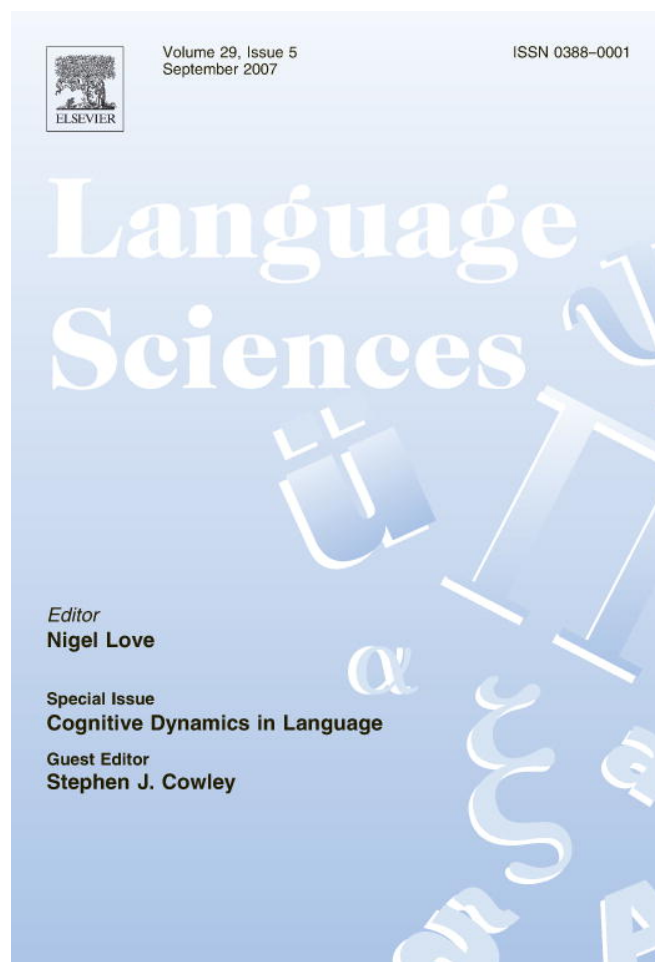


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Writing as thinking

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Abstract

In this paper I aim to show that the creation and manipulation of written vehicles is part of our cognitive processing and, therefore, that writing transforms our cognitive abilities. I do this from the perspective of cognitive integration: completing a complex cognitive, or mental, task is enabled by a co-ordinated interaction between neural processes, bodily processes and manipulating written sentences. In section one I introduce Harris' criticisms of ways in which writing has been said to restructure thought (Goody 1968; McLuhan 1962, 1964; Ong 1982). This will give us a preliminary idea about possible pitfalls for a cognitive integrationist account. The second section outlines, firstly, how *integrated cognitive systems* function. Secondly, the model is applied to a hybrid mental act where writing allows us to complete complex cognitive tasks. The final section outlines the sense in which, following Harris, there is "a more realistic picture of how writing restructures thought" [Harris, R., 1989. How does writing restructure thought? *Language and Communication* 9 (2/3) 99–106] that is concealed by the 'romantic fantasies' of theorists such as the above. This picture is one of writing providing an autoglottic space in which a new form of theoretical thinking becomes prevalent. The cognitive integrationist understands this in terms of the nature of the written vehicles and how we manipulate them.

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1. Introduction

For the integrational linguist, writing provides a new way of thinking about language. The development of representations and scripts leads to conceptualizations where

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languages become systems that determine how people arrange word-forms. Utterances, whether spoken or written, are seen as the product of coding (see, Love, this issue). From the perspective of the cognitive integrationist,¹ by contrast, the focus is placed on how writing changes the way that individuals think and act. Instead of asking how training with scripts changes *thinking* about language, we address a more concrete issue: “how does this innovation make possible or foster forms of thought which were previously difficult or impossible?” (Harris, 1989, p. 103)

In answering this question, the cognitive integrationist pays particular attention to what we *do* with vehicles such as written sentences and mathematical formulae.² Firstly, these vehicles are meaningful³ in that they are created and manipulated by an agent for some purpose (or purposes). Secondly, the vehicle is created and manipulated by an agent as a bodily act. Thirdly, we need to understand what it is about the nature of these vehicles that allows us to do cognitive things in a novel way. Thus, we need to understand writing as an active process – the creation and manipulation of written vehicles, in conjunction with an understanding of the nature of the writing-systems themselves.

