

Review Article

CONSCIOUS AND SUBCONSCIOUS PROCESSES OF HUMAN MIND. A CLANDESTINE ENTITY INDEED!

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ABSTRACT

Conscious processing is partially done by unconscious processes and analysis of a lot amount of information occurs outside of awareness. Even so, consciousness has got some advantages that the unconscious does not. To what extent do we really know our minds during decision making? Previous studies have shown that people are consciously aware of their implicit evaluations. Accuracy of judgements does not necessitate the unconscious functions of mind. At the moment there is no established concept regarding what measures are most valid to demonstrate perceptual processing without awareness. Whether the unconscious processing and conscious perception rely on independent mechanisms or lie on a continuum still remains a matter of debate.

Keywords: *Awareness, Conscious Perception, Subconscious, Unconscious, Prediction*

INTRODUCTION

In functional magnetic resonance imaging study, correlation was found between hippocampal activity associated with subliminal encoding to that of the behavioural measure of unconscious analogy detection. Analogs versus broken analogs were processed with reduced prefrontal but enhanced medial temporal activity, suggesting that analogous episodes can be detected unconsciously drawing on the episodic memory network (Reber *et al.*, 2014). In a study done by using a priming paradigm, non attentively perceived fruity odour was shown to influence actual food choices, guiding individuals towards more fruity desserts. This suggests that implicit processes in food choices must be taken into account in guidelines and strategies designed to promote healthy eating (Gaillet-Torrent *et al.*, 2014).

Processing Involved in Decision Making

The unconscious thought effect occurred when distraction improved the complex decision making. Many studies suggested that this effect is more to occur with lower than higher demanding distraction tasks (Waroquier *et al.*, 2014). An expanded analysis of conscious processing and the various ways in which mental processes are unconscious was revealed in a commentary by Velmans (2014). The authors arguments did not, impact upon contemporary dual process theories of reasoning and decision making (Evans, 2014). Newell & Shanks (N&S) criticize theories on decision making that include unconscious processes, were found to be implausible and at odds with the major developments of the past decades (Dijksterhuis *et al.*, 2014). The hypothesis of unconscious influences on complex behavior was found to be observationally equivalent to the dissociability of cognition and metacognition. The article positively argued that evidence for unconscious influence is limited by the quality of the metacognitive measure used (Sher and Winkielman, 2014).

A discussion was done on how consciousness caused behaviour, based on conclusions from large scale literature reviews (Baumeister *et al.*, 2014). The review done by Newell and Shanks clearly states that inadequate procedures for assessing awareness, failures to consider artifactual explanations of landmark results, and a tendency to uncritically accept conclusions that fit with our intuitions have each contributed to unconscious influences being ascribed inflated and erroneous explanatory power in the theories of decision making (Newell and Shanks, 2014). N&S's conceptualization of the unconscious was found to be overly restrictive, compared to standard social psychological accounts. The dichotomy between distal and proximal cues was a weak point in their argument and did not circumvent the existence of unconscious influences on decision making. Evidence from moral and developmental psychology indicated that decision making results from a dynamic mixture of conscious and unconscious processes (Ingram and

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Prochownik, 2014). N&S showed that there was no convincing evidence that processes assumed to be unconscious and superior are indeed unconscious. The argument was strengthened by using alternative paradigms that showed that there was not any convincing evidence that these processes were superior (Huizenga *et al.*, 2014). Correspondence to explicit evaluations failed to meet the criteria of relevance and sensitivity. When awareness was measured adequately and in line with N&S's criteria, there was a compelling evidence that people are consciously aware of their implicit evaluations (Hahn and Gawronski, 2014). Brunswikian psychology was absent in unconscious thought theory (UTT). Research done on self insight did not explore the unconscious. Accuracy of judgments did not necessitate the unconscious and the prescriptive claim of UTT was not established (González-Vallejo *et al.*, 2014).

