THE CONTINUING RELEVANCE OF GESTALT PSYCHOLOGY FOR AN UNDERSTANDING OF SCHIZOPHRENIA

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Introduction

From its earliest beginnings, Gestalt psychology was concerned with the application of its insights and theories to psychopathological phenomena (see Box 1). Today, however, Gestalt psychology is remembered and taught almost exclusively in terms of its contributions to the study of visual perception. In addition, psychopathology is understood primarily from behavioral, psychodynamic, or biologically based approaches. In this paper, however, we shall argue that Gestalt theory remains highly relevant for both theory development and designing experimental studies in the field of abnormal psychology. This is especially so in the subfield of serious mental illnesses such as schizophrenia. We will support these arguments by demonstrating the following:

1) Gestalt theory has received renewed attention in cognitive psychology and neuroscience (KOVÁCS 1996; WESTHEIMER 1999) and could constitute a useful paradigm for integrating brain and mind in abnormal psychology;
2) early phenomenological accounts of schizophrenia, developed from within a Gestalt psychological perspective by CONRAD and MATTUSSEK, have received renewed attention in schizophrenia research (CUTTING & SHEPPARD 1987; HAMBRECHT & HÄFNER 1993) and are seen as foreshadowing current theories of cognitive deficits in schizophrenia (HEMSLEY 1992; PHILLIPS & SILVERSTEIN, 2003);
3) perceptual organization, a paradigmatic example of Gestalt psychological principles, has been consistently found to be abnormal in schizophrenia, and, following #1, this abnormality can now be understood from within psychological and neurobiological frameworks;
4) consistent with Gestalt theory, perceptual organization and other forms of cognitive organization appear to operate via similar processes based in a general mechanism supporting cognitive coordination across domains, and there is evidence that this mechanism is dysfunctional in schizophrenia;
5) early psychiatrists who were influenced by Gestalt theory, such as CONRAD and MATTUSSEK, noted relationships between perceptual disturbances and more complex cognitive phenomena such as delusions; and

6) the pioneering work of these Gestalt-oriented psychiatrists in combination with current work in neuroscience can improve our understanding of both the pathophysiology and the phenomenology of schizophrenia. Our goal goes beyond a review of evidence, however. We wish to argue that available theory and evidence converge towards a theoretical model of cognition that is based firmly in both Gestalt theory and modern neuroscientific findings, and that this model has greater explanatory power than a number of existing models in terms of explaining schizophrenia.

We will begin by reviewing basic Gestalt psychological approaches to visual perception and brain function. This will be followed by a review of pioneering work in the area of Gestalt perception in schizophrenia and then a discussion of modern findings in this area. This discussion leads naturally into the wider implications of disturbances of Gestalt processing in schizophrenia, and the theoretical implications of these findings in terms of current neuroscience and Gestalt theory. The final section of the paper will review ideas advanced by early Gestalt-influenced psychiatrists regarding schizophrenia which have not yet received empirical testing or further theoretical development.

Gestalt theory, visual awareness, and consciousness

Gestalt theory and perceptual organization

The early Gestalt theorists revolutionized psychology by introducing a paradigm in which both the phenomenology of naïve experience and the experimental empirical investigation of psychological phenomena were to play an important role. The combination of these methodologies challenged the dominant Structuralist School in psychology in the early 20th century which advocated the reduction of psychological processes into units of sensations. WERTHEIMER's seminal research (1912) on the perception of apparent movement signaled the challenge of Gestalt theory to the structuralist paradigm and attempted to replace it with one emphasizing the phenomenology of psychological processes and their organization.

Beginning with the studies of WERTHEIMER (1912, 1922, 1923, 1924) the Gestalt theorists were successful in discovering principles involved in the formation of perceptual groups or 'Gestalten' in the visual field. The Gestalt psychologists also proposed that perceptual groups have unique properties that cannot be reduced to, or predicted from, their individual elements, and that properties of the parts are conditioned by the whole.

