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## Short Communication

Self-awareness deficits following loss of inner speech:  
Dr. Jill Bolte Taylor's case study<sup>☆</sup>Alain Morin<sup>\*</sup>

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## ABSTRACT

In her 2006 book *"My Stroke of Insight"* Dr. Jill Bolte Taylor relates her experience of suffering from a left hemispheric stroke caused by a congenital arteriovenous malformation which led to a loss of inner speech. Her phenomenological account strongly suggests that this impairment produced a global self-awareness deficit as well as more specific dysfunctions related to corporeal awareness, sense of individuality, retrieval of autobiographical memories, and self-conscious emotions. These are examined in details and corroborated by numerous excerpts from Taylor's book.

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## 1. Introduction

A growing number of researchers are suggesting that language plays an important role in consciousness (e.g., Carruthers, 2002; Dennett, 1991; Rosenthal, 2008). Some are proposing that it is inner speech *per se* that should be linked to higher cognitive abilities such as self-awareness, as opposed to more general language functions (Briscoe, 2002; Leary, 2004; Morin, 2004; Nelson, 2005). That is, to some it may appear unclear how the broad act of language could participate in the processing of self-relevant information; however, it seems easier and more conceivable to connect speech-for-self to self-awareness, where one engages in attempts to subvocally analyze and describe the self. In this view, inner speech can be seen as a cognitive process that may (1) internally reproduce social mechanisms leading to perspective-taking, (2) create a psychological distance between the self and mental events it experiences (thus facilitating self-observation), (3) operate as a problem-solving device where the self constitutes the problem to be solved and self-information the solution to the problem, and (4) verbally label aspects of one's private life that would otherwise be difficult to objectively identify (see Morin, 2005, for details; see Burns & Engdahl, 1998; Clowes, 2007; Stamenov, 2003; Steels, 2003, for additional theoretical accounts).<sup>1</sup>

Empirical evidence supporting the existence of a connection between self-awareness and inner speech is still limited yet promising. To illustrate, a significant positive correlation has been found between validated measures of frequency of self-

<sup>☆</sup> I would like to thank Dr. Jill Bolte Taylor for her kind and patient assistance in providing helpful clarification to her priceless and colourful account of what it is to experience "the formless abyss of a silent mind".

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<sup>1</sup> Although this paper specifically emphasizes the postulated role played by inner speech in the processing of self-relevant information, the reader is reminded here that inner speech serves various additional functions that have been extensively studied, among which verbal self-guidance (or self-regulation) (see Fernyhough & Fradley, 2005; Fuson, 1979; Vygotsky, 1943/1962), language production (Levine, Calvanio, & Popovics, 1982), verbal short-term memory (Baddeley & Hitch, 1974), task switching performance (Miyake, Emerson, Padilla, & Ahn, 2004), planning, problem-solving, and remembering the goals of action (Meacham, 1979). Also note that dysfunctional inner speech is frequently implicated in various forms of psychological disorders such as schizophrenia, social anxiety, and depression (e.g., Allen, Aleman, & McGuire, 2007; Beazley, Glass, Chambless, & Arnkoff, 2001).

focus and self-talk (e.g., Schneider, Pospeschill, & Ranger, 2005; Siegrist, 1995). This indicates that the more one engages in introspection to acquire self-information and develop a self-concept, the more one talks to oneself (about oneself), and vice-versa (Morin & Joshi, 1990). Studies measuring brain activity during processing of self-information consistently show activation of the medial prefrontal cortex and various additional areas that often include the left inferior frontal gyrus (LIFG). This suggests inner speech activity during some self-awareness tasks because the LIFG reliably gets activated when participants are asked to silently articulate sentences (McGuire, Silbersweig, Murray, et al., 1996) or single words (McGuire, Silbersweig, Wright, et al., 1996). Indeed, Morin and Michaud (2007) reviewed 59 studies measuring brain activity during processing of self-related stimuli and found that 60% of all studies reported LIFG (and presumably inner speech) activity during self-awareness tasks. This supports the view of a relative involvement of inner speech in self-reflective processes, especially those with conceptual, as opposed to perceptual, components.