In chronic disorders of consciousness, modularity at the global level was reduced suggesting a disturbance in the optimal balance between segregation and integration. Network properties were altered in several regions associated with conscious processing particularly, in medial parietal, and frontal regions, as well as in the thalamus in patients with chronic disorders of consciousness recovered from coma by using resting state functional magnetic resonance imaging (fMRI). The local efficiency of medial parietal regions differed between minimally conscious and unconscious patients. Alterations in the thalamus were clearly evident in unconscious patients (Crone *et al.*, 2013). In a review done by Merrick *et al.*, (2014), it was concluded that for an olfactory content to be conscious, that content must participate in a largescale network, both in terms of the neural systems involved and the scope of information integration (Merrick *et al.*, 2014).

Conscious perception and unconscious processing could not be dissociated by their time course. Unconscious processing indexed by response priming occurred, and objective discrimination performance indexed the same conscious processes as subjective visibility reports. No matter how much attention the stimulus receives relative to the mask, whether processing is measured by conscious discrimination or by priming, determines the time course of meta contrast masking (Peremen and Lamy, 2014). Based on alternative interpretation models of the early decision related brain activity, the early brain activity reflected subcriticism levels of awareness but not the complete absence of awareness. This suggests that decisions are made unconsciously (Miller and Schwarz, 2014).

Factors Contributing to Cognitive Bias

Racial bias in neural empathic responses was not influenced by minimal forms of group categorization. The participants showed association with in group more than out group members. Race is an automatic and unconscious mechanism that drives the initial neural responses to observe and feel the pain in others (Contreras-Huerta *et al.*, 2013). The relationship between sexually differentiated childhood play specifically rough and tumble play (RTP), and gender differences in psychosexual development and functioning were discussed by Friedman and Downey (2014). A neuroscientific model of volitional behavior has the potential to modernize forensic notions of responsibility and criminal punishment in order to inform public policy. Moving away from the language of free will towards the language of volitional control brings an enhanced understanding of the very nature of ourselves (Pierre, 2013).

There was no genuine dissociation in visual sensitivity measured by yes no and forced choice responses. The results suggest that evidence for visual sensitivity in the absence of awareness must be analysed using a bias free psychophysical measure such as d' , in order to confirm whether or not visual performance is truly unconscious (Lloyd *et al.*, 2013). Heightened perceptions of risk regarding the fetal safety during childbirth significantly affected women's ability to accurately assess the risk of using clinical interventions such as the time of admission, oxytocin, or cesarean birth and epidural anesthesia (Regan and McElroy 2013). In a review study done on the nature for clinical diagnostic reasoning, it was concluded that strategies directed at increasing analytical processing, by slowing down, reducing distractions, paying conscious attention, and other strategies directed at making students aware of the effect of cognitive biases, have no impact on error rates. Strategies based on increasing application of relevant knowledge have ample success rate and are consistent with basic research on concept formation (Monteiro and Norman, 2013).

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Informational invitation letters increased the intention and the intention predicting variables in a study done in an internet survey to assess the unconscious associations of chlamydia screening with annoyance, threat and reassurance. Hence the screening behavior can be increased by the use of an alternative information letter adapted to the specific unconscious and conscious determinants (ten Hoor *et al.*, 2013). Results of study done on monkeys to do a localization task, could not establish the existence of phenomenal vision in monkeys. The dissociation of visually guided action from detection parallels the dissociation of conscious and unconscious vision seen in humans (Andersen *et al.*, 2013). In study done by Oka (2013), depersonalization and schizophrenia were discussed in relation with hysteria. It was suggested that the unconscious could be topographically localized not only in a deep portion of the mental apparatus, but also in its most superficial portion, contrast to the case of Freud's psychoanalysis (Oka, 2013).