The thesis that writing is *thinking in action* is to be understood in the following way: an act of writing is supported by neural enabling processes as well as manipulations of the bodily external environment. We create and manipulate words and sentences in conjunction with relevant bodily and neural functions. Where our trains of thought, arguments, solutions to problems, or storing of the results of these cognitive and mental acts involve writing, some of the enabling processes are external. Creating and manipulating written sentences are not merely outputs from neural processes but, just as crucially, they shape the cycle of processing that constitutes a mental act. Completing a complex cognitive, or mental, task is enabled by a co-ordinated interaction between neural processes, bodily processes and manipulating written sentences.

Consequently, there are two complementary senses in which writing is thinking, firstly there is the sense in which the act of writing is itself a process of thinking. Secondly there are the enduring products of this process – the vehicles of thought – written sentences. These vehicles are manipulated in a variety of ways and these manipulations are further examples of thinking in action.

In what follows, the cognitive abilities to write and manipulate written vehicles are explained in terms of a *cognitive integration* between neural, bodily and manipulative processes. It follows that cognitive abilities are neither solely, or essentially, neural. This view is opposed to that of internalist cognitive science where it is supposed that cognition can be defined in terms of manipulating internal neural symbols.

Harris (1989, 2000) has provided a clear and influential critique of how writing might facilitate a new kind of thought. In adopting the perspective of *integrational linguistics*, he challenges a ‘romantic’ tendency in accounts of the origin of writing. This enables him to debunk the view that writing is essentially western or that literacy improves our memory

¹ Cognitive integrationists explain cognitive abilities as the co-ordination of neural, bodily and environmental processes. It rejects neural internalism and is rooted in the work of Merleau-Ponty, Wittgenstein, Clark and Gallagher.

² I shall use script to refer to a writing system and vehicle to refer to the linguistic product of writing – such as a shopping list or an essay.

³ We might also say contentful, or representational. Sometimes I will speak of a vehicle, such as a sentence, which has content, or meaning.

capacities. I do not take issue with Harris's claim that some accounts of the origin of writing are skewed in favour of a western conception of writing. Rather, I aim to show that the creation and manipulation of written vehicles is part of our cognitive processing and, therefore, that writing transforms our cognitive abilities.

In section one I introduce Harris' criticisms of ways in which writing has been said to restructure thought (Goody, 1968; McLuhan, 1964; Ong, 1982). This will give us a preliminary idea about possible pitfalls for a cognitive integrationist account. The second section outlines, firstly, how *integrated cognitive systems* function. Secondly, the model is applied to a hybrid mental act where writing allows us to complete complex cognitive tasks. The final section outlines the sense in which, following Harris, there is "a more realistic picture of how writing restructures thought" (Harris, 1989, p. 102) that is concealed by the 'romantic fantasies' of theorists such as the above. This picture is one of writing providing an autoglottic space in which a new form of theoretical thinking becomes prevalent. The cognitive integrationist understands this in terms of the nature of the written vehicles and how we manipulate them, giving us an understanding of the cognitive function of writing.

2. How does writing restructure thought?

In "How does writing restructure thought?" Harris aims to overthrow two pernicious ways of thinking about writing. The first is to regard writing "as a mere substitute for speech,⁴ or as a useful way of preserving and transmitting knowledge... [rather than] as an active and powerful cultural agency in its own right" (1989, 1999). In putting forward this view, he has in mind the work of researchers such as Ong (1982), Goody (1968) and McLuhan (1962, 1964) who, he argues, mistakenly suppose that literacy provides "a new mentality" (1989, 99). For Harris, there are two bones of contention. First, the West has an overly 'romanticized' account of the origins of writing. Second, Harris doubts that "the mental difference between literacy and non-literacy has to do with memory" (Harris, 1989, p. 102). While having no objection to the first view, what follows addresses this second bone of contention. There is a sense in which Harris is correct, this cannot be the only difference, but cognitive integration leads us to view working memory as hybrid:

"Instead, it [working memory] must be viewed as essentially hybrid, made up of two distinct components. In particular, the processes involved in working memory must be viewed as made up of both biological processes and processes of external manipulation of relevant information-bearing structures in the environment" (Rowlands, 1999, p. 147).