It has been observed that in brain damaged patients who eventually recover from their trauma, conscious experience often returns in parallel with inner speech (Ojemann, 1986); conversely, healthy individuals report inner speech inhibition when they shift from wakefulness to sleep (Rusalova, 2005). Not surprisingly then, loss of inner speech caused by brain injury negatively affects self-awareness, as the following quotation by Scott Moss, a former aphasic patient, suggests:

I had lost the ability to converse with others, I had also lost the ability to engage in self-talk. In other words, I did not have the ability to think about the future—to worry, to anticipate or perceive it—at least not with words. Thus for the first 4 or 5 weeks after hospitalization *I simply existed.* (Moss, 1972, p. 10; italics added)

The above citation from Moss' book represents the only occasion he mentions his inner speech impairment; furthermore, he does not directly address the issue of the impact of this deficit on his self-reflective abilities. Jill Bolte Taylor (2006) recently published a book in which she relates her experience of suffering from a stroke in the left hemisphere, which led to a severe language and inner speech deterioration. As a Ph.D. in neuroanatomy who was fortunate (and strong) enough to recuperate from this ordeal, she presents in her book a detailed phenomenological account of how it felt to experience total silence in her mind. Importantly, and unlike Moss' report that remains vague in that respect, Taylor frequently discusses various forms of self-awareness deficits allegedly produced by the loss of inner speech. More specifically, she describes a global self-awareness disturbance, corporeal awareness deficits, a distorted sense of individuality, problems with retrieval of autobiographical material, and lack of self-conscious emotions. All the above (with the possible exception of corporeal awareness) are postulated to depend on intact inner speech, where one can verbalize to oneself one's current emotions, values, goals, traits, behaviors, physiological sensations, perceptual experiences, etc. (global self-awareness and sense of individuality—e.g., Who am I?, What kind of person am I? Why do I feel that way? Why did I do that?); where one verbally narrates to oneself past episodes of one's life (autobiography—e.g., Last summer I spent 1 month at my brother's...); and where one verbally worries about impressions made on others (self-conscious emotions—e.g., I probably look very foolish...).

Taylor's testimony, although unavoidably subjective and based on retrospective recall,<sup>2</sup> can be taken as additional evidence for the existence of a link between self-awareness and inner speech. This evidence is presented below.

## 2. Jill's stroke and its impact on her inner speech

Jill was 37 years-old when she suffered from a hemorrhagic stroke in her left hemisphere caused by a congenital arteriovenous malformation. The hemorrhage originated at the fronto-temporal junction right in between Broca's and Wernicke's areas, and in the space of a few hours a large blood clot had formed and disabled both these language regions, at which point "... my brain chatter began to disintegrate..." (p. 41). "Where was my language... what had become of the brain chatter, which was now replaced by a pervasive and enticing inner peace?" (p. 47).

Although it is clear from Jill's personal account that she rapidly lost most of her ability to engage in self-talk as a result of her hemorrhage, it should be emphasized that she did not entirely lose inner speech, at least in the early phase of the stroke. In the chapter "Morning of the stroke", Jill provides numerous examples of what appears to be inner speech "left overs", all in italics, e.g., "What is going on?" (p. 41), "What is it I am trying to do?" (p. 44), or "... resounding like thunder from deep within my being, a commanding voice spoke clearly to me: *If you lie down now you will never get up!*" (p. 45). She never explicitly refers to these passages as inner speech occurrences, but recently confirmed to the present author in a personal communication that they actually are. In addition, at times Jill uses the expression "moments of clarity" to designate episodes when "... I could see, I could identify, I could remember what I was doing, and I could discriminate again between the varied incoming stimuli" (p. 57). She also specified in a personal communication that these moments of clarity were remnants of inner speech in the early period of her stroke. Once completely deteriorated, inner speech was gone for 5 weeks. Jill reports that imagery then replaced inner speech:

The most notable difference between my pre- and post-stroke cognitive experience was the dramatic silence that had taken residency inside my head. I just didn't think in the same way. Communication with the external world was out. Language with linear processing was out. But thinking in pictures was in. (pp. 75–76)

<sup>2</sup> Taylor specifies that "Post-stroke year two was spent reconstructing, as best I could recall, the morning of the stroke. I worked with a Gestalt therapist who helped me verbalize my right hemisphere experience of that morning..." (p. 126).

As a matter of fact, one can often find examples of “thinking in pictures throughout the book—e.g., “As I visualised the road...” (p. 44); “I visualized myself...” (p. 48); “In an instant a number flashed though my mind’s eye” (p. 51); “I quickly jotted down the image I saw in my mind” (p. 53); and so forth. The use of mental images instead of words led to a drastic shift in problem-solving strategy—namely, starting from the specific (a single image) and getting to the general (a broad concept), as opposed to beginning with something general and ending with a particular element. This caused some frustrating difficulties to Jill. For instance, when asked “Who is the President of the United States?”, she first formed an image of what a president is (a prototype, one assumes), and second, an image of the United States. She then put the two together, “But my doctor was not asking me anything that was really about the United States or about a President. He was asking me to identify a specific man, and that was a completely different file. Because my brain could not get from ‘President’ and ‘United States’ to ‘Bill Clinton’, I gave up...” (p. 77).

