

PHENOMENOLOGY, BIOLOGY AND SPECIFICITY OF DYSFUNCTIONS IN GESTALT PERCEPTION IN SCHIZOPHRENIA

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We thank CUTTING (2004) and TSCHACHER (2004) for their thoughtful commentaries on our paper. Both authors agree with our basic assumption that Gestalt psychology offers a useful paradigm from which to understand certain biological and cognitive abnormalities in schizophrenia. However, both authors have also reservations concerning central issues surrounding the scope, specificity and biological correlates of dysfunctions in Gestalt mechanism in schizophrenia.

Phenomenology, philosophy and Gestalt perception in schizophrenia

CUTTING is very sympathetic to the application of Gestalt psychology towards the understanding of cognitive dysfunctions in schizophrenia. CUTTING's enthusiasm stems from the fact that Gestalt theory is able to accommodate findings from specific experimental tasks in which reduced sensitivity to perceptual gestalts leads to a superior ability to make judgements about individual stimulus features (i.e., PLACE & GILMORE 1982, SILVERSTEIN et al. 1996a, Study1, UHLHAAS, PHILLIPS & SILVERSTEIN in press). He also notes, however, "...that the Gestalt approach still does not explain even a minority of the overall psychopathological phenomena of the condition" (p.332). In this context, we would like to note that the purpose of our paper was not to outline a complete theory of the psychopathology of schizophrenia. While we acknowledge that Gestalt theory at present does not offer a complete account of schizophrenia, and indeed no other theory is at present even close to this, we agree with KNIGHT (1984) who demonstrated that a Gestalt-based view of cognitive deficits in schizophrenia can account for findings from a variety of experimental paradigms better than other cognitive models. We also believe that impaired Gestalt mechanisms may also have a wider relevance for the understanding of certain psychopathological symptoms in schizophrenia than has previously been appreciated. In fact, Gestalt psychology is particularly suited as a 'stepping stone' (CUTTING p.3) because its emphasis on phenomenology makes it possible to relate theories and findings to everyday experience, our being-in-the-world. In addition, we would like to

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propose that the alterations of Gestalt mechanisms in psychopathology might allow us to analyse their wider philosophical and ontological significance.

We had already indicated in our first article that changes in Gestalt perception in schizophrenia constitute not only a perceptual deficit, but are indicative of a transformation in self-experience (UHLHAAS & SILVERSTEIN 2003, p.265). This hypothesis is underlined by the constitutive role of Gestalt mechanisms, especially in perceptual data, for our being-in-the-world. MERLEAU-PONTY (1962), for example, suggests that the perceptual consciousness is foundational for all human existence, a 'nascent logos', from which ideas and abstract thought are derived. In his view, sense and meaning of the perceptual field are the result of an 'implicit understanding', that is, an essentially pre-reflective activity of the ego which is accompanied by an immersion in which self and world create a unity, an indivisible whole in which the phenomenal self and our phenomenal world appear as a Gestalt (METZINGER 1995).

The immediate grasping of sense and significance in perceptual consciousness is closely related to the inherent organization of perceptual field. Throughout our conscious life, we are never confronted with scattered facts and experiences but by objects that stand out from their background, which exhibit organizational forms and structures different from their surroundings. Such organization is the prerequisite for our actions and understanding of the perceptual field since meaning is closely intertwined with the organization of perceptual data. KÖHLER (1929) suggested that, "...for its gradual entrance into the sensory field, meaning follows the line drawn by natural organization" (p. 139).

The relevance of organization in the perceptual field goes beyond its contribution to individual percepts in affirming the existence of objects and the field or horizon of consciousness since it is only through the continuity of context that the individual percepts of an object are linked. Continuity of context and organization are also a necessary part of the stream of consciousness (JAMES 1890). The phenomenal stream of conscious experience is characterized by the continuous emergence of novel organizations which are, at the same time, linked to each other by the context of preceding originations which provide a frame of reference from which organizations continuously emerge (GURWITSCH 1964).

From a phenomenological perspective, the perceptual disturbances described by MATUSSEK (1987), CONRAD (1952), and others (e.g., CHAPMAN 1966, McGHIE & CHAPMAN 1961; CUTTING & DUNNE 1989), therefore, indicate not only a change in perception per se but a profound change in the level of intentionality, that is, in the way consciousness is intrinsically connected to and embedded in the world. The perceptual field appears transformed, at a further distance from the self, and is characterized by a fragmentation of meaning, as demonstrated in the following example: "I only saw fragments: a few people, a kiosk, a house. To be quite correct, I cannot say that I did see all of that, because the objects seemed altered from the usual. They did not stand together in an overall context, and I saw them as meaningless details. The way to the University also seemed to be like that. My impressions did not flow as they normally do. If had not continuously reminded myself where I was going, I would just as gladly have stood still" (MATUSSEK, 1987, p.92).