"Remembering, on this view, involves exploiting internal, bodily, and environmental resources in order to produce some sort of action, often social in nature" (Wilson, 2004, p. 191).

This fits nicely with the definition of working memory as part of, "an integrated system for holding and manipulating information during the performance of complex cognitive tasks" (Baddeley, 2000, p. 78): it is precisely because internal and external components

⁴ This is the issue that Harris takes up in detail in *Rethinking Writing* (2000).

are integrated that they allow information to be available for the completion of cognitive tasks. It follows that processing the contents of working memory is, in part, constituted by acts involving the external manipulation of written sentences and words. This is one of the ways in which writing transforms our cognitive abilities.

The development of scripts and other representational systems and their cognitive functions⁵ lead us to the hybrid conception of memory and other cognitive abilities. The cognitive integrationist holds to the hybrid view because the manipulation of external vehicles enables us to complete cognitive tasks that would otherwise be difficult or impossible. We could take an entirely internalist perspective on cognition, in which case we must account for the existence of scripts and other representational systems and their cognitive functions. Simply viewing them as the output of internal processes does not account for the complex and subtle functions which they can have. What, then, is it about representational systems that transforms and extends our cognitive abilities? Let us start by thinking about their sheer variety:

“Algebras, alphabets, animations, architectural drawings, choreographic notations, computer interfaces, computer programming languages, computer models and simulations, diagrams, flow chart graphs, ideograms, knitting patterns, knowledge-representation formalisms, logical formalisms, maps, mathematical formalisms, mechanical models, musical notations, numeral systems, phonetic scripts, punctuation systems, tables and so on” (Peterson, 1996, p. 7).

We have developed these relevant scripts, representational, notational and graphic systems to cover a wide range of human interests and purposes. They encapsulate our knowledge of many domains and we manipulate them to complete many cognitive and mental tasks, from the mundane to the extraordinary. We learn established methods of manipulating vehicles to produce an end, such as, how to solve problems, how to make plans, how to make lists and use diaries, and how to navigate via maps and so on. It is striking that, in all these cases our thinking is an activity or practice. The effectiveness of our abilities to complete cognitive tasks depends to a great extent on the forms of representation we use and the methods we have for manipulating them (Peterson, 1996). The variety of forms of representation is a result of the variety of tasks to which we put them (Peterson, 1996)

- To draw inferences from the form of representation.
- To explore and develop an idea.
- To land an aeroplane.
- To determine a transport schedule.
- To transcribe or re-arrange a piece of music.
- To develop a scientific theory with predictive properties.
- Incrementally ticking off items on a shopping list.
- Circuit diagrams developed by an engineer.
- A physicist's equations.
- The architect's sketch on a sketchpad.

Forms of representation may exist ‘outside the head’, but they are, as Peterson puts it, “intra-cognitive” they are part of our cognitive system: “these are external components of

⁵ Scripts can have functions other than cognitive ones of course.

a cognitive system with which the internal components interact during a dynamic and task-oriented process of development” (Peterson, 1996, p. 8). Removing the external forms of representation would result in the shrinkage of our cognitive systems and knowledge. Undoubtedly, our cognitive capacities for completing cognitive tasks would be severely curtailed.

Take, for example, Beck’s classic map of the London underground railway system. Beck’s map is not an accurate model of the physical layout of the London Underground but, rather, a useful device for navigating it. The map is tailored to a particular purpose, the navigation of the tube system. As a veridical representation of the layout of the tube system, the map would represent a failure. For example, the map does not accurately represent the distances between stations. However, this level of accuracy would have made Beck’s map less perspicuous and less suited to the navigational purpose for which it was designed. Therefore, the relevant vehicles are developed for the completion of specific tasks.