Perhaps if they had asked me a question about Bill Clinton specifically, then I would have found an image of Bill and then been able to expand from there. If they had asked me, ‘Who is Bill Clinton married to?’, then I would have found an image of Bill Clinton, an image of matrimony and then hopefully an image of Hillary standing by her man. When using pictures to navigate my way back into language, it was impossible to go from a general file to a specific detail (p. 77).

### 3. Consciousness and self-awareness without inner speech

The hypothesis being put forward here is that Jill’s loss of the ability to verbally converse with herself led to self-awareness deficits—not to consciousness disruptions. Indeed she recurrently indicates that her consciousness, as defined as being capable to focus one’s attention toward the environment and to process incoming external stimuli (Natsoulas, 1978), was preserved despite her stroke and loss of inner speech. To illustrate: “I was conscious and constantly present within my mind” (p. 41); “... I still retained a consciousness” (p. 66); “... I was not unconscious” (p. 73). The following citation further suggests that Jill maintained some intact metacognitive skills: “I was fully aware that I was inept at holding a plan in my mind long enough to execute it” (p. 47).

Self-awareness represents the ability to focus one’s attention inward toward the self and to process self-information, either of a private nature (e.g., emotions, sensations, values, goals) or of a public nature (e.g., behavior, physical appearance) (Duval & Wicklund, 1972; Fenigstein, Scheier, & Buss, 1975). Self-awareness constitutes a complex multidimensional construct that includes the following elements: knowing that one remains the same person across time, that one is the author of one’s thoughts and actions (sense of agency), and that one is distinct from the environment (Kircher & David, 2003). Self-awareness brings about the realization that one exists as an independent and unique entity in the world and that this existence will ultimately end. This awareness of self is associated with a host of concepts among which are self-recognition, self-regulation, self-knowledge, self-esteem, personal identity, and autobiography (Morin, 2004).

Jill’s deficits caused by her stroke affected her overall self-awareness as well as four more specific sub-dimensions of her sense of self: She experienced (1) an inability to identify her own physical boundaries, (2) a loss of sense of individuality, (3) difficulties with retrieval of autobiographical memories, and (4) a lack of self-conscious emotions, most notably embarrassment.

#### 3.1. General self-awareness

The following quotations exemplify Jill’s global self-awareness disturbance: “I retained only a vague idea of who I was and what I was trying to accomplish” (p. 52); “What a daunting task it was to simply sit there in the center of my silent mind... and trying to remember, *Who am I? What am I doing?*” (p. 57); “... I had lost my left hemisphere consciousness containing my ego center and ability to see my self as a single and solid entity separate from you... one set of programs was no longer functioning—the one that reminded me moment by moment of who I was and where I lived, etc.” (pp. 71–72); “I struggled to comprehend my existence” (p. 91). And perhaps most importantly:

Without a language center telling me: ‘I am Dr. Jill Bolte Taylor. I am a neuroanatomist. I live at this address and can be reached at this phone number,’ I felt no obligation to being her anymore. It was truly a bizarre shift in perception, but without her emotional circuitry reminding me of her likes and dislikes, of her ego center reminding me about her patterns of critical judgment, I didn’t think like her anymore. From a practical perspective, considering the amount of biological damage, being her again wasn’t even an option! In my mind, in my new perspective, that Dr. Jill Bolte Taylor died that morning and no longer existed. Now that I didn’t know her life—her relationships, successes and mistakes, I was no longer bound to her decisions of self-induced limitations.” (pp. 67–68)

#### 3.2. Physical boundaries

Jill frequently reports an inability to identify her physical boundaries, one of the four more precise self-awareness dysfunctions mentioned above. She indicates that “I could not determine how my body was positioned, where it began or where it ended. Without the traditional sense of my physical boundaries, I felt that I was at *one* with the vastness of the universe”

(p. 65). “My entire self-concept shifted as I no longer perceived myself as a single, a solid, an entity with boundaries that separated myself from the entities around me” (p. 69). This corporeal awareness deficit can be linked to one’s sense of agency and feeling of distinctiveness from one’s environment. Although the claim is being made here that most self-awareness disturbances experienced by Jill were produced by her loss of inner speech, this most likely does not apply to her failure at identifying her physical boundaries, which has been repeatedly associated with lesions to the superior parietal gyrus (e.g., [Berlucchi & Aglioti, 1997](#))—an area that was compromised by her hemorrhage.

### 3.3. Sense of individuality

Related to the feeling a physical distinctiveness is a sense of individuality, which is clearly disturbed following Jill’s stroke: “. . . my consciousness soared into an all-knowingness, a ‘being at one’ with the universe. . .” (p. 41); “I no longer perceived myself as a whole object separate from everything” (p. 42); “. . . it was impossible for me to perceive either physical or emotional loss [e.g., death or heartache] because I was not capable of experiencing separation or individuality” (p. 70); “I had stepped beyond my perception of myself as an individual” (p. 61).

