

Psychodynamic psychiatry and neurobiology

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Summary

The historical development of psychodynamic psychiatry and its core principles were focussed on in the perspective of current research, especially of neuroscientific research. The three-dimensional model of psychodynamic and neuro-psychodynamic psychiatry and spatiotemporal psychopathology are described and applied to depression and schizophrenia as clinical examples underlining the practical relevance of the neuro-psychodynamic approach for psychiatric treatment and psychotherapy. Operationalized psychodynamic diagnostics (OPD) is discussed as an "instrument to transfer psychodynamic constructs into neuroscience".

Keywords: *Psychodynamic psychiatry, neurosciences, three-dimensional model, spatiotemporal psychopathology, depression, schizophrenia, Operationalized Psychodynamic Diagnostics (OPD), therapeutic attitude*

"The modern dynamic psychiatrist must strive to be bilingual – the language of the brain and language of mind must both be mastered in the service of knowing the person and providing optimal patient care" (Gabbard 2014, p. 7) [1].

Introduction

This paper focuses on the relationship between psychodynamic psychiatry and neurobiology, especially on the question of whether and how neurobiology may contribute to the development of psychodynamic psychiatry. Mental functions such as the self, the conscious and the unconscious, and the psychological and neuronal mechanisms and functions underlying these are focussed on [2]. The self in psychiatric patients is considered in a relational perspective.

First, the historical development of psychodynamic psychiatry is addressed and its core principles are reconsidered in the perspective of current research, especially neuroscientific research.

Second, the three-dimensional model of neuropsychodynamic psychiatry is described, which tries to connect the essentials of psychodynamic psychiatry and of the "first-person-neuroscience". This model is applied to depression and schizophrenia as clinical examples that underline the

practical relevance of the neuro-psychodynamic approach for psychiatric treatment and psychotherapy.

Third, spatiotemporal psychopathology is hypothesised to be a "current currency" between brain and mind.

The development of psychodynamic psychiatry

The term "psychodynamic psychiatry" generally refers to an approach steeped in psychoanalytic theory and knowledge. Psychodynamic theory has often been viewed as a model that explains mental phenomena as the result of conflict. This conflict derives from unconscious wishes and anxieties. Within the purview of psychodynamic psychiatry is the unconscious internal world of relationships and different mental representations of aspects of individuals themselves and significant others.

During the course of the development of psychoanalysis, psychodynamic theory has been related to a great variety of theoretical sources and scientific approaches. Among these the affect theory, the object relation theory, the results of the early infant research, the studies on traumatic experiences and, last but not least, neurobiology and neuroscientific approaches are of outstanding importance for the modern psychodynamic psychiatrist.

Gabbard [1] emphasised that "Today's psychodynamic clinician can no longer practice a type of psychiatry divorced from the body and sociocultural influences" (p. 4).

Accordingly, psychodynamic psychiatry has to be regarded today as situated within the overarching construct of biopsychosocial psychiatry. The enormous progress in genetics and neuroscience may have – paradoxically – strengthened the position of psychodynamic psychiatry and psychotherapy. There is more persuasive evidence than ever before that a great many mental phenomena are unconscious, that environmental factors shape the expression of genes, and that the mind reflects the activity of the brain [3]. Critical neuroscientists focus on an integrative rather than a reductive approach and recognise that psychological data are just as valid scientifically as biological findings.

Nevertheless, a critical epistemological point has to be taken into account in this context: in view of the danger of a possible reification of mental illness and a categorial error (the fallacy of treating an abstraction, such as the unconscious, as if it were a physical entity, measurable by

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neurobiological means), these developments and results of the neurosciences should not be interpreted as scientifically valid arguments for the psychodynamic model.

In order to characterise the essence of psychodynamic psychiatry Gabbard used the following definition: “Psychodynamic psychiatry is an approach to diagnosis and treatment characterized by a way of thinking about both patient and clinician that includes unconscious conflict, deficits and distortions of intrapsychic structures, and internal object relations and that integrates these elements with contemporary findings from the neurosciences” [1] pp 4–5.

Beyond the Cartesian notion of substance dualism and the the growing evidence that mind and brain are inextricably linked [4], there are still great challenges for the psychodynamic clinician: How does the psychodynamic psychiatrist integrate the domain of mind with the domain of brain, not only from an epistemological perspective but in common interactions with patients especially?

This question still presents a challenge to the psychodynamic clinician, though presumed polarities – such as genes versus environment, medication versus psychotherapy, and biological versus psychosocial determinants of psychiatric disorders – are often “glibly subsumed under the categories of brain and mind” [1].

Our minds certainly reflect the activity of the brain, but mind cannot be reduced to neuroscientific explanations [5, 6]. Whereas the brain can be observed from a third-person perspective, the mind, on the other hand, can be known only from within: The first-person perspective has to be taken into account. The construct of “explanatory dualism” [7] acknowledges that there are two different ways of knowing and understanding that require two different kinds of explanation [6].

Facing the mind-brain problem, psychodynamic psychiatry, as well as the neurosciences, are confronted with the question “What is the person?”

The person defies easy categorisation. Gabbard summarised the principal determinants of the person as “a complex amalgam of multiple variables” [1] p. 7:

- The subjective experience of oneself (based on a unique historical narrative that is filtered through specific meanings);
- A set of conscious and unconscious conflicts (and the associated defenses, representations and self-deceptions);
- A set of internalised interactions with others (that are unconsciously reenacted, creating impressions in others);
- Our physical characteristics;
- Brain as a product of genes in interaction with environmental forces and the creation of neural networks by cumulative experience;
- Sociocultural background;
- Religious/spiritual beliefs;
- Cognitive style and capacities.

In view of these multiple determinants of the person, psychodynamic psychiatry aims at providing a conceptual framework within which a wide range of treatment inter-

ventions are used (not only psychodynamic psychotherapy) that depend on the assessment of the patient’s needs.