The properties of Gestalten were not confined to sensory experiences, however. KÖHLER (1947) pointed out, for example, that experienced time has certain properties in common with experienced space and concluded that learning, thinking and emotions may share attributes of Gestalt processes. GURWITSCH (1964) extended the application of Gestalt theory to propose that consciousness per se, and therefore all modes of thought, share the characteristics of Gestalt processes. In his view, Gestalt

Box 1:

The Contributions of Gestalt psychology in psychiatry

Gestalt psychology made a number of significant contributions in psychiatry. Below is a selected bibliography of important works:

(1) CONRAD, K. (1958). *Die beginnende Schizophrenie. Versuch einer Gestaltanalyse des Wahns.* (3rd Ed.) Stuttgart: Thieme.

(2) MATUSSEK, P. (1952a). Untersuchungen über die Wahrnehmung. 1. Mitteilung. *Archive für Psychiatrie und Zeitschrift für die gesamte Neurologie*, 279–319. [condensed and translated (1987) as 'Studies in Delusional Perception'. In J. CUTTING & M. SHEPHERD (Eds.), *The clinical roots of the schizophrenia concept. Translations of seminal European contributions on Schizophrenia*. Cambridge: Cambridge University Press, 89–104].

(3) MATUSSEK, P. (1952b). Untersuchungen über die Wahnwahrnehmung. 2. Mitteilung. Die auf einen abnormen Vorrang der Wesenseigenschaften beruhenden Eigentümlichkeiten der Wahnwahrnehmung. *Schweizer Archiv für Psychiatrie und Neurologie, 71*, 189–210.

(4) GOLDSTEIN, K. (1939). *The organism: A holistic approach to biology derived from pathological data in man.* New York: American Book Company.

(5) GOLDSTEIN, K. (1944). A methodological approach to the study of schizophrenic thought disorder. In J. S. KASANIN (Ed.), *Language and Thought in Schizophrenia* (pp. 17–39). New York: Norton.

6) LEVY, E. (1943). Some aspects of the schizophrenic formal disturbance of thought. *Psychiatry, 6*, 55–69.

(7) SCHULTE, H. (1924). Versuch einer Theorie der paranoischen Eigenbeziehung und Wahnbildung, *Psychologische Forschung, 5*, 1–23 [condensed and translated (1938) as 'An Approach to a Gestalt Theory of Paranoid Phenomena' In W. D. ELLIS (Ed.), 'A Source Book of Gestalt Psychology' London: Routledge; complete translation with introduction and comment: E. LEVY (1986): 'A Gestalt theory of paranoia. Introduction, comment and translation of *Heinrich Schulte*', *Gestalt Theory 8*, 230–255].

coherence and context-dependency are inherent characteristics of consciousness. The phenomenal characteristics of the field of consciousness show, for example, that novel phenomenal organizations unfold continuously to produce the 'stream of consciousness' (JAMES 1890) in which the continuity of context links each act of consciousness with the preceding act and those to follow.

Isomorphism and Physical Gestalten

The work of the Gestalt theorists represented one of the earliest attempts in the history of psychological science to seek explanations for mental events in terms of brain processes. Gestalt theory highlighted the importance of phenomenology, and at the same time, the understanding of mental events in terms of biological processes (EPSTEIN & HATFIELD 1994). Although WERTHEIMER (1912) put forth such an explanatory model in his study on apparent movement, Wolfgang KÖHLER (1920) became the main advocate of the doctrine of psychophysical isomorphism within the Gestalt movement.

Consistent with the idea that the analysis of behavior should start at the molar level, KÖHLER argued that brain states are not merely the summation of independent physiological processes but exhibit Gestalt characteristics similar to those of the visual field. The doctrine of isomorphism postulated a correspondence between organization in the visual field and physiological processes in the brain. KÖHLER (1920, p.38) summarized this view as follows:

> "... our theory leads to concrete resemblance between psychophysical events on the one hand and Gestalt properties of the phenomenal field on the other … we mean here that actual consciousness resembles in each case the real structural properties of the corresponding psychophysical process".

In other words, KÖHLER believed that the perceived perceptual organization of external stimuli was the direct result of the organization of neurophysiological activity generated in the brain during the processing of the individual stimuli.