The psychologist Merlin Donald has provided an intriguing account of how systems of representation, especially scripts, and cognitive processes might have co-evolved. Donald (1991) argues that human cognition has evolved across a series of three distinct transitions, each bringing with it its own cognitive benefits. Cognitive evolution began with episodic cognition – similar to that possessed by apes – then moved to mimetic cognition – action based and gestural – to mythic cognition – the advent of human speech – and finally theoretical cognition – involving the evolution of scripts, notational systems of mathematics and other forms of representation. The three transitions of cognitive evolution are said to have led to changes in the structure of the brain and new communicative and cognitive capacities.

According to Donald, the invention of writing allows the external storage of ‘symbolically represented information’.⁶ This information now becomes susceptible to analysis, transformation, and intellectual criticism, in a way that it is not when stored biologically (as neural memories).

Human memory is no longer restricted by the boundaries of the body, but is now extended by external memory systems. New cognitive abilities become prevalent. In a mimetic and oral culture rote memorization is important, this is less important in a theoretical culture where techniques for retrieving and using information stored in external form become dominant. Holding complex forms of information in working memory is now possible by the hybridization of the working memory space, as constituted, in part, by the external memory field. Donald points to the properties of external vehicles, what he calls exograms, they last longer than engrams (neural memories), have greater capacity, are more easily transmissible across media and context, and can be retrieved and manipulated by a greater variety of means (1991, 315-6). The main point of the transition from engrams to exograms is not greater storage however, which Harris doubts is a genuine cognitive change, it is that exograms can be acted upon in ways that engrams cannot and it is the novel way in which exograms can be manipulated that gives us new cognitive abilities.

The crucial evolutionary movement is from mimetic behaviour to the invention of representational systems. The first important step is from purely episodic representation to mimesis. Donald classifies mimetic actions as conscious, self-initiated, representational

⁶ Notice that Donald does not think that the primary function of writing is the representation of speech.

acts that are intentional but not linguistic (Donald, 1991); imitation and re-enactment become behaviours which are iterable (Donald, 1991; Rowlands, 1999). Rowlands classifies the important features of mimetic behaviour as: intentional, being directed at an object; generative, having a 'lexicon' of motor actions that are combinable into different forms; public, because external. Mimetic behaviours afford the first real opportunity to share knowledge and skills with each member of a group having to discover it for themselves (Rowlands, 1999).

“This transformation from the internal representations characteristic of episodic experience to external mimetic representations is the fundamental turning-point in the development of the modern mind” (Rowlands, 1999, p. 131).

The development of representations brings us to the era in which we currently find ourselves. According to Donald and Rowlands, external written vehicles offer us something importantly different from neural vehicles. They allow for storage, different representational formats, and a variety of novel manipulations and transformations. External representational systems have both extended and transformed our cognitive capacities.

Harris finds implausible the claim that writing restructures thought because it liberates psychological capacities from having to store memories. This is firstly because, as Plato insisted, there is the worry that reliance upon writing as a form of memory storage weakens memory rather than strengthens it. Furthermore, learning to write places its own burdens on memory. As such, there is no clear sense in which the use of writing for memory storage liberates us to develop new cognitive abilities.⁷ However, I do not think that Donald and Rowlands fall into this error. The focus is not simply upon the capacity to store information in a public space, it is rather on the novel representational systems and manipulations of the vehicles of those systems that allow for the completion of cognitive tasks that were before difficult or impossible (to echo Harris's question).

Cognitive integration views representational systems not simply as stores of (transparent) information, but as enabling us to do new things with the resulting vehicles. Building on the work of Vygotsky and Clark, they claim that writing can help constitute acts of thinking. In elaborating this view in the next section, I concur with Harris that it is intellectual tools that have restructured thought. “The question with every new intellectual tool is always: how does this innovation make possible or foster forms of thought which were previously difficult or impossible?” (Harris, 1989, p. 103) What cognitive integration has to offer, I believe, is a new view of how this is achieved.