The empirical basis of the essential principles of psychodynamic psychiatry

There are some principles derived from psychoanalytic theory and technique that still provide an essential orientation to the psychodynamic psychiatrist. Their empirical basis was investigated during recent decades, among others via neuroscientific approaches. The following section provides an overview of a multitude of results of empirical studies. These results ought not to be misunderstood as direct proofs for certain principles of psychodynamic psychiatry, nor should the categories “neural processes” and “psychotherapy” directly be linked in a causative way. Hence, similar results in different scientific fields, which were generated by very different scientific approaches and methodologies, may strengthen the plausibility of a scientific model, such as the conceptualisation of some of the essential principles of psychodynamic psychiatry.

The unique value of subjective experience

Psychodynamic psychiatry – in contrast to descriptive psychiatry – conceptualises symptoms and behaviours as “the final common pathway of highly personalised subjective experiences that filter the biological and environmental determinants of illness” [1].

Whereas the descriptive-phenomenological approach mainly focuses on the question of whether a patient corresponds to others who show congruent features, “psychodynamic psychiatry essentially focuses on the history of subjective experiences and the development of the symptoms trying to understand, how the individual patient differs in his particular life-history from others.

“Furthermore, psychodynamic psychiatry places paramount value on the patient’s internal world: fantasies, dreams, hopes, wishes, fears, impulses, self-images, perception of others, and psychological reactions to symptoms” [2].

Psychodynamic psychiatrists are curious about “the neurobiological and psychological, i.e. neurobiopsychological or neuropsychodynamic mechanisms, which lead to the ‘final common pathway’ of symptoms and behaviors; central here is to address the question, how these mechanisms were necessary to protect the interior world and how the ‘exterior’ world reflects the inner contents of the respective person” [2].

The unconscious

Psychodynamic psychiatry is a conceptual model of the mind that includes the unconscious [8]. According to Freud [9], “the unconscious in a psychoanalytic sense, the dynamic or repressed unconscious, does not only operate outside awareness but is extremely complex including distinct aspects of the persons’ self. It includes innate and inherently sexual and aggressive blind drives (i.e., the id), most of its conscience and ego ideals (i.e., the superego), and processes (perception, action, etc) that deal with reality (i.e., the ego). The dynamic or repressed unconscious mediates wishful, associative, instinctual primary processes” (see also [8]).

Many studies from experimental and development psychology have strengthened Freud's description of unconscious mental functioning [10]: "that at any given moment consciousness includes only a small content, so that the greater part of what we call conscious knowledge must in any case be for very considerable periods of time in a state of latency, that is to say, of being psychically unconscious."

Psychodynamic psychiatry views symptoms and behaviours as unconscious processes that defend against repressed wishes and feelings. The unconscious may manifest itself in the patient's nonverbal behaviour to the clinician. These characteristic patterns of relatedness occur outside the conscious, verbal, narrative memory [10].

Psychic determinism

The psychodynamic approach asserts that we are far more restricted in our decisions than we think, and that we are characters living out a script written by the unconscious (e.g., determining the choices of marital partners and profession).

In the perspective of psychodynamic psychiatry, symptoms represent adaptations to the demands of the unconscious shaped by a mixture of early attachment, object relations, defenses, disturbances in the development of the self and, last but not least, biological and neurobiological factors: symptoms and behaviour have meaning!

The causes of behaviour are both complex (overdetermined) and multiple ("in the sense of their being alternate sets of sufficient conditions" [11] p. 181). Psychodynamic psychiatry conceptualises behaviour as the final result of many conflicting forces that serve a variety of very different functions corresponding both to the demands of reality and to unconscious needs [1]. The psychodynamic psychiatrist's task is to sort out which symptoms and behaviours can or cannot be explained by psychodynamic factors.

The significance of the biography: temperament, personality and epigenetics

The aetiology and pathogenesis of psychiatric symptoms are often linked to childhood events and relationship experiences. The repetitive patterns of interaction within the family are of great aetiological importance and contribute to the development of self and personality. In a subgroup, overt trauma such as incest or physical abuse, leads to long-lasting disturbances in the adult personality.

Besides these personality traits, constitutional elements have to be considered. Infant research [12] has revealed several discrete constitutional temperaments in newborn infants. These results and those of the so-called binding research underlined the importance of the "fit" between the temperament of the child and the temperament of the parenting person (e.g., the hyperirritable child who does reasonably well with a calm and low-key mother may do poorly with a highly strung mother). This model of "goodness-of fit" avoids blaming either parents or children for the latter's behaviour problems or psychiatric symptoms that may result [1].

Theories of childhood development have always been central to psychodynamic psychiatry. Whereas Freud reconstructed childhood development retrospectively based on reports of adult patients in psychoanalysis, subsequent psy-

choanalytically inspired studies have investigated childhood development prospectively by means of direct infant and child observation.

Stern [13–15] demonstrated that the infant seems to be aware of the mother from the first days of life, thus questioning former theories of primary autism or an autistic phase in the early development of the child. He described five discrete senses of self, which he regarded as different domains of self-experience (emergent or "body self", core self, subjective self, verbal or categorical self, and narrative self), each of which remains for the entire life span and operates in concert with the other existing senses of self. He concluded that humans emerge from an "intersubjective matrix" that is the result of sensitive affective attunement from mothers and caretakers, and emphasised that human existence is a fundamentally social existence.

In contrast to object relations theory, attachment theory posits that the goal of the child is not to seek an object but rather to seek a physical state achieved by proximity to the mother/caregiver [16, 17]. Attachment is a biologically based bond between the child and the caregiver that is designed to ensure the safety and survival of the child. Secure attachment strongly influences the development of internal working models of relationships, which are stored as mental schemas and lead to experiences regarding expectations of the behavior of others toward the self.

Attachment strategies are adopted in infancy and remain relatively stable. Ainsworth et al. [18] found – in a laboratory scenario ("strange situation") – four different behavioural strategies involving the toddler's separation from the caregiver: secure binding, avoidant behaviour, anxious-ambivalent (or resistant) behaviour, and disorganised-disoriented behaviour.