Semantic access was shown to occur for the apparently shapeless ground side of a border in a study done by Sanguinetti *et al.*, (2014) contrasting to the traditional theories of perception that only objects access semantics; abutting, patently shapeless grounds do not. The human mind is not unfit to distinguish between truth and deception but that this ability resides in previously overlooked processes. Judges who were kept from consciously deliberating outperformed judges who were encouraged to do so and also from judges who made a decision immediately. Unconscious thinkers' detection accuracy was significantly high level (Reinhard *et al.*, 2013). Repeating an unconscious and attended masked stimulus enabled the progressive emergence of perceptual awareness (Atas *et al.*, 2013).

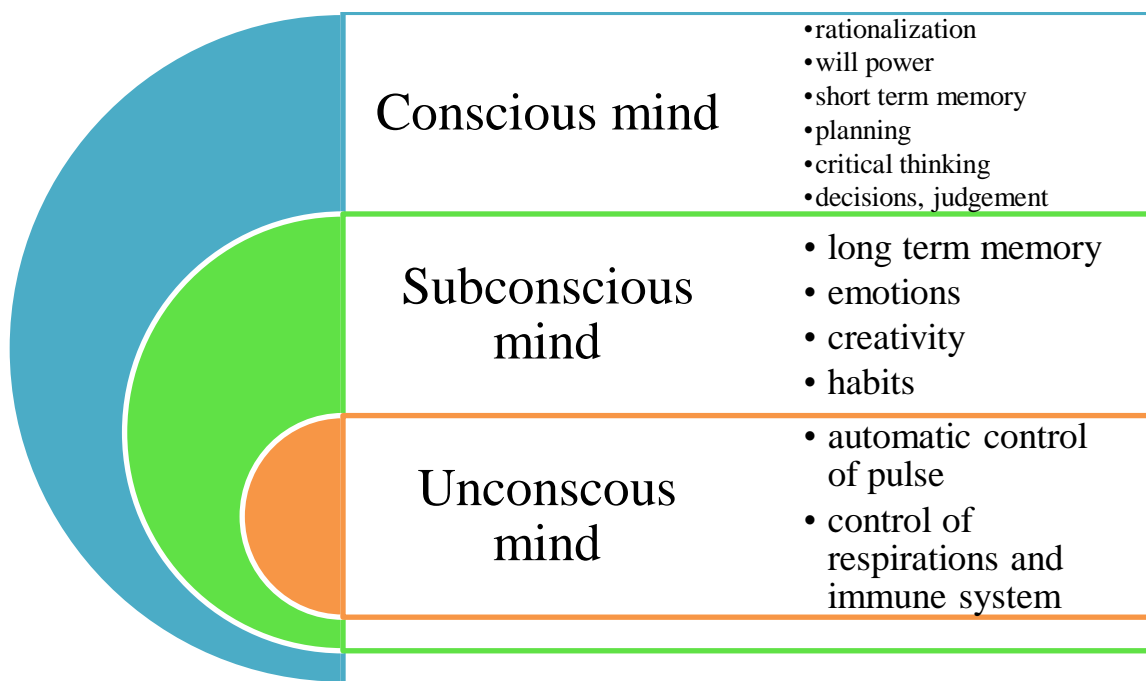


Figure 1: Functioning of mind within a single brain

Role of Cortical Neurons and Glia

A novel translational research on glial functions with a multi dimensional model was proposed, combining various experimental approaches on animal studies, in vitro & in vivo neuron glia studies, a variety of human brain imaging investigations, and psychometric assessments. This was an attempt to understand the pathophysiology of psychiatric disorders (Kato *et al.*, 2013). Propofol induced loss of consciousness was mainly found to be tied to cortico cortical, but not thalamo cortical mechanisms. Decreased efficiency of information flow was the main feature differentiating the conscious from the unconscious brain (Monti *et al.*, 2013). Emotional face processing occurs very early in time in the

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absence of any functional striate cortex. Spectral power analysis in response to the different emotions revealed the existence of specific oscillatory frequencies that reflect unconscious processing of facial expressions in affective blind sight (Zotto *et al.*, 2013). Increasing stimulus similarity did not produce exclusion failure effects and did not facilitate the measurement of unconsciousness and cognition in experiments done by using forced choice exclusion tasks like choosing the opposite of a masked target stimulus (Fisk and Haase 2013).