3. Integrated cognitive systems and writing

Cognitive integration views cognition as based on both the co-ordination of bodily processes, including neuronal ones, and manipulations of external material vehicles that enable agents to complete cognitive tasks. Body schemas and cultural norms govern the co-ordination of the bodily and extra-bodily elements. A body schema is “a system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring” (Gallagher, 2005, p. 24). They are the capacities that enable skilled behaviour, such as

⁷ Reliance on technology is not necessarily a good thing. Relying on a calculator, rather than being able to do long, or even short multiplication would be another example.

writing with a pen, typing with a keyboard, or driving a car. We learn the cultural norms as practices; established methods of manipulating representational vehicles to produce an end.

While cognitive integration has its roots in the phenomenological tradition and the later Wittgenstein (1953), it has developed in theories that adopt an embodied approach to cognition (Clark, 1997; Gallagher, 2005; Rowlands, 1999; Wheeler, 2005). It takes seriously the detailed description of embodiment with regard to cognitive and mental capacities such as perception and social cognition. Further, emphasis is also given to detailed descriptions of manipulations of external vehicles with regard to cognitive capacities such as memory and belief. The integration of neural and external processes leads us to understand cognition and the mind as: *Hybrid* – involving both neural and external processes and *integrated* – neural and external processes co-ordinate with one another in the completion of cognitive tasks.

The mind is hybrid because of the bio-cultural⁸ evolution to which Donald and Rowlands draw our attention. Neural vehicles and scripts complement one another, even though they have different properties (Rowlands, 1999; Clark, 2001, 2003; Sutton, 2004, 2007; Menary, 2006).

Cognitive integration appeals to the manipulation thesis which Mark Rowlands formulates in the following terms:

“[C]ognitive processes are not located exclusively in the skin of cognising organisms because such processes are, in part, made up of physical or bodily *manipulation* of structures in the environments of such organisms” (Rowlands, 1999, p. 23).

The claim is locational. Crucially, cognitive processes are not exclusively located in the body. This is underwritten by the constitutive claim that cognitive processes are, in part, constituted by the bodily manipulation of structures in the environment. The manipulation thesis is thus consistent with the view of Clark and Chalmers:

“In all these cases the individual brain performs some operations, while others are delegated to manipulations of [external] media. Had our brains been different, this distribution of tasks would doubtless have varied” (Clark and Chalmers, 1998, p. 8).

The manipulation thesis raises the question of what different kinds of structure/vehicle and manipulation there are. The focus of interest for us is that external vehicles are often written sentences of scripts or mathematical formulae (Clark and Chalmers, 1998; Rowlands, 1999; Hurley, 1998; Menary, 2007).

I have argued (in Menary, 2007) that there are at least four types of cognitive manipulation:

- *Biological coupling*: such as extended phenotypes (Dawkins, 1982), animate vision (Ballard, 1991), and the sensori-motor contingency theory of perception (O'Regan and Noë, 2001).
- *Epistemic actions*: using the environment as its own representation, obviating the need for neural representations – as in expert players of Tetris who directly manipulate the blocks as they fall, via the game controls, rather than construct internal images of them and then manipulate the blocks (Kirsh and Maglio, 1994).

⁸ The co-evolution of biological niches and cultural niches.

- *Self-correcting actions*: the use of language and external vehicles to direct and structure practical actions in completing tasks – such as the use of egocentric speech, or using a written list of instructions to guide and direct practical actions (Vygotsky, 1978; Clark, 1996).
- *Cognitive practices*: the manipulation of external representational and notational systems according to certain normative practices – as in mathematics (Vygotsky, 1978; Karmiloff-Smith, 1992; Menary, 2007).

The vehicles of writing allow the kinds of manipulation that depend on cognitive practices. As we saw in the previous section, when we learn to write, we learn established methods of manipulating vehicles to produce an end such as how to solve problems, how to make plans, how to make lists and use diaries, and how to navigate via maps and so on. I think that we learn cognitive practices by learning the cognitive norms that govern the manipulation of vehicles. The result of this learning is the flexible, fluid manipulation of vehicles, rather than a ploddingly conscious application of rules (Menary, 2007).

