Unconscious representations 1:

Belying the traditional model of human cognition.

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Abstract: The traditional model of human cognition (TMHC) postulates an ontological and/or structural gap between conscious and unconscious mental representations. By and large, it sees higher-level mental processes as commonly conceptual or symbolic in nature and therefore conscious, whereas unconscious, lower-level representations are conceived as non-conceptual or sub-symbolic. However, experimental evidence belies this model, suggesting that higher-level mental processes can be, and often are, carried out in a wholly unconscious way and/or without conceptual representations, and that these can be processed unconsciously. This entails that the TMHC, as well as the theories on mental representation it motivates and that in turn support it, is wrong.

Key words: conscious/unconscious cognition; traditional model of human cognition; vehicle vs. process theories; higher/lower-level cognition; (non-)conceptual representations

1. Introduction

Often, or more often than not, contents, states, or just processes in our minds (i.e., mentation, or cognition) are inaccessible, phenomenologically and/or epistemically, to ourselves. In other words, we often are unaware of experiencing certain emotions or feelings, of having certain motives, goals, desires and wishes, of perceiving and further processing certain stimuli and affordances from the environment, of nurturing certain beliefs, of deciding on certain courses of action, of learning certain facts about the world or ourselves, etc. Sometimes, attention, or some other factor, makes us aware of some of those contents, states, or processes (e.g., traumatic memories, over-learned skills, repressed emotions, operant conditioning, etc.), but many of them are believed to remain permanently out of the reach of consciousness (e.g., classical conditioning, word retrieval in fluent speech, discrimination of all too briefly exposed masked stimuli, perception of visual stimuli in blindsight, etc.). Mental processes, states, and contents temporarily or permanently removed from phenomenological and/or epistemic self-access are all said to be *unconscious*, with researchers showing a special interest in the latter.

Despite a critical caveat by W. James (1890), late 19th-century psychology surrendered to the idea of unconscious mental processes (see Augusto, 2010). Psychoanalysis was prominent in the theoretical development of this idea (see Ellenberger, 1970), but for much of the 20th century the experimental psychology of the unconscious was restricted to “laboratory studies of *behavior* without awareness” (see

Adams, 1957). This research sanctioned the hypothesis that a person's behavior can be unconsciously influenced or unconscious to her-/himself, and it was greatly influenced by the idea of a limen, or threshold, of discrimination (Dixon, 1971; Miller, 1939). The 'cognitive revolution' of the 1950s/60s opened the gates to an abundance of research into unconscious *mentation*, whether cognitively inspired — in which case it is often referred to as "implicit" rather than as "unconscious" — or somehow fitting in/into the psychoanalytic tradition (for general approaches, see, e.g., Eagle, 1987; Kihlstrom, 1987).

While acknowledging the importance of the latter, I focus here on the former. This began more precisely in the late 1960s with the work of A. Reber in implicit learning (Reber, 1967; 1969), and it soon ramified into the fields of implicit memory (Graf & Schacter, 1985), priming (Marcel, 1983a; 1983b), and, more recently, unconscious (social) thinking, reasoning, and emotional processing (e.g., Dijksterhuis & Nordgren, 2006; Greenwald & Banaji, 1995), and even neuronal correlates of unconscious processing are now researched (e.g., Bechara & Damásio, 2005; Skosnik et al., 2002; Tamietto & de Gelder, 2010).

Although this research has succeeded in securing a scientific status for the postulation of unconscious mentation, being today capable of specifying not only its distinctive features, but also its evolutionary foundations (see Augusto, 2010), it has not been so successful in eradicating the pervading notion that unconscious cognition is restricted to low-level, basically sensorimotor processes, often being denied any protagonism in higher-level processes involving decision making, planning, and reasoning in general. This strict segregation in level between conscious and unconscious mental processes and representations in general is ontologically/structurally accounted for by postulating that while the former are conceptual or symbolic in nature, the latter

are non-conceptual or sub-symbolic. This is what we can call the traditional model of human cognition (TMHC), which motivates refined, rivaling theories on mental representation,[1] and is in turn supported by them. But the experimental evidence belies this model, suggesting that, on the one hand, high-level processes can be carried out in a wholly unconscious way, temporarily or even permanently remaining outside the grasp of consciousness, and often without concepts or strictly conceptual representations, and, on the other hand, lower-level processes can reach consciousness and be symbolic and/or conceptual in nature.

2. On distinctions between conscious and unconscious representations: The TMHC and its escorting theories

2.1. The current state of affairs

Despite inconclusive philosophical debates around the mind-brain problem, it appears reasonable to think that, being endowed with one brain — albeit naturally sectioned in two hemispheres that seem to a certain point independent —, human individuals are endowed with one mind only. If this belief is justified, then we have reasons to believe that both conscious and unconscious mental processes concur to that single mind, i.e., they must be integrated in the normal mind of the *homo sapiens sapiens* subspecies (see, e.g., Tononi, 2004). This integration can be supported by the postulation of an evolutionarily recent co-development of unconscious and conscious mental processes, which, in turn, might find support in evolutionarily distinct neuronal and computational

[1] The approach adopted here, which sees cognition and mentation in general as mental representation, is accounted for and elaborated on in the second, independently published part of this paper on unconscious representations (Augusto, 2013).

correlates. These suggest that consciousness is a more recent property of human mentation, whereas unconscious cognition is shared with all other vertebrates: research results point in the direction of an implication in consciousness[2] of the cerebral cortex (e.g., Eccles, 1992; Koch, 2004), a later development in the history of the evolution of the brain that appears to be highly distinct and distinctive in humans (the neocortex; see, e.g., DeFelipe, 2011), while older, subcortical/primitive brain structures present in virtually all vertebrate species with a minimally developed brain appear to be prominent in unconscious mentation (see, e.g., Damásio, 1999).