Further empirical studies showed that these attachment patterns may continue into adulthood [19, 20]. Longitudinal studies testing the stability of attachment classification found many factors that may be associated with changes in security from infancy to adulthood, including stressful life events, parental death, social support, family functioning, divorce, and serious illness in either parents or children [20]. A large body of empirical evidence suggests that disorganised attachment is a vulnerability factor for later psychiatric disturbance (e.g., certain types of personality disorder) and that attachment security, on the other hand, can serve as a protective factor against adult psychopathology [21].

Mentalisation, a key concept in attachment theory, refers to the capacity to understand that one's own and others thinking is representational in nature and that one's own and other's behaviour is motivated by internal states, such as thoughts and feelings [17, 22]. Through the interaction with the caregiver, the child learns that behaviour can best be understood by assuming that ideas and feelings determine a person's actions. Mentalising may be referred to the "theory of mind", the ability to understand the minds of others [23]. Of course, this ability is also an essential fundament of psychotherapy. Mentalising and empathy have gained an increasing importance in neuroscience. Neuroimaging studies suggest that the medial prefrontal cortex, the temporal poles, the cerebellum and the posterior-superior temporal sulcus may be involved of components of a mentalisation network [23, 24].

Another approach which is relevant for the historical-developmental aspects of psychodynamic psychiatry is represented by the embodied cognitive science.

Inspired by biology and the life sciences, embodied cognitive science currently understands human organism – and the human psyche – “as being in an ongoing (embodied) state of change involved in constant dynamic processes of interaction with the environment in which a continuous process of recategorising experiences occurs. Memories of earlier situations unconsciously determine present thought, feelings, and action, though not in the sense of stored knowledge in analogy to a computer or static memory traces. In contrast memories are products of dynamic, complex constructions in the here and now. In the sense of embodiment, sensorimotor coordinations in the present always operate in an analogue manner as was the case in earlier situations” [25].

In contrast to former tendencies towards genetic reductionism, the developmental perspective of psychodynamic thinking has been supported by recent studies on epigenetics. Personal identity does not overlap with genomic identity [26]. Genes are in a constant interplay with the environment, and DNA is not destiny. For example, monozygotic twins with identical genomes can be highly distinct individuals, and we can move beyond the nature-nurture debate, because “it is now clear that DNA is both inherited and environmentally responsive” [27].

Contemporary genetic research and neurobiological studies of brain plasticity have shown that genes are highly regulated by environmental signals throughout life [28].

Primate research has been particularly useful in demonstrating the protective influence of early experiences involving social attachment relationships (e.g., to overcome the inborn vulnerability to separation anxiety [29]; or to adapt to the possible negative effects of the short allele of the *HTTT* gene [30].

Meaney and his colleagues [31–33] demonstrated that the expression of genes regulating glucocorticoid receptors is enhanced as a result of the grooming behaviour (of the rat mothers). In concert with this enhanced expression is a suppression of genes regulating corticotropin-releasing factor synthesis: i.e., grooming behaviour, which goes along with an increased care of the pups, provides them with a life-long protection from stress. This maternal behaviour is transmitted across generations without alteration of the genome. This transmission is referred to as epigenetic modifying or programming and is related to differences in DNA methylation [33].

Much of the research on the interplay between genes and the environment is finding counterparts in humans. For example, there are windows in time during which a gene is dependent upon a certain type of environmental influence to determine its expression [34].

Transference

Transference determines the relationship between the patient and the therapist in every psychotherapeutic encounter: “Regardless of whether psychodynamic or classical psychoanalytic treatments are concerned, there is always an unconscious transference. Also with behavioral therapy techniques, transference phenomena occur, even if

they are named differently. Transference is, for example, positively or negatively noticeable when expectations, desires, feelings and behavior manifest themselves in a form which does not correspond to the real relationship in an encounter situation and cannot be explained from it; in other words emotional attitudes of the patient to the therapist or to other persons in the present which were originally referring to childhood but which are unconsciously transferred to the present” [35].

Freud [36] answered the question “What are the transferences?” thus: “These are reprints, imitations of the impulses and phantasies that are to be aroused and made aware during the advancement of the analysis with a person's characteristic replacement of a former person by the physician. To put it another way: A whole series of earlier psychological experiences is not experienced as a past, but as a current relationship to the person of the physician.”

The original concept of transference was extended in the following decades [37], “so that the transference encompasses almost all aspects emotions and attitudes that constitute the patient's relationship with the therapist and the therapeutic environment. In this extended use, it is useful to refer the term ‘transference’ to the therapeutic encounter with patients suffering from different mental disorders including the psychoses” [35].

Neuroscientific research contributes to understanding social interaction in general. Recent studies have illustrated the decisive role of the so-called mirror neuron system, which enables human beings to identify immediately with the observed behavior and the mental state of others [38]. In the context of psychotherapy and psychoanalysis, this was related to transference: “...this means that during interaction with the analysand, analogue sensorimotor coordinations take place within the analyst as in the analysand implying that unconscious processes of immediate identification are occurring” [25].

“But also in this context, one has to be aware of a common fallacious reasoning, which again includes a category error. The term mirror is, however, to use metaphorically. The same could be said for transference. Bringing both together is using the terms in their primary sense (forgetting their metaphorical nature), and merging concepts of different categories (neurons/neurobiology with transference/psychology).”

To sum up, from a neurobiological perspective, transference is related to internal representations of objects triggered by real characteristics of the therapist: “Representations exist as a network of neurons that can be activated in tandem” [39].

Countertransference

The transference of the patient and the countertransference of the psychiatrist are essentially identical processes: Each unconsciously experiences the other as someone from the past [1]. Freud's narrow definition [36] referred to the analyst's transference to the patient or the analyst's response to the patient's transference. The emergence of unresolved conflicts from the analyst's unconscious is implicitly supposed in this conceptualisation:

“We have become aware of the countertransference which comes to the physician by the influence of the patient on

the unconscious feeling of the physician, and are not far from raising the demand that the physician must recognize and cope with countertransference” [36] p. 108).

