of our genome coding its development—nevertheless require an explanation, in particular because I am trying to show that there is *not* something special or unique about language. That using language brought about several evolutionary advantages in functioning as a cognitive tool (recall the Clark’s six constraints we considered in section 1) provides at least a plausible reason. No doubt, language is a powerful tool which most humans do heavily use.

But perhaps other beings are ‘prewired’ to use other tools for cognition. They perhaps simply got a different gene coding the development of a brain area specialized for building and manipulating images or mental maps.

No matter what our pre-installation, our genetic equipment, will be, it does not mean that we (or other creatures) cannot develop another ‘plug-in’, a different cognitive tool with the same—or even better—computational functions—compared to those linguistic behavior provides—if it (language) does not work for them. Innate capacities could thereby be replaced. Indeed, the basic biological equipment is adjusted to the use we make of it. Brain areas responsible for frequently performed tasks appear to grow larger than others while the contrary is the case for brain areas we put to use rather seldom. As an example might serve the enlarged hippocampus of London taxi drivers found in a study by Maguire et al. (2000). The drivers’ extraordinary orientation skills correlate with the size of the respective brain area, the posterior hippocampus.

A similar effect can be observed with respect to language areas. Researchers at Dartmouth College found that “bilinguals appear to engage more of the neural landscape available for language processing than monolinguals” (Knapp 2006). More concretely, they identified the right hemispheric Broca-area and the right dorsolateral prefrontal cortex being highly activated during bilingual processing. They are the right equivalents of those parts of the left hemisphere activated during monolingual processing. In monolinguals, no such right hemispheric activation patterns could be observed, even not when they were processing their mother tongue and a foreign language simultaneously.

Both examples clearly show that the structure of our cognitive architecture, our brain, is determined by what we use it for; and the tools, or representational mechanisms, implemented in it depend on the tasks we face.

The case of finding the appropriate tool is similar to choosing a programming language on a computer. If you want to solve a constraint satisfaction problem or built a sentence parser for a given grammar you might choose Prolog to be the code suited best. On the contrary, if you want to implement a poker game with a graphic user interface, multiple players and nice animations, you should rather choose C++ or Java. Additionally, you should take into account in which language you are able to write a program or in which one you are best. We always have to consider the task and the tools available to us before we can decide which one to use. Note that even a tool that does not promise the very best performance on a given task might be—if you can competently handle it—the better choice in comparison to a perfect tool you are unable to use. Despite its restrictions, the weaker tool will allow you to find at least some *rather good* solution.

In human thinking and cognition, language turned out to be quite a good choice—otherwise we could presumably not use it the way we do. It obviously serves some purpose and we often apply it to enhance our cognitive performance. Nevertheless, there are other possibilities, other ways to think about thoughts, also such that they do not show any deficits when being compared to language (We will see an example later in this section).

A general problem in considering thought—including higher order thought—is that we cannot look into other people's head. We cannot judge what thinking and thinking about thoughts is like for them, especially not if they lack what appears to us as the most basic feature in (higher order) thinking, i.e. language. What vehicle would the thoughts of a deaf take, who thinks about the postcard from Austria?

However, we need not only consider people *lacking a quality of mental representation*, we can also consider those who have additional abilities—Synesthesians for instance. In the most common form of synesthesia, people see colors whenever they hear a sound: a simple word becomes a colorful image to them. Perhaps they have evolved further and are now capable of applying a genuinely new tool to given cognitive tasks? They could be able to communicate images, at least to a part<sup>10</sup>.

The suggestion made by Bermúdez that we are *in general* unable to use images in complex mental operations like inferencing, does not seem plausible to me. It might be the case that we—as linguistic creatures—can more easily use natural language sentences (possibly due to our genetic wiring), but that does not mean we can never use anything else. Using language is like a habit or skill. We apply it similar to other abilities and try to achieve the best payoff by doing so—if you are very good in playing football you will probably try to make your living with that, but you do not need to be a good football player to find a job you get paid for.

As an illustration of how humans can think without linguistic entities, I invite you to participate in a little thought experiment:

Just imagine what you did on Sunday morning.

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<sup>10</sup> in fact we need not be a synesthesian to hand a picture around, we could also draw the scene in front of our inner eye to a paper—but this appears to be rather unhandy

If you cannot think of anything, let me give you a cue: Perhaps it was rainy, you were out in the street, your wellies on, walking home from the bakery. In your right hand you carried a bag of rolls, in your left the leash and Boris was walking next to you on the pavement. You might have been longing for the hot coffee ready in the kitchen at home.

What do you introspect thinking this through, thinking about Sunday morning? If you are like me, you do not see (neither hear) any sentences, words or letters. Note that this case is different from the postcard I presented in the very beginning. The crucial point is that here you are asked to imagine a scene; you do not read a message<sup>11</sup>. If you have difficulties not “hearing my voice” reading the lines above, just remember something else, your last holidays for instance. This, I am sure, is not going to appear to you in form of text or voice (at least not exclusively, some acoustic memory might be involved)—but still, you think. And I contend you can also think about that scene in a second order thought<sup>12</sup>.

I would even go further and say your imagination *is* already a second order thought: the scene you observe in your head is a ‘displaced’ one. It is similar to the Andalusian horses in the Spanish veldt mentioned in section 2. The parts of the scene you imagine are not present. You have to invent them by a process of thinking and further have to manipulate these first order thoughts to make them fit together. This, in a way, also applies to memories: each time we recall something our memory is adjusted to current knowledge, gaps are filled, contradictions to other information are resolved, non-essential aspects are lost over time—memory is not stable (see Goldstein 2005).

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<sup>11</sup> Of course this is not to say you *cannot* imagine what is written on the friend’s postcard from Austria in front of your inner eye. You can, of course imagine him doing what he is writing about. But then you lose the linguistic character of the message, i.e. you no longer attend to the sentences you read as a “listener”—hearing his voice or your own, which is, I think, the most usual form to think about it. Possibly, your thought might even “switch” between two modes described. This supports my claim that language—in thinking and in general—is not irreplaceable.

<sup>12</sup> Simply imagine that you turn around or walk some steps. In doing so you already reflect and evaluate your thought to a certain extent, which that means you are thinking about it.

Now that we have demonstrated how a simple case of higher order thinking is possible using imagery, I think it is reasonable—since a complex thought is composed of simple ones—to assume that we can, in general, use much more complex pictorial representations of our thoughts to vehicle them and that we can direct higher order thoughts at them, too.

Along the line with Clark, I suggest that language is not the only tool making our thoughts stable and transferable. I agree that language seems to us to be perfectly suited for thinking about thoughts, but no doubt other media can be applied as well. What we need is an accessible kind of representation, be it an image, a sound or even a feeling. For every job we should use the most appropriate tool available to us.

Language perhaps is the tool suited best for thinking in the same way a hammer is the best tool you can choose if you want to nail a picture to the wall. But even if it seems unusual to people possessing a hammer, a man who does not have access to a hammer might use the back of a screwdriver to make the nail stick to the wall. Once in a while he might even have better chances to put up the picture compared to somebody who only has a hammer: if he first has to fix clamps with little screws on the back of a wooden frame before he can put the picture up on the nail, the screwdriver will be advantageous.

All in all, the decision which vehicles to employ highly depends on the individual circumstances of the thinker—on the tools he is able and familiar to use—as well as on the preferences of that person, viz., if she rather likes imagined formulas and sentences or schematic drawings and colorful scenes.

Language is not magic. It is one tool among others that fantastically empowers our biological brain. Not more.

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