This phylogenetic dissociation, alone or together with other researched aspects, motivates the common practice of strictly segregating unconscious and conscious mental processes: the former are believed to be action-directed (the "action precedes reflection" motto; see, e.g., Bargh & Morsella, 2008), the latter overall (better) integrated in computational terms (e.g., Balduzzi & Tononi, 2008), etc., among other behavioral-phenomenological dissociations (see Augusto, 2012). Generally, despite abundant theoretical work and supporting experimental results, there is in contemporary psychology still some degree of resistance to a notion of unconscious cognition (see Augusto, 2010). This is particularly true of higher-level thought processes, such as decision making and problem solving in situations in which one has to decide by relying on one's knowledge base: these are seen as goal-controlled/directed, symbolic/conceptual in nature, and therefore calling for consciousness. Contrastingly, unconscious mentation is often seen as essentially non-conceptual/sub-symbolic, being

[2] Not to be confused with *wakefulness* and *mere sentience*; see below the discussion motivated by Merker (2007). Wakefulness/sentience appears to be more immediately connected to subcortical structures, namely to the brainstem (e.g., Laureys, 2005).

relegated to the sensorimotor, procedural, or automatic level (e.g., Rasmussen, 1983; Sun et al., 2009; Tzelgov, 2002).

But while segmenting approaches such as the modularity of mind, massive (Barkow et al., 1992) or otherwise (Fodor, 1983; Pylyshyn, 1999), might easily be compatible with the scientific effort of coming up with a theoretical account of cognition as unified processing of information, what we call a mind or an integrated cognitive architecture (see Barrett & Kurzban, 2006), the all too frequent segregation between conscious and unconscious representations severely hinders any progress towards it. In particular, approaches differentiating crisply in kind or quality (i.e., ontologically) and/or in structure between conscious and unconscious representations and thought processes fuel the view of a divided mind to an extent that perhaps not even Freudian theory is willing to do.

To be sure, conscious and unconscious representations do exhibit some differences, as discussed below, but the experimental evidence available suggests that they are not ontologically and/or structurally discontinuous with respect to each other to the point of sanctioning a dichotomy — if not a gap — between low-level, unconscious, and high-level, conscious processes. This current state of affairs might in large measure be due to an explicit or implicit equation between the kinds of perceived information we operate with and a more or less rigid distinction between computational correlates, with conscious computations being believed to be carried out solely with 'high-quality' representations, where quality has to do with stability in time, strength, and distinctiveness, properties apparently dispensable for unconscious processing (see, e.g., Cleeremans, 2006; Mathis & Moser, 1995).

2.2. The TMHC and the process vs. vehicle theories

This segregating view constitutes by and large the TMHC. A few additional details will shortly be approached, but, as it is, it motivates and in turn finds support on the debate whether it is the processing itself that determines the nature (i.e., the ontology and/or structure) of the mental representations, a perspective known as *process theories*, or vice-versa, with the representations determining the status of (un)consciousness of the processing, a viewpoint known as *vehicle theories* (see Atkinson et al., 2000).

A particularly influential segregating approach distinguishes conscious from unconscious representations by postulating that the first are *symbolic* and/or *conceptual* in nature, whereas the latter are *sub-symbolic* and/or *non-conceptual* (e.g., Smolensky, 1988). As a matter of fact, this, due to its semiotic, representational nature, seems to realize quintessentially the prevalent view that strictly differentiates between declarative-explicit and procedural-implicit modes of mentation (see Augusto 2010; 2012), with influential work in the human cognitive architecture proposing implementations of "hybrid" models based on this dichotomy (e.g., Sun, 2002). Rasmussen's (1983) is an especially interesting elaboration on one such ontology in that he offers a third, differentially intermediate kind between unconscious and conscious mental representations. This makes it a more refined version of the TMHC. Rasmussen (1983) speaks of three levels of processing, one clearly unconscious, involving skill-based behavior, and one clearly conscious, knowledge-based, in functional reasoning; between the two, an intermediately unconscious-conscious level of rule-based behavior. Appealing to influential theoretical work in semiotics, Rasmussen claims that the largely unconscious skill-based behavior operates with *signals*, the conscious knowledge-based behavior with *symbols*, and the mostly unconscious but partly conscious rule-based behavior with *signs*. Basically, signals correspond to the perception of space-time sensory data from the environment, signs correspond to

percepts and rules for action, and symbols are seen as internal conceptual representations. Their relation to the external environment is inversely proportional to their operational immediacy: while reasoning operations can be carried out immediately with symbols, which are for him abstractions at the highest level (i.e., *concepts*; cf. Rasmussen, 1983, p. 260), signals, more or less raw data from the external environment, require sensorimotor mediacy, and signs are conceived as activators or modifiers of stored patterns of behavior, not being able of undergoing direct processing. No — clear — gradation is conceived, each of these semiotic units appearing as all-or-none entities, with the consequence that shifting from one level of behavior (i.e., from one mode of perception) to another appears difficult; nevertheless, the different levels of information processing are assumed to interact. The explanation of their relation to the states of (un)consciousness in which they are processed is clearly indicated by Rasmussen (1983, p. 260):

> The distinction between the perception of information as signals/signs/symbols is generally not dependent on the form in which the information is presented but rather on the context in which it is perceived, i.e., upon the intentions and expectations of the perceiver.