Today, in contrast, a broader definition of countertransference as the therapist’s conscious and appropriate emotional reaction to the patient is gaining greater acceptance, “subsuming all the emotional reactions that the patient causes in the therapist. This broader definition particularly helps to understand the therapeutic processes in the treatment of patients with severe personality disorders and psychoses. This modified and broader conceptualisation views countertransference as a major diagnostic and therapeutic tool that enables a deeper insight into the patient’s internal world” [35].

Resistance

Resistance involves the patient’s wish to preserve the status quo and to oppose the therapist’s efforts to produce insight and change: “The resistance accompanies the treatment step by step. Every single association, every act of the patient under the treatment must reckon with the resistance and represents a compromise between the forces that are striving for recovery and the opposing ones” [36] p. 103.

Resistances to treatment may take many forms (e.g., being late to appointments, refusing to take medication, being silent in therapy sessions, focussing on unimportant material during the sessions, etc.) and have in common the wish to avoid unpleasant feelings (anger, guilt, envy, shame, etc.).

In the framework of psychodynamic psychiatry, the challenging question is what resistance is protecting and which past situation is being reenacted: “The manner in which the patient resists is likely to be a re-creation of a past relationship that influences a variety of present-day relationships” [1] pp 22–23.

The synopsis of the quoted empirical studies underlines the neurobiological basis for the essential principles of psychodynamic psychiatry, especially for the psychodynamic concepts of the unconscious (or procedural) memory, attachment, internalisation, identification and transference.

Three-dimensional model of psychodynamic psychiatry

One hundred years ago, it had been logical to look for the necessary supplement of descriptive psychiatry in psychoanalysis, which had dealt with the psychic drives and energies and unconscious motivations beyond the exterior phenomena [2]: “Freud hoped to be able to develop a systematology according the transferred paradigm of medicine. He started from the concept of nosological entities, which get along with certain and always equal causes, pathogeneses, symptoms, courses, and therapeutic specificities” [2].

Freud (1926) assumed a specific intrapsychic conflict, which would underlie the respective disorder: “These disorders on the basis of unconscious inner conflicts were called neuroses. Freud regarded the correlated symptoms and syndroms as parts of mechanisms of defence and compensation and therefore also as – inadequate – compromising trials to solve conflicts” [2]. It was assumed that the

phenomenology of the so-called psychoneuroses serves the symbolic expression of psychic conflicts [37], whose origins were localised in childhood.

Mentzos [40, 41] stressed that the emphasis on symbolisation as the most decisive differential criterion of the psychoneuroses compared with other forms of neuroses is applicable, but not sufficient. That is, “symbolic patterns of expression also get along with other psychic disturbances, e.g., anorexia, psychosomatic disorders of the skin or with psychoses. In order to be able to differentiate psychoneuroses sufficiently, rather the different maturational levels of symbolism have to be taken into account, e.g., the maturational level of the personality organisation and of the defence mechanisms, furthermore also the kind of the conflict has to be considered” [2]. Subsequent to the drive conflicts (especially the triadic or oedipal conflict), which were focused on by the early psychoanalysis, “the later self psychological, object relational, and intersubjective developments of psychoanalysis during the last decades point to further relevant dimensions far beyond the original conflict” [42].

Finally, the multidimensionality of the single case has to be taken into account [43, 44].

The overcoming of the former concepts concerning hypothesised conflict specific conditions in psychoneuroses, or finally also in obsessive-compulsive disorders, neurotic depression, and phobias became necessary [42]: “The expected constellations of conflict, defense and symptomatology – according the former concept of nosological entities – could not be validated empirically.”

In view of a necessary new orientation, Mentzos [41] proposed a three-dimensional diagnosis, which enables characterisation of each individual case with regard to three psychodynamic dimensions or criteria:

“The first dimension refers to the mode of defense and compensation of the conflict ad/or the trauma. The second dimension concerns the specific features and the level of the conflict or dilemma (e.g. self identity vs. symbiosis as an “immature” conflict contrary to the “mature” oedipal conflict). The third dimension refers to the level of the personality organisation, especially to the relationship to significant others or to one’s own self” [42].

In summary, the development of a three-dimensional diagnostics for psychiatric disorders was necessary, “because similar psychic disorders differ from one another in regard to psychogenesis, conflict, and developmental level and no conflict specificity referring to the occurrence of psychic disorders could be stated” [42].

Neuropsychodynamic psychiatry: three-dimensional neuropsychodynamic model

On the basis of Mentzos’ three-dimensional model encompassing the psychodynamic dimensions mechanisms of defence and compensation, structure and conflict [42], an analogous model was developed in the context of neuropsychodynamic psychiatry, integrating the current knowledge of neurobiology and neural mechanisms [2, 42].

“Neuropsychodynamic psychiatry” may be understood as an extension and specification of psychodynamic psychiatry: “Neuropsychodynamic psychiatry focuses on mental

functions such as the self, the ego, the conscious and the unconscious, and the psychological and neural mechanisms and functions underlying these. The epistemological possibilities and limitations of neuroscientific approaches concerning the core questions about the self and interpersonal relationships with significant others are addressed. The self in psychiatric patients is considered in a relational perspective, and the relational connecting processes between the brain and the environment are examined. The empirical plausibility of this relational definition of the self and brain presents a particular challenge” [2].

The dimension of defence and coping “describes certain modes of intrinsically predisposed mechanisms for processing extrinsic life-events” [42].

Boeker and Northoff [42] described the intrinsic activity of the brain as a dynamic balance between “different neuronal networks, for instance the default mode network, the executive network, the sensorimotor network, the attention network and the language network. These different networks are found in various regions. They are related to one another in a specific way: the default mode network (DMN) may be characterised particularly by the midline structures of the brain, whereas the executive network (EN) covers lateral pre-frontal and parietal regions. Functional imaging studies showed that both these networks are related to one another in a negative way, anti-correlating with one another. For instance, the activation of the DMN leads to a reduced activation of the EN and vice-versa. If the EN is strongly activated, for instance by cognitive processes, the activity in the DMN is reduced and the associated emotions or self-specific processes may be recruited in only a limited way. Because of the balance between different networks, there are pre-determined mechanisms, by means of which extrinsic stimuli and tasks may be processed.”