In what follows I provide an account of how we should understand creating and manipulating written vehicles to be actively driving cognition. This applies, for example, to writing a scholarly article where the relevant parts of the world come into a reciprocal causal loop with other texts and deeds. Following Clark and Chalmers (1998), the cognitive integrationist believes that because manipulating external vehicles is part of the cognitive process, mind and environment function as a coupled system:

“In these cases, the human organism is linked with an external entity in a two-way interaction, creating a coupled system that can be seen as a cognitive system in its own right” (Clark and Chalmers, 1998, p. 9).

Since this concept is crucial to understanding how acts of writing contribute to thinking, I proceed by explaining Clark and Chalmers’s view of what constitutes a coupled system and then apply it to an act of writing with a word processor.

1. All the components in the system play an active causal role.
2. They jointly govern behaviour in the same sort of way that cognition usually does.
3. If we remove the external component the system’s behavioural competence will drop, just as it would if we removed part of its brain.
4. Therefore, this sort of coupled process counts equally well as a cognitive process, whether or not it is wholly in the head.

The active features of the environment have an influence over us in the here-and-now. If we maintained the internal structure but varied the nature of the environment then our behaviours and competences might alter radically. Causal coupling involves a kind of reciprocal influence, the inner and outer features have a mutually constraining causal influence on one another which unfolds over time. For example, it is not simply that the written sentences in a diary prompt or cause, as input, various cognitive processes to unfold in my brain; it is rather that the external process of retrieving the information from the diary and the concurrent processes in my brain jointly govern my future behaviour.

This is the dynamical basis for cognitive integration (Menary, 2007). Although we can identify the relevant components, and factorise them into internal and external components, the nature of reciprocal coupling makes it difficult to study the components as

separate systems because they are continuously influencing and responding to one another. They are co-ordinating with one another to produce behaviour. In so far as brain, body and world can be shown to be reciprocally coupled in this way, we can consider them to be a coupled system.

Take the example of writing a scholarly paper by word processing. Which of the components play an active causal role? Presumably, thanks to the CPU, the keyboard and monitor are able to exert an effect on what I write next and the words I type which come up on the screen are an extension of short term memory. In a stronger sense my reading and re-reading what I have written gives me new ideas about what I should write next. Thus, the keyboard and monitor play an important causal role in the production of the paper. There is, however, a sense in which this is the wrong focus of interest. Whilst it is true that tools such as keyboards and pens enable me to write,⁹ it is manipulating the written vehicles themselves that drives my cognitive processes. The sentences extend my working memory and are, of course, what can be re-written, erased, moved to another paragraph, etc. It is, moreover, precisely these kinds of manipulations that are not easily, if ever, achieved in the head.

Therefore, writing as an active and creative process is enabled by tools such as pen and paper or word processors. The written vehicles are then available for further manipulations such as restructuring, revising and re-drafting. Manipulating written vehicles is a kind of problem solving where a particular goal is aimed at: “how do I make this piece of writing clearer?” for example. I could, of course, compose a paper without external media. Nevertheless, not only would retaining the paper and updating it be made more difficult but, perhaps more crucially, it would take on different content and be written in a different style. The kind of manipulations of written sentences described above require external vehicles and tools for manipulating them, without them behavioural competence will drop.

However, it is not just a matter of ease that is at issue here; in an important sense, the manipulation of scripts transforms the skills needed in composing scholarly articles. The media¹⁰ function as enabling hardware, but the vehicles themselves enable processes that cannot be completed in the head alone. The physical act of typing¹¹ necessarily involves external physical manipulations. My ability to compose a paper is severely curtailed by the absence of those external manipulations. Hence, cognitive integrationists are inclined to think that those external manipulations play an important enabling role in the processing of the task.

Why could we not stick to a form of neural internalism here? There is, of course, an attenuated sense in which I can compose an article in my head. The likelihood of retaining much of the argument and structure, would, however, become very limited. Making revisions and corrections would be almost impossible, for example: trying out ideas and then deleting them. By contrast, becoming integrated with external tools and representations transforms my cognitive capacity to compose a philosophy paper. Importantly, there are things I can do with pen, paper, or word processor that I cannot do in my head. Stable and enduring external written sentences allow for manipulations, transformations, re-orderings, comparisons and deletions of text that are not available to neural processes.

⁹ And spell and grammar checkers are further tools that augment the process of writing.