Rasmussen's is thus a process theory, claiming that the differences in ontology or structure of the mental representations are accounted for by the requirements of the processing to be carried out, which is dependent on the intentions and expectations of the perceiver. These have to do with, at the lowest level, mere automated performance, activation and/or modification of learned rules at an intermediate level, and, finally,

conceived as a higher level, prediction and planning. Thus, while signals are used in the performance of automated actions such as bicycle riding or music performance, actions requiring merely feedforward control and no awareness of the goals, and signs prompt the retrieval of learned rules in the performance of mostly unconscious goal-directed behavior, symbols — i.e., concepts — are invoked when goal-controlled behavior, which necessitates consciousness, is called for. That is to say that while signals escape conscious control by the agent (e.g., the music performer), symbols actually require conscious manipulation by the agent (here, the 'reasoner'); signs can be used in unconscious activation of rules, but consciousness can be activated in the case of, for instance, corrections needed in the performance of an automated action.[3]

The fact that in order to make Rasmussen's a vehicle theory one only needs to postulate that the form (i.e., the ontology and/or structure) of the representations determines the kind of processing shows how trivial this model of human cognition is: in fact, it motivates both vehicle and process theories alike, and is supported in turn by any of them, rivaling as they are, to the point that it is impossible to distinguish the TMHC from its escorting theories of mental representation. Table 1 summarizes what we can see by and large as the TMHC that motivates/supports both vehicle and process theories.

[3] Signs are sub-symbolic/non-conceptual according to Rasmussen (1983); so, this activation of consciousness appears to imply that the processing is taken over by symbols/concepts.

Table 1. Traditional model of human cognition: correlation between types of mental representation, type/level of information processing, and (un)consciousness. (Based on Rasmussen, 1983.)

	SUB-SYMBOLIC, NON-CONCEPTUAL		**SYMBOLIC, CONCEPTUAL**
Type of Mental Representation	**Signals**	**Signs**	**Symbols, Concepts**
Type of Information Processing (IP)	Sensorimotor	Know-how	Abstract reasoning
Objective of IP	Activation of automated sensorimotor patterns	Feature recognition with a view to the activation of stored rules	Feature identification with a view to planning and predicting
Level of IP	Low (automation)	Intermediate (automation, but may require adaptations)	High (reasoning in face of novelty: decisions may be required)
Type of Performance	**Skill-based**	**Rule-based**	**Knowledge-based**
Consciousness?	No!	No (Yes, sometimes)*	Yes!

* See footnote 3.

2.3. Differentiating between conscious and unconscious mental representations

It is important to make the direction of my argumentation clear: I am not arguing that all mental representations can be indifferently manipulated at either a conscious or an unconscious level. We have reasons to believe that we are beings such that can have an unconscious mental life alone (for instance, in coma or in the vegetative state), but never a conscious mind only (e.g., sleep appears to be essential for humans). Given this, I think it is safe to conclude that representations *need not* become conscious in order to be processed, or computed, but the main question is which *can* and which *cannot* become conscious, and the problem is how to answer this question while refuting the

TMHC, belied by experimental evidence, and consequently discarding both vehicle and process theories.

Firstly, because cognition is a temporal process, and a real-time process for that matter, temporal constraints are imperative for reasons of optimality: the representations that issue commands regulating the complex order and combination of our thought processes cannot in principle become conscious. For instance, while speaking fluently one's maternal language, one is not aware of all the background (if you will) processing taking place that has to do with retrieval of words and concepts, their multiple associations, etc.; sometimes, one consciously searches for a word, and this is commonly a non-optimal, often unsuccessful, process.

But in fact even some conceptual representations may also not be accessible to consciousness at all. Due to specific ontological and/or structural features that have to do with the intensity, complexity, and/or duration of (presentation of) stimuli, as revealed in priming and subception (e.g., Ansorge et al., 2007; Marcel, 1983a, 1983b; Merikle & Daneman, 1998), as well as in the paradigms of artificial grammars, simulated complex systems, and sequence learning (see, e.g., Dienes & Berry, 1997), or due to reasons to do with the locus of their formation (see Milner & Goodale, 2007, for the dual visual system hypothesis; see Barker et al., 2006; Knowlton et al., 1996; Molinari et al., 1997, for other functional-anatomical dissociations) and/or with their subjective (see Breuer & Freud, 1895/1955; Freud, 1900/1953; 1915a/1968; 1915b/1968; 1923/1961) or evolutionary meaning (e.g., Reber, 1992a; 1992b), some representations may be inaccessible to conscious processing.

However, the differences between conscious and unconscious representations might not be so fundamental so as to justify the TMHC, or any other similar,

segregation: minimal alterations in the structure (e.g., less degradation or lower complexity of stimuli), brain redundancy and/or plasticity (brain areas assuming functions thought to be not originally their own), and even exploration of their subjective meaning (as in psychoanalysis, for instance), all might more or less easily make accessible to consciousness the unconscious representations above.

But the differences exist and cannot be dismissed. This is especially true of very low-level representations, i.e., very close to 'sensations,' which defy verbalization, as well as of automatized skills. But then again these can be (at least partly) consciously processed; for instance, one can be conscious of an 'ineffable' sensation (e.g., a sound or a color), and one can consciously 'describe' some skill by gesturing. So, it appears that an impasse has been reached.