It may be hypothesised from a neural perspective, that “the different modes of defence and compensation of conflicts and/or traumata are analogue to the resting state spatiotemporal structures’ ability to modulate and adapt as well as to the resting state’s self-specific organisation” [42].

In this model of “spatiotemporal psychopathology” [43] “two different spatiotemporal axes are important: a longitudinal axis with a very long spatiotemporal scale, possibly reaching back into early childhood. Secondly, the mode of processing of the conflict or trauma depends on the interaction between a certain life-event at a specific time with the spatiotemporal structures of the involved conflicts or traumata” [42].

Second dimension: conflict. The challenging question is, “how can the extrinsic-intrinsic interaction between the external reality and the internal psychic reality be translated into the neuronal context of the brain?” [42]: “The psychic conflict in a neuropsychodynamic perspective may be characterised as an interaction between the intrinsic resting state activity and the extrinsic stimuli, as resting state stimulus interaction or stimulus resting state interaction” [42].

Boeker and Northoff point to one limitation of this model: “resting stimulus and stimulus resting state interaction describe specific mechanisms resulting from the interaction between intrinsic activity and an extrinsic stimulus. In con-

trast, conflict in a psychodynamic perspective is more a result than a mechanism” [42].

Third dimension: structure. The dimension of structure focusses on the “organisation of the personality and the psychic structure of the subject including her/his relationship to the object and to the self” [42 (see also [44, 45]).

An analogy between the psychic structure of the personality and the spatiotemporal structure of the brain may be hypothesised. Therefore the extrinsic activity of the brain and the brain’s intrinsic activity have to be differentiated: “The extrinsic activity of the brain focusses on the neuronal activity, which is triggered by certain extrinsic stimuli or tasks. This extrinsic activity should be differentiated from the brain’s own activity which develops in the brain independently of extrinsic stimuli. This intrinsic activity is paradoxically called resting state activity” [42].

A specific spatiotemporal structure of the intrinsic activity can be assumed: “This spatiotemporal structure is most probably constituted by the interaction between different networks and regions and the interaction between different fluctuations in different frequencies (0.001–180 Hz) ... it may be hypothesised that this spatiotemporal structure is essential for the transformation of purely neuronal processes into subjective experiences and phenomenal processes. Only if a certain extrinsic stimulus or task is integrated into this intrinsic activity, can something be consciously experienced” [42] (see also [8, 46, 47]).

A further analogy between the psychodynamic and the neuronal level may be hypothesised, it concerns the self- and object-specificity: “Intrinsic activity and its spatiotemporal structure show a strong overlap with the neuronal processes which underlie self-experience and are also at the same time greatly influenced by the outside world and its extrinsic stimuli. There is much evidence that particularly the midline regions show a strong overlap between intrinsic activity and activity by means of self-related stimuli (for instance by saying one’s own name). This is only possible if specific self-related information is decoded by the intrinsic activity and its spatiotemporal structure. On the other hand, neuroimaging studies have shown that the intrinsic activity and its spatiotemporal structure may be strongly influenced by the outside world, especially by stressful life-events. Thus, intrinsic activity and its spatiotemporal structure would appear to fulfil the criteria for self- and object-specificity analogous to the structure in the psychodynamic context” [42].

Depression and schizophrenia as examples of the interrelationship between psychodynamic and neurobiological perspectives

Depression and schizophrenia were focussed on as examples of the interrelationship between psychodynamic and neurobiological perspectives towards psychopathological phenomena (“The decoupling of the self in depression”, for further details see [45, 48–53]; “The concept of cathexis and paraconstruction in schizophrenia”, see [54]).

As we have stated in our former publications, the development of neuropsychodynamic hypotheses of the altered self-reference in depression was based on the investigation of the emotional-cognitive interaction in depressed patients [48]. These studies had focussed on the neuro-

physiological correlates of depressive inhibition and the neurophysiological substrates of negative cognitive schemes (overview in Böker and Northoff [48, 54, 55], for further details see [56–75]).

On the basis of these neuroimaging studies, depression may be characterised “by reduced neuronal activity in the left dorsolateral prefrontal cortex and increased activity in the right dorsolateral prefrontal cortex. The neuronal activity in the left dorsolateral prefrontal cortex can not be modified by emotional valence. The severity of depression correlates with the activity in the right dorsolateral prefrontal cortex. Connected with the reduced deactivation in the pregenual ACC (default mode network), depressed persons can not shift their attention from themselves to the outside world” [48] (see also [69, 76, 77]).

Furthermore, it may be concluded “that the increased negative self-attributions – as as typical characteristics of an increased self-focus in depression – may result from altered neuronal activity in subcortical-cortical midline structures in the brain (especially from hyperactivity in the cortical-subcortical midline regions and hyperactivity in the lateral regions” [48] (see also 77–79).

The focus on both psychodynamic and neurobiological dimensions maybe very helpful in the treatment of depressed patients (see case vignette below). The essentials of neuroscientifically informed perspectives in the psychotherapy of depression are summarised in table 1.

In schizophrenia, many neuroimaging studies showed aberrant neuronal functions, especially hyperactivity and hyperconnectivity of the DMN (default mode network) in schizophrenic persons and also in their first-degree relatives (for an overview see [87], further details in [2, 54, 88]). Contrary to healthy persons [89] “the balance of the connectivity between DMN and CEN changes, depending

on the amount of abnormally high resting state activity and hyperconnectivity in the CMS” [54] (see also [64, 65, 90, 91]).

Abnormal anterior-to-posterior connectivity is related to self-specificity processing in patients with schizophrenia [92]. The result of these dysfunctional activation patterns can be observed on the phenomenal level: “the change or even deterioration of the consciousness of the self” [54].

