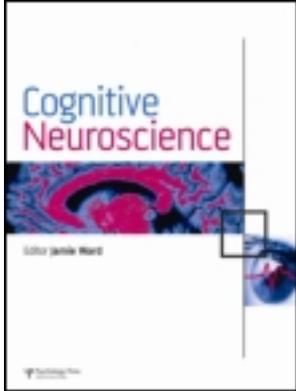


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### Implicit emotional awareness in frontotemporal dementia

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“awareness” and lack of it, without recourse to a dual route system such as Mograbi and Morris propose.

But the pattern is not so clear-cut. Some explicit judgments are preserved in AD. Souchay (2007) describes a complex pattern of preserved and impaired metacognition. People with AD have adequate knowledge of what is easy or difficult to remember (e.g., characteristics of words and list lengths) but not the explicit knowledge that their memory is impaired. Thus, explicit awareness depends on what type of knowledge is being assessed. Whilst people with AD can accurately gauge the state of their memory for semantic (general knowledge) tasks, in the same paradigm, they are unable to accurately predict performance on episodic materials.

Mograbi and Morris provide a structure by which we may come to understand the behaviors and beliefs of people with anosognosia, and we argue that the core element of their model can be captured empirically in metacognitive paradigms. However, there are a few caveats. As above, some explicit judgments are preserved in AD: There is not a complete failure to reflect rationally on one’s cognitive activities. For instance, the type of information used to gauge the difficulties of words to be remembered, is not useful for the assessment of one’s limitations in general. For that, we need a more expansive view of metacognition. Moreover, metacognition is nearly only researched with memory tasks, as Mograbi and Morris note.

Perhaps the most critical issue which comes from a metacognitive viewpoint, is that we should be careful about inferring “awareness” from non-aware behaviors. For instance, patients with AD elect to study words for about four times longer than controls. This might be a tacit acknowledgment of their dysfunction (i.e., implicit awareness); but it may also be a failure to respond to low-level feelings which signal the need to terminate study. It may also represent a strategic failure to give up studying when it would be wise to do so. The only way to negotiate these different interpretations may be to avoid the neo-behaviorist interpretation of behaviors as “aware,” and consider instead subjective reports of experience, motivation, and the relation between awareness and function using the framework proposed by Mograbi and Morris.

Finally, Mograbi and Morris suggest that implicit awareness may guide behaviors and therefore have a therapeutic value. The current AD literature shows that if patients are implicitly aware in their metacognition, then it has very little benefit for their function. The exploration of how we might bring to awareness information streams that will help patients is a priority. In MCI we showed that patients were aware of the benefits of errorless learning—a technique based on implicit memory processes—in the explicit predictions of

performance that they made (Akhtar, Moulin, & Bowie, 2006).

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## Implicit emotional awareness in frontotemporal dementia

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**Abstract:** The preserved “implicit awareness” in patients with Alzheimer disease (AD) presenting anosognosia has opened a new branch of research regarding explicit-implicit integration. The behavioral variant of frontotemporal dementia (bvFTD), contrary to AD, would present impaired anosognosia-related implicit awareness due to a dysfunctional implicit integration of contextual information caused by an abnormal fronto-insular-temporal network. Loss of insight and anosognosia are pervasive in bvFTD, but no reports have assessed the implicit emotional awareness in this condition. We emphasize the need to investigate and extend our knowledge of implicit contextual integration impairments and their relation with anosognosia in bvFTD vs AD.

Mograbi and Morris have highlighted a curious and not well-known phenomenon of “implicit awareness” in patients with Alzheimer disease (AD). Despite unawareness of deficit, these patients preserve the emotional reaction to disability-related material, suggesting some kind of intrinsic knowledge about the illness. Moreover, they have discussed the anosognosia in terms of a general process including explicit-implicit integration through emergent networks influenced by top-down modulation, expectation, and anticipation. Furthermore, their approach to anosognosia is not restricted to basic processes such as perception, but also includes emotional and social cognition processes.

Within this framework, we discuss the hypothesis that the behavioral variant of frontotemporal dementia (bvFTD), in contrast to AD, would present impaired anosognosia-related implicit awareness. This deficit would be triggered by the impaired implicit contextual integration of social knowledge.