From the example above we conclude that the change in intentionality in schizo-

phrenia is located in the *pre-reflective mode of intentionality* which is a mode of intentionality which furnishes the background texture or organization of the field of experience and hence serves as the necessary foundation for more explicit or volitional acts of thinking, perception and motor acts. (SASS & PARNAS 2003). This deficit in pre-reflective perceptual intentionality may account for two symptoms of psychopathology in schizophrenia which CUTTING describes: 1) the preoccupation with thingness; and 2) preoccupation with divine, spiritual and metaphysical themes. As a consequence of the loss of organization in the perceptual field, objects appear as framed or 'weighted' which causes objects to seem strange or hypersignificant (MATUSSEK 1987, p. 93-94). That is, objects lose their significance or to use the Gibsonian term *affordances*, their significance as obstacles, tools, objects of desire, and the like leading to the preoccupation with thingness as described in the following example: "My eyes met a chair, then a table; they were alive, too, asserting their presence. I attempted to escape their presence, with its existence. I attempted to escape their hold by calling out their names. I said, "chair, jug, table, it is a chair." But the words echoed hollowly, deprived of all meaning, it had left the object, was divorced from it, so much so that on one hand it was a living, mocking thing, on the other, a name, robbed of sense, an envelope emptied of content." (SECHEHAYE 1970, p.40-41).

Secondly, a deficit in pre-reflective intentionality can be related to changes in self-experience or *ipseity*, the underlying sense of existing as a vital and unified subject of awareness or first-person perspective (SASS & UHLHAAS 2003). SASS (1992) highlighted a specific change of self-experience in schizophrenia as *hyperreflexivity*. This is a form of exaggerated awareness, in which a subject takes its own thought processes as an object of thought, which is relevant for the current discussion. In the vignette by MATUSSEK, the unreflective immersion in the world is beginning to be replaced by a distancing between self and world since there is no reason for attention to be directed outward. As a result, processes of the body or of thinking become the focus of awareness. The shattered mental equilibrium leads to an introspective mode which may lead to a resulting metaphysical quest to explain the profound change in the relationship between self and world as in the following example: "He had to define and analyze everything: needed new concepts for the world and human existence; absorbed by new ideas or interests, gradually taking over my way of life and thinking" (MOLLER & HUSBY 2000).

CUTTING also draws a parallel between the phenomenology of schizophrenia and Alzheimer's disease (AD). In his view, the loss of Gestalten is present in both disorders and results in a particular stance towards the world that may also be conducive to creative expressions. Although it is correct that both AD and schizophrenia are characterized by deficits in Gestalt perception, we wish to question the relationship between Gestalt perception and creativity, especially in AD. While it is true that changes in Gestalt perception may lead to a different view of the world that may be captured in artistic expression, it is generally not the case that AD patients show prodigious artistic talent (MILLER & HOU 2004). In contrast, the pathology of AD critically involves visual areas whose impairment is also reflected in the art of patients with AD, such that the neuropsychological deficits in visuospatial functioning are reflected in the paintings of patient with AD (MAURER & PRVULOVIC 2004). Emergence of artistic talent in dementia patients is more commonly associated with

the frontotemporal variant of dementia (MILLER et al. 1998), which does not affect visual areas of the brain. So far, there have been no studies showing that Gestalt perception is impaired in this form of dementia.

The neuropsychology of schizophrenia: Is it right?

We are sympathetic to CUTTING's assessment that "...there is no place these days for general statements such as 'schizophrenics have brain damage or dementia praecox'" (p.332) although such metaphors are still not altogether absent from the psychiatric discourse. Yet, we also believe that a definition of the neuropsychological profile of schizophrenia in terms of an imbalance in hemispheric activity is oversimplified to explain the heterogeneity of the disorder that is found at the biological and psychological level. Disturbances in hemispheric functions are certainly an important feature of the disorder but provide a mechanism, which as an explanatory concept, is far too general to derive specific hypothesis about the cognitive and biological abnormalities of the disorder. Despite these reservations, we certainly regard this hypothesis as interesting and worthy of further study and potentially compatible with our approach. As noted by VENABLES (1984), schizophrenia patients who perform like right-hemisphere brain damaged patients on psychological tests typically can be characterized as having the "process" (or neurodevelopmental) form of the disorder. While this supports the view that patients with Gestalt processing disturbances may represent a neurodevelopmental subtype, it also highlights the fact that heterogeneity exists in terms of how schizophrenia patients perform on measures of lateralized function, and that neither a right- or left-hemisphere based dysfunction is likely to account for the full range of phenomena seen in schizophrenia.

There is already evidence that impaired Gestalt perception in schizophrenia is related to a right hemisphere deficit, but these data have so far come from studies that examined schizophrenia spectrum disorders, such as schizotypy. For example, GOODARZI et al. (2000) examined Gestalt perception with a version of the Global/Local task (NAVON, 1977), which uses large letters made up of small letters in a sample of university students in relationship to schizotypal traits. The global/local task typically requires participants to identify the letter that is made up of small letters (global level) or to identify the individual letters (local level). The consistent finding for normal subjects is that the targets at the global level are identified faster than targets at the local level. On the basis of initial results, NAVON (1977) proposed that global attributes of a stimulus are analysed first, with subsequent local analysis. GOODARZI et al. found that students with elevated levels of schizotypal traits showed a deficit in global processing which was linked to a processing in the left visual field, indicating a right hemisphere dysfunction. Future studies should replicate this result in schizophrenia patients to provide further evidence for a right-hemisphere dysfunction. In addition, the examination of Gestalt perception in schizophrenia with functional magnetic resonance imaging (fMRI) would be useful to identify aberrant patterns of hemispheric activity.