In order to be able to provide a clear, unambiguous model of human cognition supported by the experimental evidence, and thus contradict the TMHC, we have to account for how *higher-level cognitive processes* (i) *can take place (wholly or largely) without consciousness and/or* (ii) *without concepts (taken in a strict sense)*,[4] as well as for how (iii) *conceptual representations can be processed unconsciously* and how (iv) *low-level and/or unconscious mentation is symbolic in nature, too*. In other words, human cognition, whether low- or high-level, unconscious or conscious, is essentially symbolic, and concepts, taken in the strict sense, are just a particular kind of symbol.

[4] Although not necessarily without symbols. In fact, concepts are just a kind of symbol or symbolic expression/structure. In the more restricted sense commonly attributed to it, the term *concept(ual)* is intimately connected to word meanings (e.g., CAT is the concept associated to the meaning of the word *cat*). While we cannot equate both (for instance, there are aphasics who appear to preserve conceptual representation in the loss of language; see, e.g., Lecours & Joanette, 1980), in non-impaired subjects concepts and word meanings appear to be intimately connected or associated.

Furthermore, we have to do it while escaping the lure of the vehicle vs. process theories.[5] This amounts to rejecting an ontological and/or structural segregation between conscious and unconscious representations, paving thus the path for an integrative approach to the human cognitive architecture. In what follows, I discuss evidence supporting (i)-(iii); in part 2 of this article, I focus on the symbolic character of human cognition in general — aspect (iv) above — and elaborate on a theoretical account for (i)-(iv).

3. Belying the TMHC

The following cases make the TMHC — and therefore process, as well as vehicle, theories — appear simply misguided:

I. Infants as young as 3 months old can learn to control contingent events (e.g., by repeating certain actions) and to make predictions, as suggested by their emotional reactions to the success or failure of the supposed predictions (see, e.g., Papoušek, 1967).

[5] For instance, there is a current, often implicit or only timidly stated, view in cognitive science and cognitive psychology according to which although mental representations may be *inaccessible* to conscious processing, mostly for the reasons above (i.e., degradation, indistinctness, low intensity, brevity of presentation, meaning, etc., of stimuli), they may be *available* to be processed in an unconscious way. This view claims to account for many phenomena in studies of unconscious mentation (see Augusto, 2010; Cleeremans, 2006), but it does so largely by — often implicitly — taking side with either the vehicle theories or their rival process theories.

II. Experimentally conditioned subjects can accurately predict a specific stimulus without being aware of that or even against their conscious expectations (e.g., Perruchet, 1985).

III. People with cortical blindness over their entire visual fields can navigate physical obstacles in a wholly new environment, an action that requires good planning and predicting, unaided (e.g., de Gelder et al., 2008).

IV. We more often than not make judgments about people, i.e., we make decisions regarding them, based on stereotypes and attitudes of which we are wholly unaware (see, e.g., Dion et al., 1972).

If the TMHC is right, higher-level cognition = symbolic/conceptual manipulation = conscious mentation, whereas lower-level cognition = sub-symbolic/non-conceptual manipulation = unconscious mentation. But Cases I to IV above contradict this, as shall be discussed. Allowing for uncertainty regarding the presence or absence of concepts, as well as amenability to consciousness, in each of the Cases of interest (marked by tiny question marks, where tininess indicates that the uncertainty is fairly small), the essentials of Cases I – IV are summarized in Table 2.

Table 2. Proving wrong the traditional model of human cognition.

	Cases			
	I	II	III	IV
Higher-level cognition?	Yes	Yes	Yes	Yes
Conceptual manipulation?	No (?)	Yes (?)	No (?)	Yes (?)
Conscious manipulation?	No	No	No	No
Amenable to consciousness?	No	Yes	No (?)	Yes (?)

As can be seen in Table 2, Cases III and IV differ from Cases I and II in that in the former (non-)amenability to consciousness is not so safely ascertained/excluded as in the latter. Cases I and II alone suffice to belie the TMHC, as typically one counterexample to a theory suffices to refute it, but Cases III and IV provide extra contexts; all together, Cases I-IV show that the TMHC is wrong as far as such diverse fields as infant cognition, classical conditioning, cognitive neuropsychology, and social cognition are concerned.

3.1. Case I. Higher-level cognition in the absence of consciousness and concepts: Infant cognition

In the case of 3-month-old infants, it is unlikely that they carry out conscious processing of information, namely involving concepts, and yet they appear to be capable of goal-controlled behavior (see Papoušek, 1967). It is thus justified to suspect that high-level information processing can be carried out without both conceptual representations and consciousness.

The results reported by Papoušek (1967) suggest that higher-level cognition (here: predicting and planning) can be carried out by infants as young as 3 months old, a hypothesis that, in turn, may find support in findings that suggest that the understanding of object permanence is innate, present at birth, and fairly well developed by the age of 3 months (for instance, 3-month-old infants can detect violations in occlusion, containment, and covering events involving objects; see, e.g., Baillargeon & DeVos, 1991; for a review, see Baillargeon, 2004). Papoušek conditioned newborns and 3- to 5-month-old infants by repeatedly presenting them with a bottle of sweetened milk on the right side of their heads and a bottle of unsweetened/bitter milk on the left side. The results reported were that 3-month-old infants effectively learned to turn their heads to the right in order to obtain the reward of the sweetened milk. Furthermore, they showed pleasure when their expectations were fulfilled and displeasure when they were not met, and after inversion of the bottles (sweetened milk on the left, bitter milk on the right) they quickly learned their new positions and acted accordingly.

