

Editorial: The Significance of Psychotherapy in the Age of Neuroscience

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Anyone engaged in the progress of psychiatry and psychotherapy must ask themselves the disquieting question whether we are about to split into a neuroscientific camp on the one hand and a psychosocial camp on the other—despite all stated beliefs about a common biopsychosocial point of view. A supplement of *Schizophrenia Bulletin* devoted entirely to the psychotherapy of schizophrenic patients therefore merits an editorial that addresses the specific significance of psychotherapeutic approaches in relation to recent discoveries in neuroscience.

The biological paradigm has become predominant both among experts and in the lay press in recent years. This paradigm often comes with the tendency to regard all mental illnesses primarily as expressions of impaired brain function, therefore isolating them from the interrelations between person and environment. Hence, mental illnesses in this view no longer differ, in principle, from other illnesses of the central nervous system, and it seems possible to treat them most effectively, and invariably, with drug therapy. Some protagonists, in fact, declare subjectivity and consciousness to be mere epiphenomena of brain function. This view disregards the close ties of conscious experience with its physical embedding: consciousness is based on the permanent interaction of the brain with all other somatic processes as well as on a person's continuous exchange with the social and physical environment.

Psychotherapeutic practice, in contrast, is still tempted to defend the traditional dualism in which psychotherapy is regarded as the treatment of choice for disorders that are more likely to be of psychological origin, whereas disorders considered more likely to be caused by biological factors are to be treated with pharmacotherapy. This view, however, is as one-sided as a reductionist biological approach. Since the pioneering studies on the neurobiological foundations of learning by Donald Hebb in the middle of the last century, numerous studies of researchers and clinicians actually showed that interrelations between genetic factors,

biological and psychological influences during development, and environment-related factors shape the onset and course of mental disorders. This holds true despite many simplifying neurobiological or psychological statements. In particular, the discovery of the synaptic plasticity of the brain provides a foundation for understanding how neuronal networks are formed by activity and stimulation.

An integrative view will be helpful to deal with such issues. While it is true that genome sequence remains constant, its transcription does not, ie, its ability to control the formation of specific proteins. For instance, once genes have been activated by cellular developmental processes early in life, the type and the extent of gene expression is being regulated by environmental influences throughout life. This process sculpts the microstructure of the brain and, especially, the strength of synaptic connections. The effect of environmental factors on gene expression explains the phenotypical differences between monozygotic twins and their discordance for illnesses such as schizophrenia or depression. Studies of families and twin studies showed that children's personality traits influence their parents' attachment and attitudes, indicating that children may experience, in the same family, fundamentally different environments. This finding led to the concept of the "nonshared family environment," which presently plays an important role in research on the pathogenesis of mental illnesses. Studies on the development of children in different family constellations have found, moreover, specific time windows. In these windows, type and manner of gene expression depend on specific environmental influences. Other studies were recently carried out with young primates; the animals were allocated randomly either to mothers without pathological behavior or to mothers with high anxiety levels induced by unpredictable events that affected feeding. The primates growing up with anxious mothers showed deficient social skills and servile social behavior. These deficiencies were associated with changes in serotonergic and adrenergic neurotransmitter systems. This did not, however, become manifest before adolescence—supporting the assumption that disturbances at early stages of development can trigger psychopathological disorders at a later age.

There is no doubt that the development of the brain is determined by individual genetic equipment to a great part. Yet, this is not the whole story. Generally, learning processes control the construction of cognitive-emotional

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schemata, which is correlated in particular to dendritic cross-linking. In addition, the formation of neural connections between the cortex, the limbic system, and the autonomous nervous system, linking emotion and memory, develops with each component depending on specific experiences. In the case of adults, environmental factors can, furthermore, allow a genetically anchored vulnerability to become manifest or not. Also, changes in social relationships can result in lasting changes in neurotransmitter systems. Further insights of this integrative kind originate from research on procedural and declarative memory, from attachment theory, and from concepts such as intercorporality, empathy, and embodiment.