Patients diagnosed with bvFTD demonstrate early decline in social interpersonal behavior, early impairment in regulation of personal conduct, as well as early loss of insight and progressive deterioration in their social functioning (Piguet, Hornberger, Mioshi, & Hodged, 2011). Insidious behavioral changes and social cognition deficits are related to disintegration of neural circuits engaged in social behavior (Piguet et al., 2011). Ibáñez and Manes (2012) have proposed that the deficits of bvFTD patients in social cognition (e.g., emotions, empathy, decision making, theory of mind, etc.) can be understood as a general impairment of implicit integration of social context information due to an abnormal fronto-insular-temporal network. The damage to this network is linked to a dysfunctional implicit integration of emotional-social cognition information that prevents patients from updating and anticipating implicit contextual information (Melloni, Lopez, & Ibáñez, 2013). Similarly, Seeley

(2010) argues that in bvFTD there takes place a progressive fronto-insular “Salience Network” breakdown that leaves patients unable to model the implicit emotional impact of their own actions or inactions. Contrarily, when explicit information is provided, bvFTD spares multiple cognitive and social domains (Burgess, Alderman, Vollet, Benoit, & Gilbert, 2009; Mesulam, 1986). For this reason, the use of explicit traditional tests is not good for assessment of bvFTD, given that these tasks lack the implicit context of everyday situations (Burgess et al., 2009; Ibáñez & Manes, 2012). Summarizing, integration of implicit social information within awareness seems to be impaired in bvFTD. Thus, bvFTD deficient integration of implicit information would prevent the access to implicit awareness of the own condition.

Complex, multi-factorial concepts such as “loss of insight” require not only inference, but determination of kind and quality of insight failure. A patient may state that he/she has bvFTD, but fail to appreciate the behavioral, functional, or cognitive consequences of his or her illness. In some cases, loss of insight into illness may be indistinguishable from lack of concern.

Loss of insight and anosognosia are a prominent clinical manifestation in bvFTD, presenting more severe affectation than AD patients (e.g., Méndez & Shapira, 2011). In spite of these features, there are no reports about affectation of implicit awareness in this condition.

This scenario opens new research challenges: (1) to determine the possible implicit contextual integration impairments and their relation with different levels of anosognosia in bvFTD vs AD; (2) to assess the possible influence of fronto-insulo-temporal networks in the emergence of anosognosia in bvFTD; (3) to design rehabilitation strategies based on implicit awareness, taking into account the importance of teaching implicit rules for interpreting unpredictable social knowledge (Baez et al., 2012, 2013); (4) to develop neuroscience studies to support neuroanatomical models of implicit-explicit integration within anosognosia research. Thus, a fruitful extension of implicit awareness to bvFTD research would shed light on these questions.

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## More work on lack of awareness and insight in healthy people and psychiatric patients will assist model building

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**Abstract:** We comment on the work of Mograbi and Morris and their newly developed Cognitive Awareness Model in terms of metacognition and awareness of disability in health aging, dementia, and psychosis. It is suggested that further research comparing implicit awareness of disability and objective metacognitive processes would be useful for theory development, as well as further understanding cognitive models of insight in the clinical domain.

Mograbi and Morris provide a fascinating overview of the concept of implicit awareness in clinical anosognosia. We would make the point that further study

of implicit awareness of performance and behavior, initially in healthy aging, and later in other clinical groups, will enhance understanding and aid theoretical development. The authors state that implicit awareness is “also observed in normal ageing, where reduced driving can be a strategic response in relation to other disabilities and factors such as fatigue”, however, this may not always be the case. A recent study by Ross, Dodson, Edwards, Ackerman, and Ball (2012) investigated age-related decline in awareness of driving abilities in adults between 65 and 87 years. They found the number of self-reported accidents and driving citations significantly increased with age, while time spent driving did not. Interestingly, regardless of previous accident history, 85% of the drivers rated their abilities as “good” or “excellent.” This indicates that driving abilities decline with age, while awareness of this does not, and is not always implicitly addressed by a change in driving behaviors. These results support the CAMs model “gating mechanisms,” suggesting that new information about driving ability is not used to update Personal Data Base, therefore metacognitive judgments are made using out-of-date information. Inappropriate behavior is therefore likely to ensue, such as driving despite increased crashes. Further research into implicit awareness of problems with daily activities would be an interesting addition to healthy aging literature.

The cognitive neuroscience of metacognition is rapidly developing, with obvious clinical implications (David, Bedford, Wiffen, & Gillean, 2012). New methods have been developed to account for varying levels of performance, exposing differences in appraisal of performance (Fleming, Weil, Nagy, Dolan, & Rees, 2010). Hence, an interesting line of enquiry would be whether implicit awareness as defined by Mograbi and Morris was related to more objective measures of metacognition, as patients' metamemory abilities have already been linked to clinical awareness of illness (Cosentino, Metcalfe, Butterfield, & Stern, 2007). A recent study by Weil et al. (2013) investigated perceptual metacognitive abilities of healthy participants aged 12–41 years, using a two-forced-choice perceptual judgment confidence rating (Fleming et al., 2010). Results indicated that overall there was a negative relationship between perceptual metacognition and age. However, when analyzing data from participants between 12 and 17 years, there was a significant positive relationship between perceptual metacognition and age, and a decrease in metacognitive ability as participants entered middle age (18–41 years). Recently presented data at the 2013 Association for the Scientific Study of