Specificity of deficits in Gestalt perception

TSCHACHER's commentary focuses on the notion of specificity, which he deals with at length. In particular, he asks whether our original position has been modified. We wish to note that we have maintained a consistent perspective on dysfunctions in Gestalt perception in schizophrenia. While it is true that we have put forward that the perceptual organization hypothesis "is the best explanatory concept for cognitive deficits in schizophrenia" (UHLHAAS & SILVERSTEIN p.272) and that schizophrenia "...may be characterized by a general impairment in Gestalt processes..." (p.272), we have already pointed out, in the original article, that schizophrenia patients do not show deficiencies on all tests of perceptual organization and that the severity of these deficits varies according to illness subtype, being especially related to those characterized by disorganized symptoms and/or poor premorbid functioning (p.268). Similarly, we do not believe that recognition of heterogeneity in schizophrenia and attempting to explain it weakens a theory of schizophrenia. Recognition of heterogeneity in schizophrenia is now generally accepted in terms of symptoms, course, and cognition, and a theory must address this issue.

TSCHACHER distinguishes several broad categories of neurocognitive specificity and notes that in our position there is "...some opacity where it concerns the topic of specificity" p. 337). We would like to discuss each category of specificity and show that we have been consistent on the notion of specificity. TSCHACHER misinterprets our position that deficits in perceptual organization represent a circumscribed perceptual deficit in schizophrenia (faculty specificity). We have noted before that an impairment in perceptual organization is not confined to a particular cognitive domain, for example, visual perception, but represents one manifestation of a wider deficit in the coordination of cognitive activity which is manifested in dysfunctional representation and organization in multiple domains of cognition (including language, perception and thinking), and on the symptom level as the disorganization of thought and behaviour (UHLHAAS & SILVERSTEIN 2004, PHILLIPS & SILVERSTEIN 2003). TSCHACHER is correct, however, in stating that a faculty specific cognitive dysfunction would provide little insight into the pathophysiological mechanism of the disorder, and that the wide range of cognitive dysfunctions in schizophrenia makes this view unlikely. Accordingly, we reject the notion that deficits in perceptual organization reflect a localized impairment in cognitive function but instead argue for the view that dysfunctional perceptual organization represents an impairment in a general cortical algorithm that supports perceptual organization and context-processing (function specificity).

This view does not exclude the possibility that heterogeneity in deficits of cognitive coordination exists. We have argued elsewhere that such a general cortical algorithm still leaves room for variation. This is compatible with the observed heterogeneity of deficits in cognitive coordination in schizophrenia. In studies spanning over almost 20 years, we have repeatedly observed that dysfunctions in perceptual organization in schizophrenia are related to specific features of the illness, including poor premorbid functioning, poor outcome, elevated nailfold plexus visibility and increased levels of disorganization (reviewed in UHLHAAS & SILVERSTEIN in press). At present, the co-occurrence of these features and dysfunctions in perceptual organization suggests

that these features may constitute a taxon (i.e., category or type). Such a taxon most closely corresponds to the proposed neurodevelopmental subtype of schizophrenia (JONES, GUTH, LEWIS, & MURRAY 1994).

In terms of functional specificity, TSCHACHER furthermore hypothesizes that the dysfunction in perceptual organization in schizophrenia may be linked to certain task parameters. Specifically, he hypothesizes that the "...decisive distinction between functional and dysfunctional Gestalt formation may not be the stability of Gestalts (or the "ease" of Gestalt emergence) per se, but instead the contextual adequacy of a Gestalt given a certain control parameter" (TSCHACHER p. 6). This formulation closely corresponds to the findings we have obtained in a number of studies: schizophrenia patients are not impaired in all tasks of perceptual organization, but these deficits are pronounced when perceptual groups have to be disambiguated by current context as well as top-down mediated contextual influences. For example, stimulus processing is intact in schizophrenia when stimuli have strong prepotent structures (KNIGHT, MANOACH, ELLIOTT, & HERSHERSON 2000, SILVERSTEIN, BAKSI, CHAPMAN & NOWLIS 1998b) but is impaired in the utilization of top-down cues for stimulus grouping. Likewise, the study by SILVERSTEIN et al. (1998a) demonstrated that schizophrenia patients displayed intact perception for stimuli with "good" (symmetrical) form but were significantly impaired in detection of stimuli with a "poor" (nonsymmetrical) form in a pattern recognition task. SILVERSTEIN et al. (1996a, Study2) included a task manipulation to examine specifically the contributions of top-down processing strategies to impairments in perceptual organization. Strengthening of contextual top-down feedback normalized performance of poor premorbid schizophrenia patients, suggesting that impairments in top-down processing might be a critical deficit in perceptual organization in schizophrenia. Similarly, COX and LEVENTHAL (1987) observed that non-paranoid schizophrenia improved their perceptual organization performance after the preattentive discriminability of stimuli was increased. In addition, PLACE and GILMORE (1982) observed that in contrast to controls, schizophrenia patients did not benefit from previous exposure to configural stimuli.