From a psychodynamic perspective, people with schizophrenia suffer from self-fragmentation [45, 93], which may be seen as a “trans-phenomenal concept underlying anomalous subjective experiences” [54]. Schizophrenic patients lose the clear distinction between internal and external mental content (“self-environment blurring” [54]) or, in psychodynamic terms, a loss of boundary cathexis takes place [94]. Mentzos’ concept of the “schizophrenic dilemma” between self-relation and object-relation [41] may also be referred to in this neuropsychodynamic context.

The psychotherapist of the psychotic patient is directly involved in the patient’s dilemma, i.e., there may be the danger of developing a countertransference resistance: “...the common countertransference is impatience, fear, anger, and feelings of distance, because the therapist has to bear the psychotic disintegration of his patient” [87]. When treating psychotic patients therapists can benefit from these neurobiological and psychodynamic perspectives, when they have in mind “the imagination of abnormal neuronal events in the brain of their psychotic patients, e.g. hyperconnectivity and DMN–CEN imbalance. The danger of their own self-fragmentation will then be reduced. By considering not only the phenomenal, but also the neuronal perspective, the therapist’s paradigm can be changed, resulting in a reduction of his countertransference-resistance

Table 1: Main essentials of neuroscientifically informed perspectives in the psychotherapy of depression^{*}.

| | |
|--|--|
| Dysfunction of the cortical midline structures (CMS) | |
| Induced neural arousal (hyperactivity CMS) | |
| Hypoactivity DLPF | |
| Disturbed self referential processing | |
| Disturbed experience of the body | |
| Emotion regulation | |
| Therapy Process: | |
| Acute depression: Considering state variables | Containment |
| | Considering anxiety and agitation (no interpretations of aggression!) |
| | Considering cognitive deficits |
| Recidivism and longtime-course: Considering trait variables | Stepwise adapted focus |
| | Necessary emotional attunement |
| | Adequate timing of therapeutic interventions |
| | Increasing focus on conflictuous patterns of self worth regulation and relationship expectations |
| | Psychotherapeutic maintenance therapy in chronic depression |
| Indication: individual-oriented (personality structure, traumatisations, coping mechanisms, relationship patterns, severity of symptoms, course of depression, motivation) | |
| Synergistic effects of pharmacotherapy and psychotherapy: top-down and bottom-up | |
| Main aim of psychotherapy: overcoming defensive strategies and vicious intraindividual and interpersonal circles | |
| Depression-specific treatment approaches (CBT, IPT, STPT, CBASP) | |
| Psychoanalytic psychotherapy contributes to an adequate treatment of depressed patients, whose structurally based dynamics of intrapsychic and/or interpersonal conflicts triggers depressive episodes and contributes to the chronification of the depressive disorder [80] | |
| Stepwise application of different therapeutic interventions considering state- and trait-variables | |
| Therapeutic relationship is of outstanding importance! | |
| Time factor, network dynamics, and gene expression: sufficient long duration of treatment is necessary! | |
| Further development of differential indication on the basis of functional subtypes (considering psychodynamic and neurobiologic dimensions) | |

CBASP = cognitive behavioural analysis system of psychotherapy; CBT = cognitive behavioural therapy; CMS = cortical midline structures; DLPF = dorsolateral prefrontal cortex; IPT = interpersonal psychotherapy; STPT = Short Time Psychodynamic Therapy * Focus on and consider of [80–86].

his being the case, more therapists could attempt to treat psychotic patients neuro-psychodynamically” [87].

The future emphasis should be “to find treatment methods which are able to connect self-fragments together or in other words, which strengthen or even restore the spatio-temporal structure of the self” [54], “bottom-up”, e.g., with antipsychotic medication and “top-down” by means of psychotherapy, “which may have an additional influence on neuronal activity in CMS (cortical midline structures)” [54].

Operationalized psychodynamic diagnostics (OPD) as an “instrument to transfer psychodynamic constructs into neuroscience”

The system of operationalized psychodynamic diagnostics (OPD; for further details see [95]) aims at broadening the International Classification of Diseases (ICD) and diagnostic and Statistical Manual (DSM) classifications by including essential psychodynamic dimensions and at the same time remaining aspects of reliability apparent in the descriptive-phenomenological instruments.

Besides its use in psychotherapy training and psychotherapy research, OPD was used as an instrument to “transfer psychodynamic constructs into neuroscience” [96].

Buchheim et al. (HANSE-NEURO-Study [97]) investigated neural activation patterns in the course of psychotherapy in depressed patients; they found changes in prefrontal-limbic function in major depression after 15 months of long-term psychotherapy.

In a functional magnetic resonance imaging (fMRI) study functional brain changes in patients with depression were explored using individualised stimuli [98, 99].

The fMRI data were collected during free association to emotionally significant sentences and two groups were compared: (a) individuals with the association reflecting a possible psychodynamic conflict; (b) individuals in whom no sign of conflicts was found in their associations [100]. The conflict group exhibited stronger activation in the anterior cingulate cortex (ACC), which is involved in emotion processing and conflict monitoring: “Thus OPD was used post hoc to deliver a psychodynamic interpretation of brain activity” [100].

Kessler et al. [101] investigated behavioural and psychophysiological reactions to conflict-related and individualised stimuli as potential correlates of repression in a group of healthy female subjects. Sentences were generated from individual OPD-based interviews.

Furthermore, OPD has been used in the context of therapy planning, psychotherapy evaluation, psychotherapy training and psychotherapy research:

Jakobsen et al. [102] described results of long-term psychoanalytic psychotherapy in specific psychic disorders. They found a significant improvement of symptoms and of interpersonal relationships in patients with affective disorders, anxiety disorders, obsessive-compulsive disorder (OCD), dissociative and somatoform disorders, and personality disorders.

Leichsenring et al. [103] found changes in personality functioning after inpatient psychodynamic psychotherapy using a dimensional approach to personality disorders.

Dinger et al. [104] investigated the change of emotional experience in major depression and borderline personality disorder (BPD) during psychotherapy. They found that lower levels of personality functioning in depressed patients with BPD are associated with a broader spectrum of negative emotions.