Perceptual organization and cognitive neuroscience

Research on perceptual organization has confirmed and extended a number of central claims of Gestalt psychology. The central tenet of Gestalt psychology, that perception is not a product of independent local stimulation but is characterized by emergent, holistic properties, has been confirmed in numerous experiments. New paradigms involving computational and traditional psychophysical approaches have been developed which allow a rigorous study of perceptual organization and its underlying processes (PHILLIPS & CRAVEN 1999; POMERANTZ & KUBOVY 1986). Such research has not only confirmed Gestalt principles of perceptual grouping but has identified new criteria as well (i.e., PALMER & ROCK 1994).

A number of findings, however, suggest that perceptual organization must be approached differently than originally conceptualized by Gestalt theorists. For example, the anti-empiricist stance of Gestalt psychology led to the view that learning is of minor importance in perception. However, research has shown that grouping by prox-

imity, for example, is open to modifications by experience (POLAT & SAGI 1994). Similarly, perceptual grouping is not solely a dynamic process but is, in part, determined by prespecified receptive field arrangements. As a result, perceptual grouping as described by the Gestalt psychologists may be best applied to processes where, in computational terms, novel input produces novel output as the result of the interaction between organizational processes (WATT & PHILLIPS 2000).

Many other questions remain unresolved in this field of research. WERTHEIMER (1923) discussed perceptual grouping as occurring at a very early stage in the processing of visual information. Although there is agreement that grouping of visual elements based on Gestalt principles is crucial for pre-attentive processing (TREISMAN 1988), recent research suggests that central state factors, such as attention, exert its influence through top-down factors on lower processing stages and could be involved in perceptual grouping (GILBERT, ITO et al. 2000). The influence of higher level processes during perceptual grouping, however, would support another claim of Gestalt psychology, namely, the interaction between various parts of a system in a dynamic fashion. Finally, much debate in cognitive neuroscience resolves around the question whether organization in vision is analogous to other cognitive modalities. The claim of Gestalt psychologists that Gestalt characteristics are not confined to vision is stressed by theories which emphasize the computational commonalties of different cognitive processes (PHILLIPS & SINGER 1997).

Physical Gestalten reconsidered

The refutation of KÖHLER's concept of physical Gestalten through studies of LASHLEY, SPERRY and associates (LASHLEY, CHOW, et al. 1951; SPERRY & MINER 1955) and the demonstration of its implausible physiological assumptions caused the demise of the theory. This had repercussions for the standing of Gestalt theory as a whole within academic psychology. Certain advances in the brain sciences in recent years, however, suggest that assumptions of Gestalt theory regarding the nature of brain processes and their relation to cognition may not be as implausible as widely assumed (SCHEERER 1994).

Central to the development of neuroscience has been the emphasis upon localization of functions into cognitive modules (FODOR 1983) which are distinguished by the information on which they operate. Such approaches have been complemented, however, by those which stress the relevance of processes coordinating activity within and between anatomical regions (EDELMAN 1989; PHILLIPS & SINGER 1997). PHILLIPS and SINGER emphasized the importance of local cortical processors which enhance the salience of neural signals by maximizing the transmission of information coherently related to the context in which it occurs. Context is thought to assert a modulatory role on processing of information without changing the content of information. On the neurophysiological level, contextual influences are hypothesized to be mediated by synchronized spike activity, within the gamma range, between neuronal groups (SINGER & GRAY 1995). Perceptual grouping in various cognitive domains is seen as a paradigmatic example of contextual influence, and synchronization has been proposed to be an effective signal for perceptual grouping (PHILLIPS & SINGER 1997).

The dynamic, context dependent character of brain processes as advocated by Gestalt theory is furthermore underlined by neurophysiological research which increasingly emphasizes the interdependence of receptive fields (WÖRGÖTTER & EYSEL 2000). Traditionally, a visual receptive field was thought to analyze only the most rudimentary features of the visual world in a static fashion with the same stimuli always leading to the same response. This view of the nature of receptive fields is gradually giving way, however, as research has shown that response properties of cells in V1 are highly dependent on the context within which those features are placed and are themselves modulated by attentional influences (GILBERT et al. 2000). Contextual influences may include the precise geometric relationships between line elements within the receptive field, and contours or surfaces outside the receptive field which modulate responses despite their location.

