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Prospective
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A Neuropsychological Experimental Paradigm to Detect Insular Cortex Dysfunction: Implication for Differential Diagnosis of Insular Cortex Epilepsy

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Prospective

Anatomically, there is persuasive evidence that the insular cortex has wide connections with the neocortex, basal ganglia, thalamus, limbic structures and olfactory cortex [1,2]. Klingler's techniques and MRI-DTT (Magnetic Resonance Imaging-Diffusion Tensor Tractography) studding the white matter tracts emphasized the structural complexity of the insular lobe and its close relations with surrounding lobes, the limbic and para limbic structures through white matter fibers tracts, providing evidence against the anachronistic view of the insula as an isolated island [3,4]. This intricate connectivity of the insular cortex may explain its multifunction processing character.

Insular cortex epilepsy is a localization-related epilepsy syndrome that frequently remains unrecognized, thus accounting for epilepsy surgery failure in patients suffering Temporal-Frontal- and Parietal-Lobe Epilepsy (TLE, FLE, PLE) given the presence of a subtle insular cortex involvement, while this is particularly true for most refractory TLE cases [5]. A 10% of TLE surgery fails to deliver any benefits and is therefore classified as intractable epilepsy, while the main reason for treatment failure may be insular cortex involvement, as simple temporal lobectomy did not resolve epileptic symptoms [6]. Penfield and Jaspers [7] and Penfield and colleagues [8] reported that seizures emanating from the insula may present a clinical semiology similar to TLE. Fifty percent of the patients with TLE manifest intermittentinsular cortex discharge intraoperatively under local anesthesia, as detected by electrocorticography and applied electric stimuli. Insular cortexstimulation also induce symptoms similar to those observed during routine ictal onset. It has thus been seen that the insular lobe cortex may also possess the epileptogenic potency, and insular epilepsy may be intermingled with TLE [9]. Moreover, the anatomical depth of insular cortex and the interposition of the lateral clustered middle cerebral artery make studying it *via* scalp EEG very hard. Since, to ascertain whether an identified epileptogenicity originates from the mesial temporal lobe territories and spreads to the insular lobe or vice versa is clinically tricky, a neuropsychological task taping insular functioning becomes therefore highly desirable.

From a functional point of view, the insular cortex constitutes a kaleidoscopic integrative structure encompassing a great variety of functions (i.e., autonomic, sensory-motor, viscero-sensitive, cognitive and emotional; [10]). One of the most relevant insular functions, made possible by the re-representation work of the anterior insular cortex [11], is corporal awareness [12] and representation (i.e., inner Body Image). In order to assess the ability torepresent our inner body image, we set up inner Body Image (iBI) task. The iBI task consists in the presentation of pictures depicting internal organs (i.e. brain, heart, liver, intestine, stomach, etc.) within a reference background, consisting in a head silhouette, except for the brain, for which we use a left foot silhouette. The organs are presented in different sizes: medium: 100% consistently with the size of the silhouette; enlarged: 120% and reduced size: 80%. During the iBI task subjects are asked to press a push button when they attribute to themselves the organ displayed based on its size. The total number of self-attributions of each organ size (small, medium and large size) was recorded. Then we calculated the iBI score that can vary from negative to positive values - representing small to large organs self-attribution, respectively - through 0 corresponding to medium-sized organs self-attribution.

Understanding how people represent inner body would help to better define a sense of internal function [13], both in clinical and healthy populations, since that investigating how brain represents

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inner world can have important implications in facing up to disease and therapies.

We herewith propose to integrate the above experimental paradigm to the regular preoperative neuropsychological assessment as a clinical vehicle to diagnose insular dysfunction and hopefully contribute in defining the *functional deficit zone* from a neuropsychological point in the context of preoperative assessment protocols of epilepsy surgery candidates.

References

1. Chevrier MC, Bard C, Guilbert F, Nguyen DK. Structural abnormalities in patients with insular/peri-insular epilepsy: spectrum, frequency, and pharmacoresistance. AJNR Am J Neuroradiol. 2013;34(11):2152-6.
2. Kurth F, Zilles K, Fox PT, Laird AR, Eickhoff SB. A link between the systems: functional differentiation and integration within the human insula revealed by meta-analysis. Brain Struct Funct. 2010;214(5-6):519-34.
3. Wang F, Sun T, Li XG, Liu NJ. Diffusion tensor tractography of the temporal stem on the inferior limiting sulcus. J Neurosurg. 2008;108(4):775-81.
4. Wang F, Sun T, Li X, Xia H, Li Z. Microsurgical and tractographic anatomical study of insular and transsylvian transinsular approach. Neurol Sci. 2011;32(5):865-74.
5. Cui J. Insular cortex and insular epilepsy. Archivios de Medicina. 2015;6(2):9.
6. Nguyen DK, Nguyen DB, Malak R, Leroux JM, Carmant L, Saint-Hilaire JM, et al. Revisiting the role of the insula in refractory partial epilepsy. Epilepsia. 2009;50(3):510-20.
7. Penfield W, Faulk ME. The insula; further observations on its function. Brain. 1955;78(4):445-70.
8. Penfield W, Jasper HH. Epilepsy and the functional anatomy of the human brain. Boston, Little, Brown. 1954:896.
9. Desai A, Bekelis K, Darcey TM, Roberts DW. Surgical techniques for investigating the role of the insula in epilepsy: a review. Neurosurg Focus. 2012;32(3):E6.
10. Uddin LQ, Nomi JS, Hébert-Seropian B, Ghaziri J, Boucher O. Structure and Function of the Human Insula. J Clin Neurophysiol. 2017;34(4):300-6.
11. Craig AD. How do you feel--now? The anterior insula and human awareness. Nat Rev Neurosci. 2009;10(1):59-70.
12. Lucci G, Pazzaglia M. Towards multiple interactions of inner and outer sensations in corporeal awareness. Front Hum Neurosci. 2015;9:163.
13. Bello A, Luongo MA, Patrikelis P, Fornaro S, Mancini F, Lucci G. (submitted). Inner Body Image in Illness Anxiety. Health Psychology.