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Short Article

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François Lhermitte and frontal-parietal opposition: utilization behaviour

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ABSTRACT

French neurologist François Lhermitte coined the term 'utilization behaviour' in the 1980s. The term describes a neurobehavioural disorder in which patients demonstrate exaggerated involvement with the objects around them. Such patients tend to be attracted to environmental stimuli and feel compelled to manipulate objects in the absence of a clear purpose or need. Based on his neuropathological observations, Lhermitte suggested that frontal lobe lesions were responsible for this behaviour. Lhermitte postulated that utilization behaviour was due to a loss of frontal executive control which resulted in an imbalance between the frontal systems, which are crucial for regulating internal activity, and the parietal systems, which are involved in responses to external stimuli. As a result of this imbalance, external stimuli play a far greater role in behaviour control at the expense of the subject's behavioural autonomy. The purpose of this paper is to revisit François Lhermitte's contribution to the study of behavioural disorders related to frontal lobe dysfunctions.

KEYWORDS
Utilization behaviour, disconnection syndrome, frontal lobe, parietal lobe, 20th century history, neurosciences.

On 3 December 1981, François Lhermitte presented a paper titled *'Le comportement d'utilisation et ses relations avec les lésions de lobes frontaux'* at the meeting of the Société Française de Neurologie.[1] Lhermitte's paper described a rare self-regulation disorder in which patients are attracted to objects in their surroundings and driven to manipulate them; the mere presence of an object is interpreted by such patients as a command to use it. For example, a patient may pick up a toothbrush that has been placed before him and begin to brush his teeth, even though the setting is inappropriate. Other patients would drink from cups of water placed in front of them, put on a second pair of glasses while already wearing one pair, or seize a pen and paper left within reach and begin writing. Lhermitte's name for this disorder was 'utilization behaviour'.

Professor François Lhermitte (1921-1998), the son of the famous neurologist Jean Lhermitte and a student of Théophile Alajouanine's, was a well-known figure in French neurology in the second half of the 20th century.[2] While he completed vast volumes of research on verbal expression disorders, his interests expanded in later years to include other fields in neuropsychology. Together with his mentor and Paul Castaigne, Lhermitte oversaw the renovation of the buildings dedicated to the neurosciences at Hôpital de la Pitié-Salpêtrière in Paris. One of his last contributions to clinical literature, which he finished after having retired, was his description of utilization behaviour. Between 1968 and 1982, Lhermitte observed more than 40 cases of this disorder. In 1983 he published an article in *Brain* titled "Utilization behaviour and its relation to lesions of the frontal lobes"[3] in which he presented detailed reports on five cases of UB. These patients correctly used objects in their immediate vicinity, but their actions were not necessarily appropriate in the specific setting.

All the behaviours that have been described have the following characteristics in common: 1) actions are unintentional; 2) actions are triggered by objects in the immediate area; 3) actions do not reflect the sub-

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ject's needs or the social context; and 4) the patient is unaware of his actions being socially inappropriate.

Based on analysis of the patients' lesions, Lhermitte observed that this disorder emerges following unilateral or bilateral frontal lesions. More specifically, he observed that lesions causing utilization behaviour were located in the orbito-frontal region.[1,3] A review completed by Archibald et al. in 2001 concluded that the pathophysiology of utilization behaviour implies the presence of alterations in the mesial frontal structures and frontostriatal circuits, cingulated gyrus, caudate nucleus, and anterior and medial nuclei of the thalamus.[4]