Synesthetic experiences were found to enhance memory performance relating to unconscious knowledge (Rothen *et al.*, 2013). The article on misconduct in the pharmaceutical industry recommends that depending on the context, different sorts of regulation must be used. Enforcement mechanisms must be tailored so that they will be sensitive to the pharmaceutical researchers' unique work motivations and to their awareness or lack of awareness of their own misconduct (Feldman *et al.*, 2013). Meta d' was a useful measure of metacognition and needs rigorous methodology for its application. The study was found to be very useful for any researchers interested in assessing metacognitive accuracy including determining the accuracy of feelings of knowing and discriminating conscious from unconsciousness and cognition (Barrett *et al.*, 2013). This stimulus elicited content was considered high level content and occurs late in the processing stream in terms of stages of processing. The study deals with the implications of paradigm for consciousness research (Allen *et al.*, 2013). Unconscious mobile cueing effects demonstrated a previously unknown degree of flexibility of unconscious exogenous attention, embody a simultaneous dissociation and association of attention and consciousness, in which exogenous attention occur without cue awareness or dissociation, yet at the same time its effect is contingent on conscious motion tracking and association. Hence the unconscious effect is not automatic but controlled (Lin and Murray, 2013).

Conflict effect was reduced in incongruent blocks relative to congruent blocks. Conflict related ERP signals i. e., the amplitude difference between congruent and incongruent trials for three ERP components, early occipito parietal negativity, the fronto central N2 and the centro parietal P3, were attenuated in incongruent blocks than congruent blocks. This shows block wise adaptation to the frequency of conflict, whether consciously and unconsciously elicited conflict (Jiang *et al.*, 2013). A positive relationship was found between intelligence and conscious memory, and no relationship between intelligence and unconscious influences, once the impact of conscious influences are removed. The above study was done using a process dissociation framework called Separating automatic from intentional uses of memory, that suggests that individual differences in intelligence reflect differences in conscious strategic processes (Joordens *et al.*, 2013). Contextual information and level of conscious awareness were important to modulate the animate advantage in emotional processing. In this study, living pictures in a negative, high-arousing dimension elicited stronger skin conductance responses than nonliving pictures when participants were presented with negative and neutral pictures that denoted different living and nonliving concepts in conscious and unconscious conditions (Tan *et al.*, 2013). Following a hypnotic amnesia suggestion, highly hypnotically suggestible subjects may experience amnesia for events. The study results suggest that the material had been retrieved but blocked from consciousness. A goal oriented information processing framework was outlined to interpret the related data (Smith *et al.*, 2013). Elements of the supportive therapy were used in the Weill Cornell randomized controlled trial for borderline patients and awareness of transference was used by the therapist to avoid injury to the patient's self esteem and to maximize tact in addressing the patient's defenses and maladaptive behaviors (Carsky, 2013). Using a temporal statistical learning paradigm, evidence was found that the internal representations of individual stimuli were differentially altered according to the degree of temporal predictability. The findings complemented previous accounts of statistical learning and revealed an enriched mechanism of human learning, that learning to associate items enhances the representations of certain items relative to others (Barakat *et al.*, 2013). In the serial reaction time task checking using global local Navon letters, British expressed a greater local bias in perception than Chinese, confirming a cultural difference in perception. Chinese learned the target regularity better than the British when the targets were global, indicating a global advantage for Chinese in implicit learning who also were more sensitive to contextual regularities than the British. Cultural bias has a profound influence on both what

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people consciously perceive and unconsciously learn (Fu *et al.*, 2013). Experiments investigated the extent of subliminal processing of negation revealed that priming effects were found in the absence of partial awareness, without the effect being attributed to the retrieval of stimulus response links established during conscious rehearsal (Armstrong and Dienes, 2013). Explicit memory processes mediated by the dorsolateral prefrontal cortex indirectly interfere with implicit recognition memory (Lee *et al.*, 2013).