Other experimental results suggesting early motor control of goal-directed action abound (see, e.g., Hommel & Elsner, 2009). It is reasonable to think that goal-controlled/directed action requires a representation of the goal to be obtained (i.e., anticipation or expectation), as well as of the motor behavior required for the attainment of the goal (i.e., planning and controlling; possibly also decision making and problem solving). In other words, higher-level cognition must be invoked. While it does not appear justified to think that intentional, goal-oriented action is innate, requiring on the contrary experience in order to develop, one cannot equate this early development with conceptual representation. Not only is the brain of the 3-month-old infant globally immature (see below), concept formation and storage are also believed to require a highly structured semantic memory — and thus a personal history — intimately

connected to a natural language in turn associated to a particular culture more or less geographically localized (e.g., Quine, 1960; Rosch, 1978). Contrary to the TMHC, we cannot appeal to concepts to account for the higher-level mentation carried out by very young infants and even by newborns. Moreover, we cannot invoke consciousness, either, if by *consciousness* we mean a state in which a subject is awake, generally sentient and aware of self and environment, and capable of referring to (i.e., possessing knowledge of) at least some of the internal and external conditions/events that affect her/him.[6] A reason for this is that brain maturation begins in the brainstem and progresses to the cerebellum and the cerebrum, implying a later development of the cerebral cortex (e.g., Barkovich et al., 1988; Martin et al., 1988), the "locus" of consciousness in the sense above.[7]

Hydranencephaly, a severe condition characterized by the absence at birth (typically) of the cerebral hemispheres, might come in support of the above simply because it provides a clearer case in which, for these anatomical reasons, both consciousness and conceptual representations are more safely questioned. In hydranencephaly, only a minimal, viable, brain is present, reduced to the brainstem, alone or with a more or less preserved cerebellum, and parts of the limbic system (see Fig. 1). In other words, cerebral cortex is virtually absent. If this is responsible for

[6] This is an important note, as newborns and very young infants can be said to have "consciousness" in the sense that they can exhibit altered states of consciousness. See below for a necessary clarification of the meaning of the term *consciousness*.

[7] In particular, the prefrontal cortex appears to be implicated in consciousness (e.g., Frith & Dolan, 1996), and the development of the frontal cortex region appears to be more prominent only in the second year of life (Gilmore et al., 2012).

consciousness and conceptual cognition in humans,[8] then these patients possibly lack both consciousness and concepts. However, Merker (2007) reports that children with hydranencephaly appear to be able to react showing strong emotion to, for instance, the presence or absence of expected stimuli. According to him, they exhibit purposive, goal-directed behavior. Just as in the case of normal infants, this might entail prediction and perhaps even planning, i.e., functions of higher-level thinking, in the absence of both consciousness and conceptual representations.[9]

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[8] Although subcortical structures appear to be also involved, it is well known that verbal language, and in particular semantic processing, is highly localized in the cortex, namely of the left hemisphere (see, e.g., Bookheimer, 2002; Ojemann, 1991). While we cannot equate conceptual representation with natural language processing (see above), we might have reasons to believe that they are intimately connected (e.g., Fodor, 1975).

[9] Unfortunately, Merker sees consciousness where none seems to be possible. Merker's claim that children with hydranencephaly are conscious is actually non-falsifiable due to his all too vague conception of what it is for a (human) animal to be conscious: the "state of wakefulness … which typically involves seeing, hearing, feeling, or other kinds of experience" (Merker, 2007, p. 63). A few lines below, he specifies this vagueness and imprecision: "As employed here, the attribution of consciousness is not predicated upon any particular level or degree of complexity of the processes or contents that constitute the conscious state, but only upon whatever arrangement of those processes or contents makes experience itself possible. To the extent that any percept, simple or sophisticated, is experienced, it is conscious, and similarly for any feeling, even if vague, or any impulse to action, however inchoate. … In this basic sense, then, consciousness may be regarded most simply as the 'medium' of any and all possible experience" (Merker, 2007, pp. 63-4). But wakefulness is by no means a synonym for consciousness, as our knowledge of dissociated (wakefulness – awareness) states such as the vegetative state, absence seizures and sleepwalking indicate (see, e.g., Laureys, 2005); this is supported by evidence from just about all fields involved in unconscious cognition strongly suggesting that "seeing, hearing, feeling, or other kinds of experience" (see above) can all take place without consciousness (see Augusto, 2010). Merker, in a Brentanian-like refute of unconscious mental phenomena (see Brentano,