TSCHACHER also discusses the notion of stage specificity in relationship to deficits in perceptual organization in schizophrenia. He refers to his own work, which has examined the longitudinal course of symptom domains as well as the relationship between deficits in perceptual organization and specific syndromes of schizophrenia. On the basis of his own results and evidence from phenomenological psychiatry, he advances the notion that 'stage specificity' is a plausible assumption (p. 340). We would like to discuss this hypothesis critically, and wish to comment on the various associations found between impaired perceptual organization and psychopathological dimensions. We also want to note at the outset that while we believe there is evidence for stage specificity for perceptual organization deficits in schizophrenia, we do not see this as mutually exclusive with other forms of specificity, such as function or faculty specificity. We will return to this point at the end of this section.

In support of the hypothesis of stage specificity, the most robust finding which has emerged so far is that higher disorganization factor scores, on measures such as the Positive and Negative Syndrome Scale (PANSS) (KAY, OPLER, & FISZBEIN 1986)

and the Brief Psychiatric Rating Scale (BPRS) (SPAULDING et al. 1999) correlate with deficits in perceptual organization in schizophrenia. This finding has been supported by all seven of the studies that have included disorganization as a separate symptom factor (reviewed in UHLHAAS & SILVERSTEIN in press).

Different symptom models can account for differences in symptom correlates of dysfunctional perceptual organization across studies. SILVERSTEIN et al. (1998b, 2000) used both four and five factor solutions for the PANSS that included a disorganization factor, whereas PETERS et al. (2002) grouped symptoms into positive and negative factors only. DONIGER et al. (2001) used a three factor model proposed by WHITE, HARVEY, OPLER, and LINDENMAYER (1997), which differs significantly from the most common symptom models. Furthermore, particular syndromes of schizophrenia, such as disorganization, may be more prevalent in chronic schizophrenia than in patients early in the course of illness (SALOKANGAS 1997). Indeed, there is evidence not only that disorganization occurs more frequently with advanced chronicity, but that its cognitive correlates, such as mismatch negativity and perceptual organization deficits, also become more pronounced, suggesting that all of these related phenomena can be viewed as indices of illness progression (PHILLIPS & SILVERSTEIN 2003). The absence of significant correlations between symptom ratings and deficits in perceptual organization in the studies by CARR et al. (1998) and LIEB et al. (1994) may be explained by the relatively low levels of psychotic symptoms in patients in both studies. Nonetheless, the most robust finding that has emerged so far is that the PANSS disorganization and cognitive factors correlate with deficits in perceptual organization in schizophrenia.

Does all of this evidence of stage specificity imply that the evidence on perceptual organization deficits in schizophrenia does not also meet criteria for function specificity? We think not. The concept of a disturbance in a widespread, basic cortical computation algorithm (function specificity) that generally increases in severity over time, but that may become reduced at times, is consistent with the clinical picture of schizophrenia. Indeed, all attempts to account for phenomena observed in any illness with multiple symptoms having a common etiology, that can progress but also wax and wane over time (e.g. schizophrenia, multiple sclerosis) must deal with these realities. The question then becomes what is most likely to advance our understanding of the illness: developing theories to account for the data, or rejecting theories because they do not fit preconceived notions of how the phenomena should behave? We argue that the latter is an example of pre-emptive thinking (CROMWELL 1984; KELLY 1955), and that the theory and data we present, as for all theories, should be evaluated solely in terms of the degree to which they further our ability to integrate previously un-integrated findings.

Conclusions

Gestalt-theory informed approaches of schizophrenia could advance the understanding of the disorder in a number of ways. First, Gestalt-informed views of the perceptual deficit in schizophrenia can account for findings from a wider range of experimental paradigms than can any other cognitive model of schizophrenia (KNIGHT

1984). Second, dysfunctions in Gestalt mechanisms may be linked to more complex disturbance of self-experience in schizophrenia and we believe that Gestalt theory offers a framework to link cognitive/biological explanatory concepts with phenomenological data. The importance of linking 1st and 3rd person perspectives in the explanation of mental phenomena is underlined by recent debates in cognitive science, which have focused on the relevance of phenomenology for an understanding of consciousness. VARELA (1997), for example, has argued for a neurophenomenology of consciousness, a fruitful combination of the methodologies and insights of the cognitive neurosciences and the systematic study of lived experience. A neurophenomenological framework may not only be important for the understanding of normal cognitive processes, but also particularly relevant for approaching psychiatric disorders since psychopathology resides to a significant degree in the subjective sphere, in the symptoms, which are only accessible by examining its contents, by using a descriptive approach of lived experience. As argued above, Gestalt theory provides the appropriate language for such an analysis since its concepts are derived from phenomenological data. Moreover, past work by MATUSSEK and CONRAD has demonstrated the usefulness of such an approach for schizophrenia and its potential overlap with insights from experimental psychopathology (UHLHAAS & SILVERSTEIN 2004, p. 268). Future research should therefore aim at combining a phenomenological approach with cognitive parameters in schizophrenia in order to examine the hypothesis that complex disturbances of self-experiences in schizophrenia may be related basic disturbances in information processing, specifically in cognitive coordination.