These research results have obvious significance for psychotherapy. To date, considerable evidence has been accumulated that, in addition to neurobiological interventions, psychotherapy presents an effective form of influencing and changing metabolic activity and the microstructure of the brain. This is not surprising. If psychotherapy is understood to be a form of learning, then the unfolding learning process can also effect changes in gene expression and thus influence the strength of synaptic connections. The pertinent positron emission tomography (PET) studies of Baxter et al and Schwarz et al in the 1990s are nowadays regarded as classical. In treating patients with compulsive disorders, they showed that psychotherapy and pharmacotherapy equally resulted in the normalization of previously raised metabolization rates in the right caudate nucleus. In recent years, further PET and single photon emission computed tomography studies were published on pharmacotherapeutic as well as psychotherapeutic treatments, mainly in patients with affective disorders, borderline disorder, and posttraumatic stress disorder; studies with schizophrenic patients yielded the same type of results. Seen in a larger context, one may consequently state that all psychiatric interventions are, at the end of the day, of a biopsychosocial nature. Eric Kandel, in 1998, expressed this with remarkable clarity in a nutshell: neurobiological interventions always have, in addition to their direct effect on the brain, a psychological effect; psychotherapeutic interventions in turn always have, in addition to their psychological effect, a neurobiological effect.

Having established the above, it may be claimed that neither type of intervention can be declared superfluous. Rather, with increasing knowledge, we are gaining greater ability to influence certain psychopathological syndromes or symptoms with either psychotherapeutic or pharmacotherapeutic interventions. It is true that thus far few systematic differences between these modalities were found with respect to treatment effectiveness for individual syndromes. The assumption of a so-called “common pathogenetic final pathway” refers to this finding. Pharmacotherapeutic and psychotherapeutic interventions indeed act on the same functional systems; however, they seem to use different mechanisms. Over the past 2 years,

the results of quite a number of brain imaging studies during pharmacotherapy and/or psychotherapy suggested a “top-down” effect of psychotherapy in that modifying dysfunctional cognitive-emotional schemata lead to a reduction in dysfunctions of subcortical brain regions; pharmacotherapy, in contrast, displays a reverse “bottom-up” effect. In both cases, however, it appears that it is the successful modulation of the whole functional system that is critical for symptom remission, not the focal change of an individual region in the brain.

Such research findings underline the concept of the brain as a kind of transformation organ. Accordingly, mental illness is the product of a circular causality between neurophysiological, subjective, social, and other environmental variables constantly interacting with each other. Correspondingly, successful therapy interventions can start at various levels and have a bidirectional effect each time.

It seems, therefore, that increasing knowledge on interactions and mechanisms of action will enable us to specifically address different psychopathological syndromes with either pharmacotherapy or psychotherapy. For example, basic symptoms or disturbing dispositions of temperament such as impulsiveness and affective instability may be treated primarily with medication, while maladaptive beliefs, behaviors, and relationship patterns may be treated primarily with psychological interventions. Whereas the former shows high stability over long periods of time and is hardly influenced by psychotherapy, the latter requires repeated corrective experiences in an interpersonal process, which must be anchored over time in the metabolism and microstructure of the brain. Increasing knowledge about such differential indications may soon pave the way to specific therapy interventions and to combinations thereof, particularly for serious mental illnesses. Research-informed therapy would have to be guided by insights from the neurosciences as well as from psychotherapy research.

To date, a considerable disparity still remains between neurobiology, focusing on the individual brain and on isolated mental acts, and psychotherapy, devised as an interpersonal process with shared attributions of meaning. Nevertheless, psychotherapy at this stage can already profit from neurobiological and neurocognitive findings in various fields: procedural and emotional learning, the implicit character of early relationship patterns, the continuing effects of attachment styles, as well as the potential variability of implicit memory. Vice versa, increasing knowledge about reliable change mechanisms in psychotherapy and the impacts of schema actualization in the therapeutic process will prompt novel and sustained investigations in the neurosciences on the neural foundations of such mechanisms. In other words, the relationship between the 2 approaches—neurobiology and psychotherapy—will hopefully turn out to be one of mutual support and mutual stimulation.