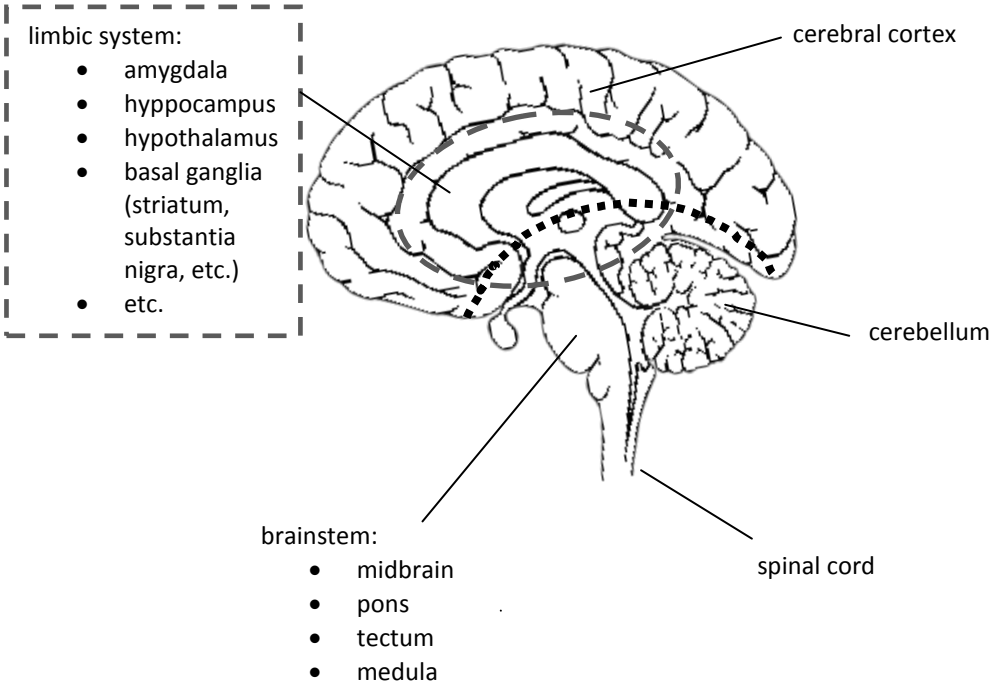

Figure 1. The 'minimal viable brain' spared in hydranencephaly in surviving patients (shown below black dotted curved line).

1874/1973), sees sentience (here: the ability to sense, or experience stimuli) as consciousness, but in this sense — labeled "creature consciousness" — an ameba can be conscious, so there is nothing gained and much actually can be lost. Although sentience is indeed an important conception, namely as far as it contributes to a much needed notion of animal welfare, it must be distinguished from whatever the mental state is that allows humans — and perhaps other animals — not only to be able to refer to their experiencing (by verbal language, by pointing, by gesturing, etc.), but also to refer to themselves as the immediate locus or source of that experiencing. The problem seems to be, of course, that from sheer sentience to self-consciousness there is a phenomenal continuum, but it might help to realize that while there can be sentience without (self-)consciousness, this requires sentience; this makes Block's (1995) *distinction* between phenomenal and access consciousness misguided, as access consciousness is necessarily phenomenal consciousness.

3.2. Case II. Conceptual representations processed unconsciously in higher-level cognition: The Perruchet Effect

Case II is well illustrated by Perruchet's (1985) results: subjects conditioned to a blinking response see their conscious expectations apparently overridden by unconsciously determined responses. While concepts are represented (the subjects 'know' what the conditioned stimuli are; see, e.g., Delamater, 2012), and it is obvious that expectations are held and verbally formulated (higher-level cognition), conscious manipulation seems to be ruled out in the specific instances when there is blinking in spite of contrary conscious expectation. In this case, conceptual representations appear to be processed unconsciously.

The relevance of Perruchtet's (1985) study lies in the fact that it suggests a conflict between conscious and unconscious mental representational processes in which the latter appear to prevail. In fact, submitted to series of presentations of a conditioned stimulus (CS) alone alternating with repetitions (reinforcements) of pairings of the CS and an unconditioned stimulus (US), where US was a puff of nitrogen and CS a 70dB, 1 sec tone, the conscious expectancies of the subjects were found to be at odds with their conditioned responses (see Fig. 2): even when consciously not expecting a puff, the subjects would blink, suggesting unconscious expectancy of the CS.