The study on legally blind participants revealed that the visual system can apparently cope with degraded visual input through information available from an unconscious secondary pathway via the superior colliculi (Brown *et al.*, 2013). Conscious thought provides the input from indirect kind of mental simulations to the executive instead of controlling directly. Conscious thought offers insights about the past and future, socially shared information, and cultural rules. Without a conscious thought, the complex forms of social and cultural coordination that define human life would be impossible. Conscious thought processes actions and events that were typically removed from the here and now and indirectly shapes action to favour culturally adaptive responses (Masicampo and Baumeister, 2013). Mindfulness meditation, with the resulting alpha brain state has been useful to stimulate behaviour change through subconscious re programming, as an adjunct to health (Stinson and Arthur, 2013). A forced choice signal detection paradigm showed that the effect of self resemblance operated at an unconscious level suggesting that individuals, if given the opportunity, seek to promote a positive assortment for self's phenotype, in a state when the level of similarity approaches an optimal point that is similar to self without causing a conscious acknowledgment of the similarity (Laeng *et al.*, 2013). Noble prize winner psychologist Daniel Kahneman had shown that the primary process is not wish fulfilling, as claimed by Freud, but adaptive. The waking primary process was found to be in service of the reality principle (Modell, 2013).

The study exploring the implicit learning of nonlocal dependencies generated by higher than finite state grammars using Chinese tonal retrogrades and inversions, people acquired unconscious structural knowledge of both tonal retrogrades and inversions. Inversions were implicitly learnt more easily than retrogrades constraining the nature of the memory buffer in computational models of implicit learning (Li *et al.*, 2013). More transfer occurred between metaphorically related domains when judgment knowledge was conscious intuition rather than unconscious guess suggesting that conscious and unconscious judgment knowledge had totally different functional properties (Guo *et al.*, 2013). The study that investigated unconscious and conscious processes by which negative emotions arise concluded that when emotional stimuli were consciously distinguished, the evoked emotional states lead to emotional conflicts. The qualitatively different effects will be caused when subliminally presented emotion evoking stimulus was appraised unconsciously (Okubo and Ogawa, 2013). Persuasiveness scores were high in participants exposed to a loss framed than to a gain framed message, but only when the loss framed message was presented in white text on a red background in an online flu vaccination program. The theoretical and practical implications of manipulating these two factors for development of health promotion materials to be more effective and impacting, is needed at the moment (Chien, 2013). Phobic individuals perceive their feared stimulus unconsciously, and establish the first direct demonstration of such feared stimulus for emotional stimuli (Siegel *et al.*, 2013).

Conscious and unconscious memories were mentally integrated into a linked mnemonic representation, in a study done on event integration (Henke *et al.*, 2013). Being confronted with strains in their own team leads to stress, which showed that the methods used for stress management following critical incidents was not sufficient enough. Interviews concerning the stressful experiences during operations were done and analysed using the JAKOB Narrative Analysis (Beck *et al.*, 2013). Implicit learning of the 'to be rejected structure' at test contaminated familiarity based classifications, but the feedback allowed competing familiarity signals to be contextualised, which was incompatible with the theories that consider familiarity context insensitive, thus supporting a dual process of artificial grammar learning (Mealor and Dienes 2013).

Stress and Depression:

Subjects with mild subclinical depression, rated low and high fat stimuli similarly when in positive or negative mood. This has potential implications for unhealthy eating patterns. This deficit fosters

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unconscious eating of fatty foods in sub clinical mildly depressed individuals (Platte *et al.*, 2013). A subconscious, reflexive appreciation of others' intentions, emotions, and perspectives is at the roots of even the most complex forms of theory of mind and these abilities have evolved because natural selection has favored individuals who were motivated to empathize with others and attend to their social interactions. These are adaptive skills and females who manifest high rates of affiliative behavior were more motivated to anticipate challenges, react adaptively to setbacks and respond appropriately to social interactions (Seyfarth and Cheney, 2013).

