Neuropsychoanalysis and the process of change: questions still to be answered: comment

Boeker, H; Richter, A
Commentary on: Beutel, M.E., Huber, M.: Functional Neuroimaging - Can it Contribute to Our Understanding of Processes of Change?

Neuro-Psychoanalysis and the Process of Change: Questions still to be answered
Heinz Boeker, André Richter (Psychiatric University Hospital Zurich)

1. Views on the paper
The paper focuses on very important aspects of research into processes of change from a psychoanalytical point of view. We agree with the authors’ statement that understanding the methodological procedures of functional neuroimaging and its limitations is the first step in considering psychoanalytical principles in the field of neuroscience.

A list of possible neuroimaging paradigms important for studying mental processes and specific symptoms is given. It is underlined that experimental stimuli need to have a strong emotional valance (e.g. videos instead of pictures to provoke changes in mental states). In the context of establishing psychoanalytically relevant aspects in functional neuroimaging, it is necessary to use paradigms which are able to address symbolic meanings and to elucidate unconscious conflicts (e.g. by verbalization or emotional-behavioral expression).

The overview of studies on symptom-related changes in the brain following therapy (psychotherapy and pharmacotherapy) shows functional changes in a broad range of psychiatric disorders (OCD, depression, anxiety disorders). However, it is still questionable whether specific functional brain changes investigated by modern functional imaging methods are able to deepen our understanding of complex inter-personal psychoanalytical processes. Paradigms which can adequately study psychodynamically relevant dimensions of symptom changes still have to be developed.

Another critical point in the studies carried out to date is the direct comparison between drug treatment and psychotherapy. It must be assumed that intra-psychic conflicts are just as important as biological factors in the development of symptoms in both study groups. Paradigms focusing on these intra-psychic conflicts may not demonstrate differences between psychopharmacologically and psychotherapeutically treated patients. Improvement of symptoms related to drug treatment should not be confused with therapy-related changes in
psychodynamic dimensions. Recent studies cited by the authors may reflect certain aspects of functional changes related to psychotherapy, but they should not be considered as neuro-pseudoanalytic studies in a strict sense.

Particularly Viinamäki et al.’s study (1998) underlines the problems involved in interpreting results: In our view, the study design does not allow for the normalization of serotonin uptake after psychodynamic psychotherapy to be explained as a direct effect of psychotherapy. We agree, however, that single-case studies of this kind may provide tentative evidence which may be useful for generating hypotheses.

2. Examples of our own work
Given the basic challenge of developing adequate paradigms, we have sought to contribute to mind-brain research in the sense of first-person neuroscience (cf. Boeker et al. 2000; Northoff et al. 2002; Northoff, Boeker 2006), reflecting the importance of subjective experience and its relationship to neurobiological correlates underlying psychodynamic processes in neuropsychiatric diseases. In a methodological approach combining both techniques, we investigated catatonia, a psychomotor syndrome with uncontrollable anxieties and akinesia, which can be psychodynamically characterized as “sensory-motor regression” reflecting a basic somatic defense mechanism. In a combined study we investigated operationalized subjective psychological characteristics – using the Repertory-Grid Technique, an ideographic procedure directed at each patient’s individual feature – as well as pre-frontal cortical activation patterns during emotional-motor stimulation by means of functional magnetic resonance imaging (fMRI). Catatonic patients with an underlying affective and schizoaffective psychosis were compared with age-, sex-, diagnosis- and medication-matched non-catatonic psychiatric controls and healthy controls. Subjective operationalized psychological characteristics of the personal constructs of the “self” were investigated in an acute and post-acute state.

We found that subjective operationalized psychological characteristics of both the acute and post-acute state showed a significant lack of social contact, decreased self-esteem and reduced emotional arousal, compared to non-catatonic psychiatric and healthy controls. fMRI revealed significant dysfunctional activation patterns in the orbito-frontal cortex and alterations in the medial pre-frontal and pre-motor cortex during negative emotional stimulation. This
correlated significantly with affective, behavioral and motor alterations in catatonia, and also with the repertory-grid dimensions self-esteem, emotional arousal and social contact.

It is noteworthy that all significant correlations between fMRI signals and categories of self-concerned activation were obtained during negative emotional stimulation. Our results thus supported the hypothesis that emotional arousal plays a central and specific role in catatonia. If cognitive defense mechanisms are no longer available, anxieties are responded to using somatic mechanisms, resulting in regression to the bodily level, i.e. “sensory-motor regression”. We therefore assumed that the total immobilization of the body may serve to prevent the total disintegration of the self as a result of overwhelming and uncontrollable anxieties. This particular form of “sensory-motor regression” in catatonia, i.e. “immobilization by anxiety”, may be accounted for by specific alterations in the right orbito-frontal cortex and additional alterations in orbito-frontal connectivity to the medial, pre-frontal and posterior parietal cortex.