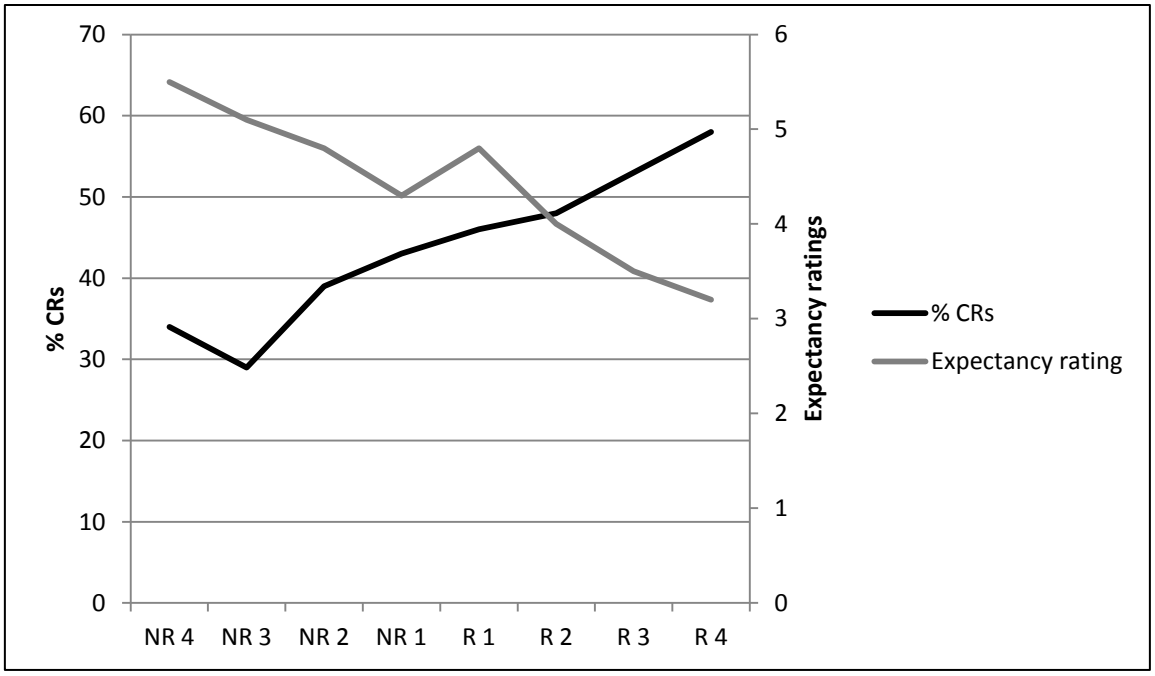

Figure 2. Mean percentage of CRs and mean subjective expectancy (full scale: 0 – 7) for the US as a function of the length (1 to 4 trials) and nature (non-reinforcement [NR] vs. reinforcement [R]) of the preceding run. (Approximate values; source: Perruchet, P. (1985))

Perruchet explains this result from a cognitive perspective based on a memory account: the subject is hypothesized to create a long-term accurate, unconscious, memory of the timing of the stimuli that may be at odds with conscious perception of the task. With the aid of another experiment, he rules out sensitization, which is dependent on reflex pathways, arguing for a conditioning effect, which seems to require the involvement of the brainstem and the cerebellum. This is particularly so in delay eyelid (blinking) conditioning in humans (e.g., Clark et al., 2002; Gerwig et al., 2007; Woodruff-Pak et al., 1996),[10] corroborating the hypothesis that unconscious cognition is to some extent

[10] For instance, delay eye blink conditioning is impaired in humans with lesions in the brainstem and the cerebellum (Clark et al., 2002)

"localized" in the cerebellum and in the brainstem, as well as in associated subcortical areas (see Fig. 1).

The main point of discussing the Perruchet effect and these latter findings is here to show that conceptual representations can, against the TMHC, indeed be processed wholly unconsciously, even when the subjects are not aware of the CS.[11] Concurrently, they also question the highly accepted multiple memory system model associated with the TMHC that strictly separates conscious, declarative from unconscious, procedural (i.e., non-declarative) memory subsystems (see, e.g., Milner et al., 1998; Squire & Wixted, 2011). The finding that delay conditioning of the eye blink reflex remains intact in human amnesics (see Clark et al., 2002) comes in support of this questioning, as it is believed that the procedural subsystems of long-term memory are not affected by amnesia (Graf et al., 1984). We thus have reasons to believe that delay eye blink conditioning is stored in a procedural long-memory subsystem; but if conceptual representation is involved in eye blink conditioning in humans — as it apparently is —, then neither the claim that conceptual representations are stored exclusively in the declarative subsystems of memory (namely in the semantic subsystem), nor the claim that the procedural subsystems are restricted to non-conceptual representations, is supported by the evidence.

[11] Note that in this Case II, and contrary to Case I, subcortical implication in conceptual representations can be supported by the subjects' (apparently) intact mature cerebral cortex (see above). We can hypothesize that fully developed conceptual representations initially require the cerebral cortex and the 'language areas,' being more or less supported by subcortical structures. Evidence for this might be the finding that thalamic lesions are associated with disturbances in naming (see Ojemann, 1991), a linguistic feature that appears to be intimately connected to conceptual representation.

3.3. Case III. Higher-level cognition without consciousness and concepts: Blindsight

Blindsight gives us reasons to believe that higher-level thinking in which conceptual representations are highly unlikely can be successfully carried out wholly in an unconscious way: patients with this condition appear to correctly process visual stimuli and properties thereof while in principle incapable of discriminating them, and thus unable to form conceptual representations of the stimuli.

Blindsight is a neuropsychological condition characterized by appropriate forced response to visual stimuli presented to subjects' scotomas (blind fields). The subjects either claim not to perceive the visual stimuli at all (blindsight Type 1), or claim to perceive/sense/detect them in modalities other than the visual one (blindsight Type 2; see Weiskrantz, 1998), reason why they typically must be forced to 'guess' the properties of presented stimuli. Telling them what the stimuli are does not appear to improve their awareness (they continue resisting performance of the task), suggesting that the processing carried out is wholly unconscious, but in some circumstances the abilities shown by patients with blindsight might indeed implicate impoverished consciousness, as some critics have pointed out, rather than wholly unconscious processing (e.g., Campion et al., 1983).[12]

Just as in Cases I and II, subcortical regions might be involved.[13] Anatomically, blindsight is accounted for by postulating a preserved subcortical visual pathway to the posterior parietal cortex (PPC) bypassing the striate cortex (V1), which implicates the

[12] This explains a safeguarding degree of doubt with respect to amenability to consciousness of stimuli presented to blind fields (see Table 2 above).

[13] As pointed out above, this might suggest that, perhaps for evolutionary reasons (e.g., earliness), subcortical structures are more extensively implicated in unconscious cognition.

superior colliculus and the pulvinar, and projects to a cortical pathway beginning in V1 and terminating in the PPC, too. These are known as the retinotectal pathway and the dorsal stream, respectively, and, in contrast with the ventral stream (also beginning in V1 and terminating in the inferotemporal cortex), are believed to process visual information wholly unconsciously and solely for "action purposes" (e.g., Ptito & Leh, 2007; Ro, 2008). In other words, in the retinotectal pathway/dorsal stream the visual stimuli are not processed in order to allow identification and storage in a semantic memory subsystem, suggesting that conceptual representation of visual stimuli is wholly or largely lacking when the ventral stream and/or the striate cortex is absent at birth (for instance, in hydranencephaly; see above), or has been lesioned or excised (e.g., in hemispherectomy; see Ptito & Leh, 2007).