The search for the core cognitive dysfunctions of the disorder needs to be complemented by investigations that examine possible pathophysiological mechanisms. Although there is abundant evidence implicating altered lateralization in schizophrenia, we believe that this concept provides a formulation that is too general to be useful for the search for neural correlates of cognitive deficits. Instead, we have proposed that synchronized activity within the gamma-band range represents an attractive target as a neural correlate of dysfunctions in perceptual organization and other forms of cognitive coordination in schizophrenia (PHILLIPS & SILVERSTEIN 2003). Perceptual organization is a paradigmatic example of binding in sensory systems of the brain where sensory input requires dynamic neural mechanisms to produce novel output (WATT & PHILLIPS 2000). Probability and strength of synchronization, for example, reflect elementary Gestalt criteria for perceptual grouping, such as proximity, co linearity and common fate (SINGER 1999). There is evidence to suggest that schizophrenia may be characterized by abnormalities in gamma frequency oscillations, and that dysfunctional perceptual organization is related to these abnormalities (SPENCER et al. 2003). There is also evidence to link differences in gamma-band activity with different symptom profiles in schizophrenia (for a review see LEE, WILLIAMS, BREAKSPEAR, & GORDON 2003) with the disorganization syndrome being the most likely symptom expression candidate of a reduction in gamma-band activity. Moreover, aberrant oscillatory activity in the gamma-band range may be linked to specific receptor functioning that allows the linkage to the synaptic pathology of the disorder. Synchronization of firing has been linked to the activity of NMDA-as well as to gabaergic interneurons and both are pathological in schizophrenia (DAW et al. 1993; WHITTINGTON, FAULKNER, DOHENY, & TRAUB 2000).

Preliminary results from our group support the hypothesis that impaired perceptual organization is related to aberrant activity within the gamma-band range in schizophrenia. In a recent study (UHLHAAS et al., in prep), we examined perceptual organization with Mooney faces in schizophrenia patients (N=17) and normal controls (N=19). Mooney faces consist of degraded pictures of human faces where all shades of gray are removed, thereby leaving the shadows rendered in black and the highlights in white. Perception of Mooney faces involves the grouping of the fragmentary parts into coherent images and is related to synchronization of neural activity in the gamma-band in normal subjects (RODRIGUEZ et al. 1999). We measured induced and evoked-gamma band power as well as phase-synchronization in response to Mooney faces in the scalp-recorded electroencephalogram (EEG) to examine the synchronization of neural circuits in schizophrenia. Compared to normal controls, schizophrenia patients: 1) were significantly impaired in the detection of faces; 2) showed both significantly reduced gamma-band power and phase synchronization; and 3) were characterized by reduced amplitudes of the P1 event related potential (ERP) components. The results provide evidence for the hypothesis that dysfunctional Gestalt perception is related to aberrant gamma-band activity in schizophrenia.

Further research is needed to define function and stage specificity of deficits in perceptual organization in schizophrenia. The notion of function specificity in relationship to impairments in perceptual organization holds that a deficit in perceptual organization does not represent an isolated phenomenon, but may allow insights into a core cognitive dysfunction that is present in multiple domains of cognition. Grouping of stimulus elements into coherent object representations according to Gestalt principles is a paradigmatic example of context-processing (PHILLIPS & SILVERSTEIN 2003). The classic demonstrations of Gestalt principles show that stimulus characteristics are dependent on the global aspects of the stimulus configuration where the neighboring stimulus elements constitute the 'context' that influences perceptual processes. A deficit in the processing of contextual information is seen by several investigators (COHEN & SERVAN-SCHREIBER 1992; GRAY, FELDON, RAWLINS, HEMSLEY, & SMITH 1991; PHILLIPS & SILVERSTEIN 2003) as a core deficit that can explain various cognitive impairments of the disorder. Thus, impairments in perceptual organization in schizophrenia spectrum disorders may be indicative of a widespread deficit in the generation of contextually coordinated neural activity across both space and time, and operating across cognitive domains (PHILLIPS & SILVERSTEIN 2003). However, we would like to note that a strong test of this hypothesis is still lacking. There have been no studies, for example, that have explicitly examined the question of whether deficits in cognitive coordination may be responsible for dysfunctions in both language and perception in schizophrenia. A core component of the disorganization syndrome in schizophrenia is formal thought disorder that is manifested in the production of incoherent verbal output. Prior studies have indicated that deficits in context-processing may be related to disorganization in thought and language (KUPERBERG et al. 1998), and there is evidence to suggest that there are commonalities between the way visual context organizes object representations in vision, and the way meaning serves as a context to structure linguistic and conceptual representations (PHILLIPS & SILVERSTEIN 2003). Future studies could use tasks that measure both grouping of contextually related stimuli in language and vision in

schizophrenia.

Further research is also warranted to examine the relationship between symptomatology and deficits in perceptual organization in schizophrenia. While the majority of studies have indicated that dysfunctional perceptual organization is linked to the disorganization syndrome in schizophrenia, it is unknown to what extent this association is stable during the course of the schizophrenia. Future studies, which examine the relationship between symptomatology at different stages of the disorder and dysfunctions in perceptual organization, would be useful to examine this question.