### 3.4. Autobiography

One’s ability to retrieve information about one’s past personal live events obviously represents an important part of self-awareness (see [Conway, 2005](#); [Conway et al., 1999](#); [Klein, Rozendal, & Cosmides, 2002](#)) as it allows one to keep an on-line mental representation of who one is. There is recent evidence showing that personal episodes (autobiographical information) are encoded and retrieved both in images and words, suggesting that we often recall personal events as self-narratives that involve inner speech (see [Larsen, Schrauf, Fromhold, & Rubin, 2002](#)). Jill’s stroke negatively affected her autobiographical retrieval process, as illustrated by these citations: “Those *little voices*, that *brain chatter* that customarily kept me abreast of myself in relation to the world outside of me, were delightfully silent. And in their absence, my *memories of the past* and my dreams of the future evaporated” (pp. 42–43; italics added); “I became detached from the memories of my past” (p. 41); “Coupled with my loss of long-term and short-term memories, I no longer felt grounded or safe in the external world” (p. 57); “With my mind stripped of its ability to remember the memories and details of my previous life, it was clear to me that I was now like an infant. . .” (p. 67).

### 3.5. Embarrassment

Self-conscious emotions such as shame, guilt, embarrassment, pride, and jealousy, are emotions that entail that the organism experiencing them has a sense of self as well as a set of internal standards ([Buss, 1980](#)). Studies show that there is a correlation between the emergence of self-conscious emotions in children and the development of self-awareness ([Lewis, 1992](#)). Jill reports on a few occasions that her sense of embarrassment was numbed following her stroke, suggesting self-awareness alterations: “Among the many circuits in my brain that had gone off-line, it was my good fortune that my circuitry for embarrassment had also gone awry” (p. 83); “Lots of people looked at me as if I was odd, but having lost my left hemisphere ego center, I wasn’t concerned with their approval or disapproval” (p. 125).

## 4. Discussion and conclusion

Dr. Jill Bolte Taylor’s case study of a left hemispheric stroke produced by a congenital arteriovenous malformation provides additional evidence for the existence of a connection between what she refers to as “brain chatter” and self-awareness—a global sense of self as well as one’s physical boundaries, sense of individuality, autobiography, and self-conscious emotions. It could be argued that with the exception of physical boundaries misperceptions reported above, the self-awareness deficits observed in this case study may not be specifically caused by Jill’s inner speech disruption and could instead be the result of some other peripheral damage in other areas of the left hemisphere. One would need to compare Jill’s phenomenological account to that of other individuals who suffered comparable left hemispheric strokes without loss of inner speech and examine their reported self-awareness dysfunctions. Of course such additional case studies are unavailable, so that the alternative explanation of Jill’s self-awareness deficits in non-linguistic terms cannot be ruled out. However, it can be suggested that the fact that Jill herself tends to interpret her self-awareness deficits in terms of inner speech loss (as already seen in some quotations above) makes this view especially plausible. She states that:

One of the jobs of our left hemisphere language centers is to define our *self* by saying “I am.” Through the use of brain chatter, your brain repeats over and over again the details of your life so you can remember them. It is the home of your ego center, which provides you with an internal awareness of what your name is, what your credentials are, and where you live. Without these cells performing their job, you would forget who you are and lose track of your life and your identity. (p. 32) Through the use of *brain chatter*, it not only keeps me abreast of my life, *but also manifests my identity*. Via my left brain language center’s ability to say “I am,” I become an *independent entity* separate from the eternal flow. As such, I become a single, solid, separate from the whole. (p. 142, italics added).

Perhaps one promising strategy for testing the hypothesis offered here could consist in using repetitive transcranial magnetic stimulation (rTMS) to block inner speech during processing of self-relevant stimuli and observe potential deficits on such tasks, as did Nixon, Lazarova, Hodinott-Hill, Gough, & Passingham, 2004 on working memory tasks (also see Aziz-Zadeh, Cattaneo, Rochat, & Rizzolatti, 2005).

It is worth noting that not all researchers agree with the notion that language—and by extension inner speech—play a key role in self-awareness. Most notably, Keenan and his team (e.g., Keenan, Falk, & Gallup, 2003; Keenan & Gorman, 2007; Keenan, Rubio, Racioppi, Johnson, & Barnacz, 2005) argue that self-recognition and Theory-of-Mind tasks mostly activate structures within the prefrontal lobe of the mute right hemisphere; since they equate self-recognition and Theory-of-Mind with self-awareness (which is highly doubtful—see Morin, 2002, 2003, 2007), they conclude that the latter is located within the same non-verbal hemisphere. The evidence presented here and elsewhere casts serious doubts on this view.

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