¹⁰ The monitor, keyboard and mouse, etc.

¹¹ Or indeed, writing with pens and paper, different tools that enable the process of writing.

A further internalist worry becomes apparent here, why should the integrationists insist that the functioning of the tools and written sentences be cognitive? Why cannot we just say that some of the representations and manipulations of those representations get manipulated in the environment and then function as input for further, genuine neural cognitive processes? Here we reach the nub of the issue, once the internalist accepts that the manipulation of representational vehicles is part of the process, it is very difficult for them to discount their cognitive function without invoking some form of neural chauvinism. Furthermore, the claim that manipulating written vehicles simply provides new input for neural processes does not do justice to the tightly coupled dynamical interactions between neural processes, bodily processes and manipulations of vehicles.

The active external components are cognitive because they actively drive the process of writing as described under conditions 1 and 2. The act of typing contributes to composition in a way that is manifestly different from my attempting to compose without the external tools described under conditions 3 and 4. The manipulations I can perform on external vehicles go beyond what I can achieve neurally. As such, there is a clear sense in which writing goes beyond simple external storage, writing is thought in action.

4. Rethinking the cognitive role of writing

I have been moving towards an answer to Harris's question from the perspective of the cognitive integrationist, but I want to look at how Harris, himself, answers the question and how this connects with the integrational answer I have been developing so far. Harris (2000) sees three historical stages in understanding literacy. The first stage is 'crypto-literacy' where writing is thought of as having supernatural powers. The second stage is utilitarian, as exemplified by Hobbes, writing is a practical tool for memory storage and communication over distances but it is still essentially a tool for representing speech. The third stage Harris characterizes as:

"Full literacy which arguably no society has yet quite reached, is one in which writing is no longer regarded just as a 'profitable invention for continuing the memory of time past, and the conjunction of mankind,' *but as a particular mode of operation of the human mind and the key to a new concept of language*" (Harris, 2000, p. xi). [My italics]

What is the particular mode of operation of the human mind to which Harris refers?

"The restructuring of thought which writing introduces depends upon prising open a conceptual gap between sentence and utterance. . . . Writing is crucial here because autoglottic inquiry presupposes the validity of unsponsored language. Utterances are automatically sponsored by those who utter them, even if they merely repeat what has been said before. Sentences by contrast, have no sponsors: they are autoglottic abstractions. The Aristotelian syllogism like the Buddhist *panchakarani*, presupposes writing" (Harris, 1989, p. 104).

Harris was right to ask the question "how does this innovation make possible or foster forms of thought which were previously difficult or impossible?" (Harris, 1989, p. 103) Autoglottic (Donald's theoretic) culture is different from oral culture because it has a technology, writing, which allows for a level of abstract verbal conceptualization that detaches words from their sponsors and allows for a new kind of theoretical thinking. The cognitive

integrationist does not think of sentences as abstractions, but as material vehicles. What the cognitive integrationist also does is look at the details of how the act of writing, representations and bodily and neural functions of an agent connect up. Although Harris is right to condemn those who think that writing is simply a storage device for off-loading memories, there is a clear sense in which both the material nature of written sentences and the memory enabling role of these is important. The cognitive integrationist explanation of writing allows us to throw off the internalist hold on cognitive explanations and a more coherent account of cognition is forthcoming that connects up neural, bodily and social dimensions of cognition. When we couple this with Harris' view of writing as enabling abstract/theoretical thinking, it is a powerful account of how we think by writing.

5. Conclusion

Writing is thinking so I have argued. If we take up the position of cognitive integration and see the external processes involved in writing working with neural processes, then we understand the entire co-ordinated result as an act of thinking. Further reasons in support of this explanatory framework were marshalled from the cognitive role of written vehicles and the resultant transformation of our cognitive capacities. These vehicles thus afford us new cognitive transformations which would be either impossible or extremely difficult by relying solely on neural resources.

“In particular, I will maintain that we do not find the basis of human oddness by looking *inside* the human phenome or genome (except in a trivial sense that was never the issue that excited debate). Rather, human specialness is ecological” (Ross (this issue)).

Quite.

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