Ehrental et al. [105] investigated psychosocial variables that influence chronic diseases, such as type 2 diabetes mellitus. They found that levels of personality functioning and not depression predict decline of plasma glucose concentrations in type 2 diabetes mellitus.

Bröcker et al. [106] performed an OPD-2-based study focussing on the course of treatment of patients with non-affective psychosis (“Modified Psychodynamic Psychotherapy for patients with schizophrenia - a Randomized Controlled Efficacy Study”). The aim of this study was to compare the predictive value of the Metacognitive Assessment Scale-Abbreviated (MAS-A) and the “levels of structural integration” of the OPD-2 with regard to psychosocial functioning of patients with non-affective psychoses. The results underlined that “levels of structural integration, including the quality of internalised object representations and unconscious interpersonal schemas might ...be considered as valuable predictors of social functioning and as one therapeutic focus in patients with non-affective psychoses.”

Several OPD-based studies have contributed essentially to depression and treatment research:

Kaufhold et al. [107] described the conflict dynamics in chronic depression on the basis of the results of the conflict and structure axis using the OPD (in the LAC study). A total of 217 patients with chronic depression were assessed before the beginning of treatment. The results underlined a moderating effect of the structure on the processing of conflicts and referred to the influence of experienced losses in chronic depression.

Leuzinger-Bohleber et al. [108] investigated symptomatic and structural changes of the outcome of cognitive-behavioural and psychoanalytic long-term treatments by means of the OPD and the Heidelberg Structural Change Scale (HSCS in the LAC Depression Study, a large multicentre study. Both psychotherapies led to highly significant changes in the depressive symptoms 3 years after the beginning of treatment. Furthermore, the results underlined the transformation processes, namely the structural changes, in psychoanalytical treatments.

In the *Zurich Depression Study* [84, 109–111], individualised stimuli were used to investigate neural emotion processing in the course of psychodynamic psychotherapy of depressed patients. In contrast to former studies which used OPD-generated sentences, the Interpersonal Relations Picture System (IRPS [110] was developed using the Maladaptive Interpersonal Patterns Q-Sort (MIPQS) to compose a system of pictorial stimuli. The MIPQS is based on the 32 items of the interpersonal relations axis of the OPD-2 [95]. The pen drawings of stick figures illustrate situations with interpersonal behaviour patterns.

Before and after 6 and 12 months of psychodynamic psychotherapy, self-assessment questionnaires, task-related and resting state fMRI and magnetic resonance spectroscopy were applied. First, the neurobiological underpin-

nings of reflecting on oneself and others in relationships were investigated in a control group of healthy participants. A modulation of brain activation in the right parahippocampus, the insula bilaterally, the left precuneus, bilaterally in the fusiform gyrus, and the left pre-supplementary motor areal was found [95].

Part of the Zurich Depression Study was the analysis of a sample of depressed and healthy participants, in which functional connectivity (FC) was explored during the recall of formative relationship episodes using functional magnetic resonance imaging [111]. Depressive symptoms were associated with increased functional connectivity of brain regions that form an interoceptive socio-affective network, such as of the precuneus, the anterior insula, dorsal anterior cingulate cortex, left amygdala, and medial prefrontal cortex, early adversity was linked to decreased functional connectivity in brain regions mediating emotion processing and increased functional connectivity of the parahippocampus.

Wade-Bohleber et al. [111] concluded that depression and early adversity are associated with differential functional connectivity patterns in the brain during the recall of formative relationship episodes: "Hyperactivity of the interoceptive socio-affective network associated with depressive symptoms may link to enhanced self-focus and emotional reactivity. Patterns of neural activation associated with early adversity may underpin numbed affective states or enhanced affective memory regulation."

A vignette of a depressed patient who was included in the Zurich Depression Study and who was treated with psychoanalytic psychotherapy demonstrates the use of OPD diagnosis in the course of the treatment:

Ms. N., a woman in her 30s, was facing a severe depressive episode that slowly developed after the death of her partner. She felt sad, hopeless and guilty, and suffered from pronounced difficulties in sleeping. She could not enjoy any of her formerly liked activities, having self-doubts and blaming herself. It had become increasingly difficult for her to maintain her job and social life.

In the psychoanalytic psychotherapy that she then began, her experiences in the relationship with her deceased partner became a major theme during the first months. Her relationship with her partner had been accompanied by ambivalent feelings. She had typically conformed to his wishes, leaving aside her own, and she felt stuck with feelings of anger towards him. Miss N. gradually linked these experiences to certain repetitive feelings, perceptions and interpersonal constellations that she had experienced throughout childhood and youth.

Her father was an alcoholic who had been indifferent to the patient and her brother. He tended to be aggressive, sometimes losing self control. The relationship with the mother was closer, especially in "good moments", but remained highly ambivalent, because her mother's behaviour fluctuated widely between near and distance, often intrusive and irritating.

In the further course of the therapy the patient remembered the "dark atmosphere" in her childhood which was also connected with the sexual abuse by one of her uncles. She felt anger, pain and shame at not having been protected by her parents. She suffered from anhedonia, a lack of any

perspectives ("life flashes by"), being unable to enter into a new partnership.

The therapy targeted five OPD focusses [95] (according to the Heidelberg Structural Change Scale/HSCS):

1. Dysfunctional relationship patterns,
2. Conflicts of self value,
3. Conflicts of guilt,
4. Affect tolerance, and
5. Use of introjected objects and separation.

The patient felt supported by the therapist and gained more and more self confidence. The therapeutic interventions were modified in the further course of the treatment. Whereas the holding function and affect attunement were the fundament of the development of the therapeutic relationship, especially in the beginning, clarification and interpretation of basic conflicts became more important in the following steps of the therapeutic process. The depressive symptoms remitted completely after two years of psychotherapy. Ms. N. could distance herself (especially from her mother and other persons who had neglected her), was able to express her needs, developed a more positive self image, and realised her professional and emotional capacities.