Summary

Gestalt-theory informed approaches towards the understanding of schizophrenia can go beyond the explanations of cognitive dysfunctions of the disorder. Deficits in Gestalt perception in schizophrenia may have a wider relevance for the understanding of the phenomenology of the disorder, especially for explanations of disturbances in self-experiences, as well as for the neurobiology of the condition. Phenomenological, cognitive and neurobiology data suggest that dysfunctional Gestalt perception in schizophrenia is linked to a wider disorganization of cognition and behaviour that may increase over the course of the disorder. In terms of specificity, we view deficits in Gestalt perception as consistent with the notions of 'function specificity' and 'stage specificity'. Future research should examine the neural correlates of dysfunctional Gestalt perception in relationship to aberrant activity in the gamma-band as well abnormalities in receptor functioning. This research will advance the understanding of the neurobiology of schizophrenia as well as stimulate novel therapeutic approaches.

Zusammenfassung

Die Relevanz gestaltpsychologischer Beiträge zum Verständnis der Schizophrenie geht über die Bedeutung für Erklärungsmodelle kognitiver Dysfunktionen bei Patienten mit Schizophrenie hinaus. Defizite in der Gestaltwahrnehmung spielen auch in der Phänomenologie der Schizophrenie eine wichtige Rolle. Phänomenologische Forschungsergebnissen deuten an, dass Störungen in der Gestaltwahrnehmung im Zusammenhang mit schizophrenie-spezifischen Veränderungen im Selbsterleben stehen könnten. Kognitive, phänomenologische and biologische Forschungsergebnisse lassen desweiteren den Schluss zu, dass der Verfall der Gestaltstruktur ein allgemeines Defizit in der Koordination kognitive und neuronaler Prozesse repräsentiert, der sich im Verlauf der Krankheit herausbildet. Defizite in der kognitiven Koordination lassen sich im Sinne einer 'Stadiumspezifität' sowie 'funktionalen Spezifität' einordnen. Es wird vorgeschlagen, dass die Erforschung der neurobiologischen Korrelate der Gestaltwahrnehmung bei Patienten mit Schizophrenie von großer Bedeutung für das Verständnis der Pathophysiologie sowie für therapeutische Interventionen sein könnte.

References

- CARR, V., DEWIS, S. A. M., & LEWIN, T. J. (1998): Preattentive visual search and perceptual grouping in schizophrenia, *Psychiatry Research*, 80, 151-162.
- CHAPMAN, J. (1966): The early symptoms of schizophrenia. *British Journal of Medical Psychology*, 112, 225-251.

- CHEY, E. Y. H., & HOLZMAN, P. S. (1997): Perceptual organization in schizophrenia: The employment of gestalt principles. *Journal of Abnormal Psychology*, 106, 530-538.
- COHEN, J. D., & SERVAN-SCHREIBER, D. (1992): Context, cortex, and dopamine: A connectionist approach to behavior and biology in schizophrenia. *Psychological Review*, 99, 45-77.
- CONRAD, K. (1958): *Die Beginnende Schizophrenie. Versuch einer Gestalt Analyse des Wahns.* (3rd Edition ed.) Stuttgart: Thieme.
- COX, M. D., & LEVENTHAL, D. N. (1978): A multivariate analysis and modification of a preattentive perceptual dysfunction in schizophrenia. *Journal of Nervous and Mental Diseases*, 166, 709-718.
- CROMWELL, R. L. (1984): Preemptive thinking and schizophrenia research. In W. D. SPAULDING & J. K. COLE (Eds.) *Nebraska Symposium on Motivation, 1983: Theories of Schizophrenia and Psychosis* (pp. 1-46). Lincoln: University of Nebraska Press.
- CUTTING, J. (2004): Gestalt psychology and schizophrenia. Commentary on UHLHAAS and SILVERSTEIN's article (with some comments on Plaum's comments on the same article). *Gestalt Theory*, 26, 331-334.
- CUTTING, J., & DUNNE, F. (1986): The nature of abnormal perceptual experiences at the onset of schizophrenia. *Psychopathology*, 19, 347-352.
- DAW, N., STEIN, P.S. & FOX. (1993): The role of the NMDA receptors in information processing. *Annual Review Neuroscience*, 16, 207-222.
- DONIGER, G. M., SILIPO, G., RABINOWICZ, E. F., SNADGRASS, J. G., & JAVITT, D. C. (2001): Perceptual closure deficit in schizophrenia: Impaired sensory precision. *American Journal of Psychiatry*, 158, 1818-1826.
- GOODARZI, M. A., WYKES, T., & HEMSLEY, D. R. (2000): Cerebral laterization of global- local processing in people with schizotypy. *Schizophrenia Research*, 45, 115-121.
- GURWITSCH, E. (1964): *The field of consciousness.* Pittsburgh, Pa.: Duquesne University Press.
- GRAY, J. A., FELDON, J., HEMSLEY, D. R., & SMITH, A. D. (1991): The neuropsychology of schizophrenia. *Behavioral and Brain Sciences*, 14, 1-84.
- JAMES, W. (1890): *Principles of Psychology.* London: Macmillan
- JOHNSTON, M. H., & HOLZMAN, P. S. (1979): *Assessing schizophrenic thinking.* San Francisco: Jossey-Bass.
- JONES, P., GUTH, CH., LEWIS, S., & MURRAY, R. (1994): Low intelligence and poor educational achievement precede early onset schizophrenic episodes. In A. S. DAVID & J. C. CUTTING (Eds.), *The Neuropsychology of Schizophrenia* (pp. 99-116). Hove: Lawrence & Erlbaum.
- KELLY, G. A. (1955): *The psychology of personal constructs (Vols. 1 and 2).* New York: Norton.
- KAY, S. R., OPLER, L. A., & FISZBEIN, A. (1986): The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin* 13, 261-276.
- KNIGHT, R. A. (1984): Converging models of cognitive deficits in schizophrenia. In W. D. SPAULDING & J. K. COLE (Eds.), *Nebraska Symposium on Motivation, 1983: Theories of schizophrenia and psychosis* (pp. 93-156). Lincoln: University of Nebraska Press.
- KNIGHT, R., MANOACH, D. S., ELLIOTT, D. S., & HERSHENSON, M. (2000): Perceptual organisation in schizophrenia: The processing of symmetrical configurations. *Journal of Abnormal Psychology*, 109, 575-587.
- KNIGHT, R. A., & SILVERSTEIN, S. M. (1998): The role of cognitive psychology in guiding research on cognitive deficits in schizophrenia: A process-oriented approach. In M. F. Lenzenweger & Dworkin, R. H. (Eds.), *Origins and Developments of Schizophrenia. Advances in Experimental Psychopathology* (pp. 247-295). Washington, DC: American Psychological Association.
- KNIGHT, R. A., & SILVERSTEIN, S. M. (2001): A process-oriented approach for averting confounds resulting from general performance deficiencies in schizophrenia. *Journal of Abnormal Psychology*, 110, 15-30.
- KÖHLER, W. (1929): *Gestalt Psychology.* New York: Liveright.
- KUPERBERG, G. R., MCGUIRE, P. K., & DAVID, A. S. (1998): Reduced sensitivity to context in schizophrenic thought disorder. Evidence from online monitoring of words in linguistically anomalous sentences. *Journal of Abnormal Psychology*, 107, 423-434.
- LEE, K. H., WILLIAMS, L. M., BREAKSPEAR, M., & GORDON, E. (2003): Synchronous gamma activ-

