## Letter to the editor

# Psychoanalysis and its role in brain plasticity: much more than a simple bla, bla, bla

## Psicanálise e seu papel na plasticidade cerebral: muito mais que um simples blá, blá, blá

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**Dear Editor,**

It is not difficult to understand why the relationship between psychoanalysis and neuroscience should interest us. Briefly, the psychoanalysis is considered a science of mind and certainly, this mental activity is linked to brain structures. The ideas of Sigmund Freud, the father of psychoanalysis, dominated explanations of how the human mind works. From a conceptual point of view, his basic proposition was that our motivations remain largely hidden in our unconscious minds. The aim of psychotherapy, then, was to trace neurotic symptoms back to their unconscious roots and expose these roots to mature, rational judgment, thereby depriving them of their compulsive power[1]. Quite interesting, Freud himself recognized *that the deficiencies in our description would presumably vanish if we were already in a position to replace the psychological terms by physiological and chemical ones*[1,2]. Following these reasoning, Freud was totally right. Since 2001, experts' neuroscientists are uncovering proof for some of Freud's theories and are teasing the mechanisms behind the mental processes described by him[1]. Taken all these information together, an interesting question could be evaluated: Is it possible to self-direct brain neuroplasticity? Yes, it is. In 1880, Freud had already proposed that the brain has ability to change its own structure. In fact, Freud first proposed a basic law of neuroplasticity that states that neurons that fire together, wire together and neurons that fire apart wire apart[3]. This very monumental discovery Freud called the law of association by simultaneity. Briefly, it means that when you put two things together in consciousness they get associated in the neuronal connections of the brain[3]. Actually, plasticity is the ability of the adult brain to change its anatomy in response to external or internal stimuli, and neurons are the principal units in most theories of brain function[4]. Adding more neurons to the existing network must therefore appear as the highest degree of plasticity imaginable[4].

In fact, the story did not begin that way. The traditional view of the mammalian brain is that neurons are not added in adulthood. This limitation was purposed by the neuroanatomist Santiago Ramon y Cajal that described: *in the adult centers, the nerve paths are something fixed and immutable: everything may die, nothing may be regenerated. It is for the science of the future to change, if possible, this harsh decree*[5]. Nowadays, this scenario has totally changed since adult neurogenesis has consistently been found in the subventricular zone of the lateral ventricle (SVZ) and the subgranular zone (SGZ) of the dentate gyrus in the hippocampus[6,7].

According to the latter, adult hippocampal neurogenesis has been identified in every mammalian species examined to date, including mices, rats, tree shrews, marmoset monkeys, macaque monkeys, and humans[6,7]. In these lines, it is important to note that although various factors that affect the division, migration, and differentiation of neural precursor cells have been isolated, i.e., several intrinsic and extrinsic factors affect the neurogenesis in the adult hippocampus[7], the precise mechanisms that control neuronal fate in the adult nervous system remain largely unknown.

Looking through the prism of psychoanalysis, although some psychoanalytic "schools" are already well established a conclusive proof of their benefit and a physiological model of their effect on hippocampal structure and physiologic process are still poorly explored.

Following these line of reasoning, as hippocampus is a plastic structure and it plasticity is the basis for how the brain adapts to changes over time and that adult hippocampal neurogenesis has added a whole new dimension to research on structural plasticity in the adult hippocampus[8], we will address the following question: What are the effects of psychoanalysis on the hippocampal neurogenesis?

It has been known that the obstacle facing pharmacotherapy for neuropsychiatric syndromes is that some patients do not achieve recovery over the duration of treatment[9,10]. Although the reason for this disappointing clinical outcome remains unknown, structured psychoanalysis is an effective adjunctive treatment of these syndromes. In these lines, we believe, specifically, that the use of psychoanalysis for neuropsychiatric syndromes also has a direct positive influence on hippocampal neurogenesis. First, if psychoanalysis affects the balance between cell proliferation and cell death in a positive way, these newly born neurons are able to survive for long periods of time? If this is the case, it have been established that some newly born neurons can survive for long periods of time[7] and the morphofunctional properties of these newly born cells have been studied extensively. For instance, these new cells proliferate and migrate continuously into the granule cell layer, develop a typical morphology of granule cells and they appear to develop electrophysiological properties like others granule cells[11-13]. The demonstration of functional integration of newly born dentate granule cells into hippocampal circuitry[13,14] and the fact that they is able to mediate long-term potentiation (LTP)[15], has led to the hypothesis that adult neurogenesis may be important in learning and memory[16]. Based on these facts, it is pertinent to speculate that psychoanalysis is able to induce adult hippocampal neurogenesis (means in this case hippocampal plasticity) and can lead to the refinement and optimization of this process.

In conclusion, the hippocampus is a plastic and vulnerable brain structure that is damaged in several neuropsychiatric syndromes. Based on this, as plasticity is the basis for how the brain adapts to changes over time and that adult hippocampal neurogenesis has added a whole new dimension to research on structural plasticity in the adult hippocampus, we addressed in this paper that psychoanalysis (a therapeutical stimulus) could be an interesting mechanism to induce adult hippocampal neurogenesis. Finally, as Ehrenreich and Sirén[17] purposed, a major aim of neurobiology research has to be to increase the understanding of endogenous mechanisms of protection, defense against and response to damage, adaptation to and coping with new situations. In this way, we are also in agreement with these authors

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when they comment that adult hippocampal neurogenesis could be considered a direct example of endogenous neuroprotection and psychoanalysis can exert actions at a cellular levels associated with gain of brain function.

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