In general, we concluded that orbito-frontal cortical dysfunction may be closely related to regression to somatic defense mechanisms, as paradigmatically observed in catatonia.

Following on from these investigations as described above, the neurophysiological basis of depressive symptomatology and its therapeutically-induced effects were investigated in several combined neuropsychological and fMRI-/MRS-studies on depression (cf. Grimm et al. in press). The results of these studies were used to develop neuropsychoanalytic hypotheses on the neuronal processing underlying defense mechanisms (cf. Boeker, Northoff 2005; Northoff, Boeker 2006): Defense mechanisms may be considered as complex emotional-cognitive constellations. As such, they require very specific functional mechanisms connecting multiple brain regions with each other by reciprocal or top-down modulated associations. Hypotheses concerning the relationship between principles of neuronal networks and certain defense mechanisms were proposed. Although our hypotheses should be considered preliminary, they may indeed provide a starting point for future empirical investigation into the psychophysiological mechanisms underlying defense mechanisms.

The psychophysiological basis of neuronal processes involved in empathy is currently being investigated in a study using a fear- and anxiety-inducing paradigm in fMRI. This study focuses on the attribution of fearful stimuli to oneself or others, in the sense of 'perspective
taking'. While viewing various pictures, the subjects are asked to define the intensity of the fear and empathy they individually felt. The study includes not only healthy subjects, but also depressive subjects since depressive symptoms are known to influence social skills such as perception of emotional expression or the judgement of attitudes in close relationships. Therefore, it is of interest to draw a comparison between different behavioral and functional results found in healthy subjects and patients with MDD. Furthermore, modulatory networks between cortical and subcortical (fear-related) brain areas will be determined.

3. Speculation as to where the field is heading and how it will be integrated in the also new discipline of neuropsychoanalysis

Neuroimaging research has shown that mental disorders may not be correlated with single cerebral regions, but should be looked upon as complex, multi-focal disorders. Future multimodal neuroimaging designs should enable the investigation of different modes of functioning in an individual subject. Specific advantages of single neuroimaging methods may be combined by correlating the results of techniques measuring neuroelectrophysiological, neurochemical, anatomical, BOLD-dependent or vascular processes (e.g. a combination of EEG and fMRI can lead to an improved understanding of the spatial-temporal dynamics of the brain, and a combination of fMRI and MRS can enable the evaluation of the neuro-chemical basis of activation processes). A core problem in neuroimaging research continues to be the great heterogeneity of samples recruited by means of clinically-defined diagnostical criteria lacking biological and psychodynamic specification.

To elucidate complex neurobiological changes in the course of psychiatric disorders and psychotherapy it seems necessary to implement the principles of clinical research and new methodological approaches linking subjective experience with neuronal processes. To study neurobiological effects of psychotherapy, clinical studies on the course of psychotherapy could be combined with neuroimaging. In doing so, the individuality of our subjects (e.g. personality, social development, traumatic experiences, etc.) could be examined, and diagnostic inventories involving psychodynamic dimensions such as the Operationalized Psychodynamic Diagnostics system (OPD, cf. Boeker et al. in press) may be used for objectification and quantification of subjective experience. This psychological data can then be linked with analogous functional data.
With this in mind, it may indeed prove worthwhile to integrate not only specific neurobiological markers, but also psychodynamic dimensions in order to achieve a greater homogeneity of samples.

**Functional neuroimaging in the field of neuropsychoanalysis:**

Given the affect-charged moments of interaction with the therapist, inducing change during psychoanalysis or psychodynamic psychotherapy, it may be assumed that the effects of psychotherapy on the brain originate in different functional brain areas. These areas are involved in cognitive processes represented in neo-cortical neural activation (e.g. implicit memory processes or regulation of social behavior) and are closely related to basic emotional processes (e.g. anxiety, mood or inter-personal perceptions), represented in activation of sub-cortical brain areas like the amygdala. Nevertheless, the complexity of the change process induced by dynamic psychotherapy suggests that many brain areas and many complex connections may be involved. Therefore, it is doubtful whether it is at all possible to evaluate specific effects of change during psychoanalysis by neuroimaging procedures. Future functional neuroimaging procedures in the context of neuropsychoanalysis will probably focus on basic principles of psychoanalysis (e.g. transference, cf. Pincus et al. 2007). Necessary steps in this direction will include the functional analysis of self-referential processes and more differentiated paradigms reflecting the inter-personal embeddedness of the self (as stated above). Only then will we be able to speak of Neuropsychoanalysis sensu strictu.

**References**


Grimm S., Beck J., Schüpbach D., Hell D., Boesiger P., Niehaus L., Böker H., Northoff G. (in press) Imbalance between left and right dorsolateral prefrontal cortex in major depression is linked to negative emotional judgement. An fMRI study in severe major depressive disorder. Biological Psychiatry