- ity: A review and contribution to an integrative neuroscience model of schizophrenia. *Brain Research Reviews*, 41, 57-78.
- LIEB, K., MERKLIN, G., RIETH, C., SCHÜTTLER, R., & HESS, R. (1994): Preattentive information processing in schizophrenia. *Schizophrenia Research*, 14, 47-56.
- LIDDLE, P. F. (1987): Schizophrenic syndromes, cognitive performance and neurological dysfunction. *Psychological Medicine*, 17, 49-57.
- MATUSSEK, P. (1987): Studies in delusional perception. In J. CUTTING & M. SHEPPARD (Eds.), *Clinical roots of the schizophrenia concept. Translations of seminal European contributions on schizophrenia* (pp. 87-103): Cambridge: Cambridge University Press. (Original work published 1952).
- MAURER, K., & PVRULOVIC, D. (2004): Paintings of an artist with Alzheimer's disease: visuoconstructural deficits in dementia. *Journal of Neurotransmission*, 111, 235-245.
- McGHIE, A., & CHAPMAN, J. (1961): Disorders of attention and perception in early schizophrenia. *British Journal of Medical Psychology*, 34, 103-115.
- MERLEAU-PONTY, M. (1962): *Phenomenology of Perception* (New York: Humanities Press, 1962; London: Routledge & Kegan Paul, 1962; translation revised by Forrest Williams, 1981; reprinted, 2002).
- METZINGER, T. (1995): Faster than thought. Holism, homogeneity and temporal coding. In T. METZINGER (Ed.). *Conscious Experience*. Thorverton: Imprint Academic.
- MILLER, B.L., CUMMINGS, J., MISHKIN, F., BOONE, K., PRINCE, F., PONTON, M., & COTMAN, C. (1998): Emergence of artistic talent in frontotemporal dementia. *Neurology*, 51, 978-982.
- MILLER, B.L., & HOU, C.E. (2004): Portraits of artists: emergence of visual creativity in dementia. *Archives of Neurology*, 61(6), 842-4.
- MOLLER, P. & HUSBY, R. (2000): The initial prodrome in schizophrenia: Searching for naturalistic core dimensions of experience and behavior. *Schizophrenia Bulletin*, 26, 217-232.
- NAVON, D. (1977): Forest before trees: The precedence of global features and visual perception. *Cognitive Psychology*, 9, 353-383.
- PETERS, E. R., NUNN, J. A., PICKERING, A. D., & HEMSLEY, D. R. (2002): Perceptual organization deficits in psychotic patients. *Psychiatry Research*, 2, 125-135.
- PHILLIPS, W. A., & SILVERSTEIN, S. M. (2003): Convergence of biological and psychological perspectives on cognitive coordination in schizophrenia: A physiological, computational, and psychological perspective. *Behavioural and Brain Sciences*, 26, 65-138.
- PLACE, E. J., & GILMORE, G. C. (1980): Perceptual organization in schizophrenia. *Journal of Abnormal Psychology*, 89, 409-418.
- RODRIGUEZ, E., LACHAUX, J.P., MARTINERIE, J., RENAULT, B., VARELA, F.J., 1999. Perception's shadow: Long-distance synchronization of human brain activity. *Nature* 397, 430-433.
- SASS, L. A. (1992): *Madness and Modernism. Insanity in the light of modern art, literature and thought*. New York: Basic Books.
- SASS, L.A., & Parnas, J. (2003): Schizophrenia, consciousness, and the self. *Schizophrenia Bulletin*, 29 (3), 427-444.
- SASS, L.A., & UHLHAAS, P.J. (2003): *Phenomenology, Context and Selfexperience*. Commentary on Behavioral and Brain Sciences target article 'Converging Evidence of Biological and Psychological Perspectives on Cognitive Coordination in Schizophrenia'. 26 (3), 102-103
- SALOKANGAS, R. K. R. (1997): Structure of schizophrenic symptomatology and its changes over time: A prospective factor-analytic study. *Acta Psychiatrica Scandinavica*, 95, 32-39.
- SECHEHAYE, M. (1970): *Autobiography of a schizophrenic girl*. New York: New American Library.
- SILVERSTEIN, S. M., BAKSHI, S., CHAPMAN, R. M., & NOWLIS, G. (1998a): Perceptual organization of configural and nonconfigural visual patterns in schizophrenia: Effects of repeated exposure. *Cognitive Neuropsychiatry*, 3, 209-223.
- SILVERSTEIN, S. M., KNIGHT, R. A., SCHWARZKOPF, S. B., WEST, L. L., OSBORN, L. M., & KAMIN, D. (1996a): Stimulus configuration and context effects in perceptual organization in schizophrenia. *Journal of Abnormal Psychology*, 104, 410-420.
- SILVERSTEIN, S. M., Kovacs, I., Corry, R., & Valone, C. (2000): Perceptual organization, the disorganization syndrome, and context processing in chronic schizophrenia. *Schizophrenia Research*, 43, 11-20.
- SILVERSTEIN, S. M., Osborn, L. M., West, L. L., & KNIGHT, R. (1998b): Perceptual organization in