In some studies with subjects presenting complete blind hemifields or with completely blind visual fields, they may be asked further to interact with the stimuli in real scenarios; for instance, they may be asked to navigate obstacles in a room. In one of these studies (de Gelder et al., 2008), it has been verified that a subject with no cortical visual abilities can successfully interact with the spatial environment unaided, which is believed to require higher-level cognition, as the subject must make decisions and accurately plan his/her next movements in the workspace in order to attain a goal (for instance, another location from that in which s/he was at the beginning of the task). Because in this case there is no residual visual cortex, the hypothesis of an impoverished visual consciousness of the workspace can safely be excluded; the subject appears to be capable of high-level, goal-controlled/directed cognition without both consciousness of the workspace and a conceptual representation of the objects that compose it.

3.4. Case IV. Conceptual representations processed unconsciously in higher-level cognition: The halo effect

Finally, research into social cognition has reported results that strongly suggest that conceptual representations in high-level cognition can be processed unconsciously. For instance, as argued by Dion and colleagues (Dion et al., 1972), people tend to associate sexual attractiveness and beauty with features that objectively may in principle have nothing to do with these, such as kindness and performance at work (the "what is beautiful is good" stereotype), with no consciousness of this association. It thus seems that concepts do not require consciousness in order to be processed, even in higher-level cognition.

We appear to apply unconsciously many and complex rules when interacting socially. A vast body of experimental studies into implicit social cognition (see, e.g., Greenwald & Banaji, 1995; Steele & Morawski, 2002) has identified some of these complex rules/patterns/algorithms/etc., of which the halo effect, first identified by Thorndike (1920), seems particularly interesting. This is the biasing influence of a — central or prominent — property or characteristic (e.g., beauty, attractiveness) upon other features not objectively connected to it (e.g., kindness, sociability, performance at work, etc.). In principle, conceptual representations are implicated: beyond the 'purely aesthetic' appreciations, which might or might not involve conceptual representations,[14] the subjects might become/be made aware of the properties involved in their judgments.[15] In fact, what constitutes the halo effect is the fact that people make the above associations or biases unconsciously, even if they are aware of the properties

[14] A tough nut to crack for aesthetics; see, e.g., Kant (1790/2000).

[15] This degree of awareness is uncertain; this explains the safeguarding doubt with respect to amenability to consciousness (see Table 2 above).

involved. The study of Dion and colleagues (Dion et al., 1972) shows this: asked first to rate photographs of three individuals perceived as of high, medium, and low attractiveness, the subjects were then asked to make judgments (ratings) with respect to such diverse aspects as personality, happiness levels, and career success of the photographed individuals; unsurprisingly, the individuals perceived as highly attractive were invariably given higher ratings in these aspects. This study only captures in a controlled laboratory set what appears to occur spontaneously in many real-life contexts of importance for the individuals involved, such as courtrooms, classrooms, and the workplace (see, e.g., Hamermesh & Biddle, 1994; Stewart, 1980; Zebrowitz & McDonald, 1991).

Case IV suggests that unconscious information processing is, perhaps to a greater degree than conscious processing, socially and culturally biased and biasing. This might entail a sort of collective knowledge base that is acquired and modified in largely or wholly unconscious ways. That is to say that not only are individuals in a society or culture unconsciously ‘knowledgeable’ of certain types of social and cultural rules (also: patterns, algorithms, etc.) that determine the formation/activation of stereotypes and attitudes towards self and others, but these, in turn, shape the forms of social and cultural expression in societies and cultures in also wholly unconscious ways. This is thus a truly dynamic, collective unconscious that governs people’s social judgments, which are just decisions: when making a judgment about oneself or others, one is making a decision in more than one way; one is actually deciding how to behave, what to do in certain specific circumstances, how to anticipate behaviors from self and

others, etc. In other words, this is higher-level thinking, and in principle it implicates conceptual representations,[16] thus belying the TMHC and its escorting theories.

4. Conclusion

Many more cases could have been invoked from the pool of abundant findings in unconscious cognition (see Augusto, 2010; Shanks, 2005), but the above suffice to strongly suggest that neither the functional, processing requirements determine the (un)consciousness status of the mental representations, nor the ontology and/or structure of the mental representations determine their (un)consciousness status: the experimental studies invoked support the claims that reasoning and decision making (high-level thinking) can be carried out wholly in an unconscious way (Cases I to IV), and conceptual representations can undergo unconscious processing (see especially Cases II and IV). And no scientific studies are required to show us that lower-level processes and highly automated actions can (at least partially) be represented consciously, if not verbally, by gesturing, for instance.

Thus, on the one hand, it appears safe to conclude that the same type of representations can in principle be manipulated at a conscious or an unconscious level; this shows that vehicle theories are not entirely correct. On the other hand, the same kind of processing or level of thinking can be to some extent carried out either at an unconscious or at a conscious level: this contradicts process theories. If one follows Atkinson and colleagues (Atkinson et al., 2000), one is left without theories. Above all, one has to dismiss the TMHC, which postulates an ontological and/or structural

[16] Note that this feature separates this from the 'classical' Jungian postulation of a collective unconscious, which is claimed not to think, or cognize at higher-levels (see, e.g., Jung, 1928/1953).

distinction between conscious and unconscious cognitive processes. This is the task carried out in the second part of this article (Augusto, 2013).

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