In 1986, Lhermitte, Pillon, and Serdaru published the first group study of utilization behaviour. This article describes results from a study of 75 patients with brain damage, including 29 cases with frontal lesions. Thirteen patients with frontal lesions exhibited utilization behaviour, which was not observed in any of the patients with posterior lesions.[5] In 1989, Shallice et al. suggested that the procedure used by Lhermitte, Pillon, and Serdaru to induce utilization behaviour can confuse patients and lead them to the erroneous conclusion that the examiner expects them to use the objects placed before them.[6] To solve this problem, the authors propose distinguishing between Lhermitte's original procedure ("induced utilization behaviour") and an additional procedure ("incidental utilization behaviour") in which the patient does not perceive any implicit or explicit expectations with regard to use of objects. Following the procedure proposed by Shallice, Brazzelli et al. evaluated occurrences of utilization behaviour in 42 patients with frontal lesions, but only found this disorder in one subject.[7] De Renzi, Cavalleri and Facchini found similar results.[8] Recently, Besnard et al. published an interesting study in which they tested for utilization conduct in 70 subjects (25 patients with frontal lesions, 10 with non-frontal lesions, and 35 control subjects) using both Lhermitte's and Shallice's procedures. According to results using either procedure, only 12% of patients with frontal lesions were shown to exhibit utilization behaviour.[9]

While this influential study by Lhermitte et al. awakened the scientific community's interest in utilization behaviour, it was not the first article in the literature to mention the disorder. In 1903, Stransky described the case of 65-year-old Ferdinand W., a patient whose behaviour patterns were similar to those described by Lhermitte. When a box of matches was placed in front of the patient, he tried to light them even when asked not to do so; if a book was nearby, he would open it and begin reading. Post-mortem examination revealed diffuse cerebral atrophy which was particularly severe in the medial frontal regions of the left hemisphere. Some years later, in 1906, the German neurologist Wernicke described a behaviour disorder similar to that described by Lhermitte and named it *Hypermetamorphose*. Wernicke defined *Hypermetamorphose* as a compulsive tendency to seek out and interact with all sensory stimuli present in the immediate surroundings. To identify the condition, he proposed bringing different objects into the patient's perceptual field so as to trigger the behaviour.[10] No additional descriptions of this behavioural disorder were published until the 1970s. Russian neuropsychologist Alexander Romanovich Luria reported in his treatise *The Working Brain* (1973) that some patients with frontal lesions were attracted by environmental stimuli, which would trigger actions that were not appropriate in the given situation and sometimes lacked a logical explanation.[11] One patient in a hospital bed rang the call button every time he saw it without any particular reason; upon the nurse's arrival, the patient was never able to provide a reason for having called. Another patient, told by his doctor that he could leave the examination room, stepped into a closet in the same examination room because he saw that the door was open.

In addition to describing the specific characteristics of utilization disorder and the location of the lesions causing it, François Lhermitte proposed a neuroanatomical model to explain the underlying cause of the behaviour. His model was based on research by Derek E. Denny-Brown and Robert A. Chambers[12] in the 1950s. Denny-Brown and Chambers observed that lesions in medial frontal structures elicited groping and grasping movements triggered by the patient's seeing objects near his hands. Similarly, when an object was placed in a patient's open hand, the patient would grip it involuntarily without being able to release it on demand. They called this syndrome 'magnetic apraxia', and interpreted it as a primary deficit in sensory motor integration which results in release of exploratory responses. Denny-Brown and Chambers hypothesised that two competing tropisms, one positive (exploratory) and one negative (withdrawal), work to coordinate movements. Parietal lobes mediate approach or exploratory responses, while the frontal lobe mediates avoidance or withdrawal responses. Loss of balance between these two regions of the brain would give rise to transcortical release, thereby disturbing the

competitive mechanisms for motor activity regulation. Lhermitte believed that the imbalance between frontal and parietal lobe activities described by Denny-Brown and Chambers should be interpreted at a higher organizational level for behaviour. He stated, "All the information coming from the body and from the outside world is received in areas of the sensory cortex which surround the parietal lobe; systems develop in the parietal area which unite these unending sequences of stimuli... Frontal damage suppresses to varying degrees this function and thus releases the activity of the parietal lobe, that is, it tends to subject the patient to all external stimuli". To paraphrase Lluís Barraquer Bordas,[13] the frontal lobes anchor us to what comes from within ourselves, whether this is a reflection of free choice, habit, or instinctive-affective impulses. In contrast, the parietal lobes attune us to our environment, our world, and our surroundings.

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