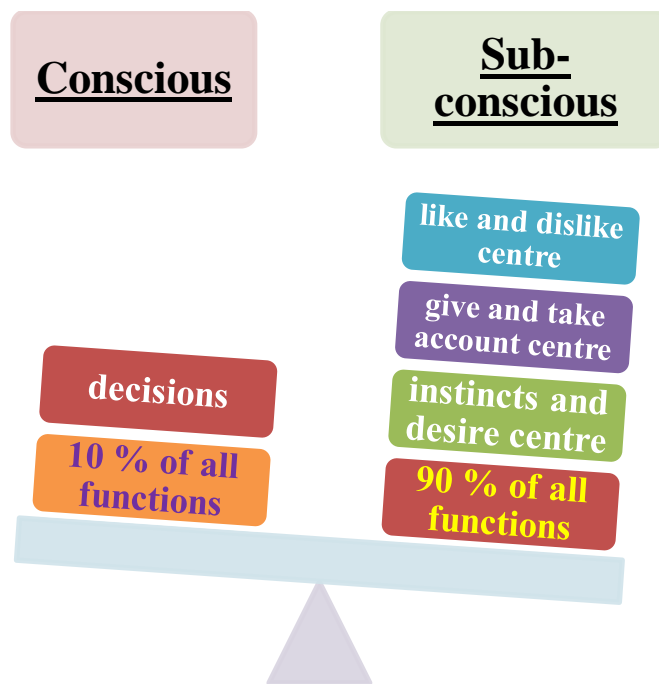


Figure 2: Centres in mind

Restorative clinical supervision that delivered to professionals showed to be highly effective in reducing burnout, stress and increasing compassion satisfaction suggesting that organisations need to maintain the programme once the initial training has been completed and have confidence within the restorative group supervision to support professionals in managing the emotional demands of their role in an institution (Wallbank, 2013). Giving ample amount of time to do the job, improved the skill mix of the staff, thus cutting down senior nurses' paperwork. Likewise ensuring that all the staff works consistently to the highest standard (Lomas, 2013). Behavioural and social sciences were found to be useful in collecting and analysing intelligence data, understanding terrorism, and developing strategies to combat terrorism. The article by Leistedt (2013), examined the psychopathological concepts of terrorism and discussed the developing roles for behavioural scientists. The self management competencies were emotional self control, achievement orientation, initiative, trustworthiness, conscientiousness, adaptability, and optimism in a sample of dental students that were the predictors of mean clinical grade assigned by preceptors. Emotional intelligence was an important predictor of clinical performance, with implications for students' development during dental school (Victoroff and Boyatzis, 2013).

Online aggression and victimization have received limited conceptual development inspite of widespread public attention to cyber bullying. The article by Runions (2013), discussed on how opportunities for aggression were distinct online from those of offline social contexts. The study done by Trawalter *et al.*, (2012) provided ample evidence that people assumed a priori that Blacks feel less pain than do Whites. This bias was found to be rooted in perceptions of status and the privilege or hardship status confers to the bias and not race per se.

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CONCLUSION

The local efficiency of medial parietal regions differed between minimally conscious and unconscious patients. Alterations in the thalamus were evident in unconscious patients. Conscious perception and unconscious processing could not be dissociated by their time course. Most of the life decisions are made subconsciously. Teaching strategies based on increasing application of relevant knowledge tend to minimize error rates in students. Conceptual bias is rooted in perceptions of status and the privilege or hardship status confers to the bias and not race per se. Conscious thought gives insight on our past and future, socially shared information, and cultural rules. Without a conscious thought, the complex forms of social and cultural coordination that define human life are impossible. One's subconscious mind-set totally depends on his/her circumstances faced during adolescence. Context affects the content of false perceptions through the activation of stored beliefs and values in the mind, which vary between individuals depending on their own culture and religion. Behaviour change and cross cultural adaptation is possible through subconscious re programming of the mind-set.

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