In view of the structural aspects of the personality and the traumatic experiences that had been connected with the development of the depressive psychopathology, the psychotherapy was continued and conceptualised as a long-term psychoanalytic psychotherapy in order to work through the unconscious conflicts of the patient and to promote her separation process towards a greater autonomy.

Future perspectives: "common currency" between experience and brain?

Unlike biological psychiatry, which focuses on the brain itself independent of its respective ecological context, psychodynamic psychiatry emphasises the integration of experience including the subject of experience within the ecological context of the world [2].

Closing the gap between experience and brain is central for psychiatry since we need to understand the processes that transform abnormal neuronal into phenomenal states which psychiatric patients experience in first-person perspective. Northoff [46] focussed on these transformative processes such as neuronal-phenomenal transformation and proposed a shared overlap or "common currency" between neuronal and phenomenal states that drives the transformation of the former into principles of psychodynamic psychiatry [46, 112].

Biological psychiatry, neurobiology, psychodynamic psychiatry, and psychoanalysis suppose different models. Psychoanalysis focuses on structure and form as well as on psychodynamic and mental mechanisms like defense mechanisms. Biological psychiatry focusses on symptoms as mental alterations which are most often associated with either cognitive, affective, social, or sensorimotor dysfunction. Finally, neurobiology searches for the brain's neural activity during various cognitive, affective, social and sensorimotor tasks, such as task-evoked activity, and, more recently, investigates the brain's spontaneous or resting state

activity. All these disciplines seem employ different presuppositions and concepts, which seem – at least to a certain extent – to be incompatible with each other.

How can these disciplines be linked to each other without amalgamating or reducing the former to the latter? For that, Boeker et al. [2] argued, a common framework with common shared features is necessary. Based on their own investigations, they suggest that such a common framework consists in spatiotemporal features [43, 46, 112–115]. By spatiotemporal features they do not mean the observable discrete point in time and space but rather structure, form and relation that as such are virtual and not observable rather than real and observable. It may be supposed that such spatiotemporal structure enables the description of psychodynamic mechanisms (such as defense mechanisms), psychopathology (such as depression as paradigmatic example), and neuroscience (such as relationships between different neural networks within the brain's spontaneous activity as paradigmatic example). Therefore, psychopathological symptoms are considered as spatiotemporal symptoms of altered neuro-psychodynamic mechanisms based on the spontaneous activity's spatiotemporal pattern [87].

Conclusion and outlook

Neurobiology can potentially benefit psychiatry and psychotherapy in many different perspectives [2], for instance:

- Breaking down stigmas and taboos about mental illness,
- Development of a stronger position among the general public and in government healthcare policies,
- Better understanding of the aetiology involved, and of how physiological and mental aspects of psychiatric disorders are linked,
- Aiming at neurobiological variables in psychotherapeutic treatment,
- Better understanding of the interaction between various brain regions, and
- Development of selective rules for indications using neurobiological predictors.

Nevertheless, the limits and possible risks that may be involved in neuroscientific approaches and, in the worst case, their one-dimensional application, should not be overlooked. Fuchs [116] emphasised that a neurobiological view of mental disorders and their treatment can always become problematic, “if neurobiological approaches are no longer considered an alternative and complement to psychological models and procedures, but claim to have the absolute sovereignty of interpretation in human science.”

Recent studies have shown a relationship between such reductionistic biological interpretations of psychiatric illness and the empathy shown by the clinician concerned: for example, Lebowitz and Ahn [117] reported on “unintentional negative consequences of exclusively biological models of illness depending on how the therapeutical relationship was built, on how the symptoms were perceived, interpreted and dealt with, and also particularly depending on the therapist's empathy.”

Psychodynamic psychiatry and neuropsychodynamic psychiatry may bridge psychiatry and neuroscience, thus contributing essentially to the bio-psycho-social model of psychiatry. Spatiotemporal psychopathology assumes correspondence and continuity between the spatial and temporal features of the brain's spontaneous activity on the one hand and the spatial and temporal structure underlying psychopathological symptoms on the other [2, 43, 46]. Such spatiotemporal correspondence was exemplified by ruminations and the experience of loss of the self in depression. Spatiotemporal continuity is disrupted in for instance schizophrenia which may be central in constituting hallucinations and delusions.

Possible therapeutic consequences of the neuro-psychodynamic approach to depression involve the necessary emotional attunement in psychotherapy of depressed patients and the adequate timing of therapeutic interventions [15, 80] the development of therapeutic interventions which strengthen the spatio-temporal structure of the self in schizophrenic patients, and the reduction of the possible countertransference-resistance of the therapist [87].

Psychotherapy is successful bringing about substantive changes in behaviour; it does so by producing alterations in gene expression that produce new functional and structural changes in the brain [3].

Beyond former, often one-sided, interpretations of neuronal and mental phenomena and categorical controversies between different disciplines Neurobiology may contribute to the development of psychodynamic psychiatry and, vice versa, psychodynamic psychiatry may contribute to neurobiology, especially to first-person-neuroscience. This development may lead near to Freud's vision in his “Project for a Scientific Psychology” [118]:

“The intention is to furnish a psychology that shall be a natural science: that is to represent psychological processes as quantitatively determinant states of specifiable material particulars, thus making those processes perspicuous and free from contradiction.”

Psychodynamic psychiatry is part of the bio-psycho-social model of psychiatry, and it will contribute to the future brain-mind-debate in general, and the critical dialogue in the debate on future directions in psychiatry and the epistemological framework involved in special [119]: “The debate on future directions of psychiatric diagnosis critically depends on a sustained and substantial reflection on the epistemological framework involved. For example, how shall we integrate the notions of subjectivity, autonomy, and personhood with neuroscientific data? In order to justify the designation of an important realm of current psychiatric research as *social* neuroscience, this question has to be answered. The proposals of ‘first person neuroscience’ and ‘two person neuroscience’ are attempts to get ahead with this issue.”

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No potential conflict of interest relevant to this article was declared.

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