- schizophrenia: Evidence for intact processing of configural patterns. *Cognitive Neuropsychiatry*, 3, 225-235.
- SINGER, W. (1999): Neuronal synchrony: A versatile code of the definition of relations? *Neuron*, 24 (1), 49-65.
- SPAULDING, W. D., REED, D., SULLIVAN, M., RICHARDSON, C., & WEILER, M. (1999) Effects of cognitive treatment in psychiatric rehabilitation. *Schizophrenia Bulletin*, 25, 657-676.
- SPENCER, K.M., NESTOR, P.G., NIZNIKIEWICZ, M.A., SALISBURY, D.F., SHENTON, M.E., & MCCARLEY, R.W. (2003): Abnormal neural synchrony in schizophrenia. *Journal of Neuroscience*, 13, 23(19), 7407-11.
- TSCHACHER, W. (2004): How specific is the Gestalt-informed Approach to Schizophrenia? *Gestalt Theory*, 26, 335-344.
- UHLHAAS, P.J., RODRIGUEZ, E., LINDEN, D.E.J., HAENSCHHEL, C., & SINGER, W. (in prep) *Gestalt Perception and Gamma-Band Oscillations in Schizophrenia*.
- UHLHAAS, P.J., & SILVERSTEIN, S.M. (2003): The continuing relevance of gestalt psychology for an understanding of schizophrenia. *Gestalt Theory*, 25, 256-270.
- UHLHAAS P.J., SILVERSTEIN, S.M., PHILLIPS, W.A. (in press): The course and clinical correlates of dysfunctions in visual perceptual organization in schizophrenia during the remission of psychotic symptoms. *Schizophrenia Research*.
- UHLHAAS, P.J., & SILVERSTEIN, S.M.(in Press): Perceptual organization in schizophrenia spectrum disorders: A review of empirical research and associated theories. *Psychological Bulletin*.
- UHLHAAS P.J., SILVERSTEIN, S.M., & PHILLIPS, W.A. (in Press): Perceptual grouping in chronic schizophrenia. *Psychiatry Research*.
- VARELA, F. (1996): Neurophenomenology: A methodological remedy to the hard problem *Journal of Consciousness Studies*, 3, 330-350.
- VENABLES, P. H. (1984): Cerebral mechanisms, autonomic responsiveness, and attention in schizophrenia. In W. D. SPAULDING & J. K. COLE (Eds.) *Nebraska Symposium on Motivation, 1983: Theories of Schizophrenia and Psychosis* (pp. 47-92). Lincoln: University of Nebraska Press.
- WATT, R. J., & PHILLIPS, W. A. (2000): The function of dynamic grouping in vision. *Trends in Cognitive Science*, 4, 447-454.
- WHITE, L., HARVEY, P. D., OPLER, L., & LINDENMAYER, J. P. (1997): Empirical assessment of the factorial structure of clinical symptoms in schizophrenia. *Psychopathology*, 30, 263-274.
- WHITTINGTON M, FAULKNER HJ, DOHENY HC, TRAUB RD (2000): Neuronal fast oscillations as a target site for psychoactive drugs. *Pharmacological Therapy*, 86, 171-190.

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