This functional architecture is reflected in the long-range interactions of intrinsic horizontal connections in the visual cortex which are hypothesized to link neurons with disparate receptive fields and which may underlie the integration of distributed neuronal activity (GILBERT & WIESEL 1983). As noted above, synchronization of neural responses is hypothesized to be the physiological mechanism for such integrative processes but is not thought to be an exclusive solution. The maturation of long-range interactions in the visual cortex has been related to a neural substrate. SINGER (1995) suggested that NMDA receptors are involved in the formation of long-range spatial interactions and are critical for the experience dependent modification of such neural circuits.

Gestalt psychology, Cognitive Neuroscience and Psychiatry

On a theoretical level, recent theories of brain organization have much in common with concepts central to Gestalt psychology. PHILLIPS & SINGER's (1997) theory suggests that a purely 'localist' account of brain functioning is insufficient to explain normal cognitive processes which depend on contextual coordination between and within streams of processing. Similarly, synchronization of neuronal groups within the gamma range could represent an empirical verification of the Gestalt principle of isomorphism. Given that perceptual grouping is a basic organizing factor of coherence in the phenomenal field, correlated neural activity that is synchronized and coherent could potentially fulfil the criteria of 'structural equality' between consciousness and the corresponding psychophysical process (SCHEERER 1994).

The concepts of Gestalt theory, which identify common principles in psychological and brain processes, may thus be of value to abnormal psychology. Linking mind and brain in mental disorders is seen as a future paradigm in the study of psychopathology (KANDEL 1998). However, Gestalt conceptions, although increasingly recognized in cognitive neuroscience, have received little attention thus far as applied to cognitive and brain processes in psychiatry. In the next two sections we shall argue that Gestalt processes may be crucial for an understanding of schizophrenia.

Phenomenology of Visual Perception in Schizophrenia

The status of visual perception in the works of KRAEPELIN and BLEULER

For the early writers on schizophrenia, disturbances in visual perception were considered relatively unimportant compared to features such as thought disorder or delusions, which dominated the clinical presentation. KRAEPELIN (1919/1971, p.5), for example, suggested that "Perception of external impressions in dementia praecox is not usually lessened to any great extent as far as a superficial examination goes". This position was echoed by BLEULER (1911/1950, p.76), who suggested that "Sensory responses to external stimulus is quite normal. To be sure, the patients will complain that everything appears to be different … However, this strangeness is usually attributable to a deficit in customary associations and particularly to an alteration of emotional emphasis".

In the 1950s and 1960s, however, a number of researchers (ARIETI 1962; CONRAD 1958; MATUSSEK 1952, a, b, 1987; CHAPMAN 1966) suggested that the proposition of intact visual perception in schizophrenia is incorrect. They noted that one of the most prominent symptoms of the illness is fragmented visual perception, as described in the following examples:

"She remembered that she could not look at the whole door. She could only see the knob or some corner of the door. The wall was fragmented into parts" (ARIETI 1962, p.85);

"I may look at the garden, but I don't see it as I normally do. I can only concentrate on detail. For instance, I can lose myself in looking at a bird on a branch, but then I don't see anything else" (MATUSSEK 1987, p.92);

"Everything I see is split up. It's like a photograph that's torn in bits and put together again. If somebody moves or speaks, everything I see disappears quickly and I have to put it together" (CHAPMAN 1966, p.29).

These reports by schizophrenic patients very clearly indicate that abnormal visual experiences, consistent with the alterations in the Gestalt laws, do occur in schizophrenia. However, the explanatory models first put forward to make sense of these deficits came from other orientations. For example, McGHIE and CHAPMAN (1961) suggested a primary deficit in the selective and inhibitory mechanisms of attention. Such a deficit was thought to lead to the intrusion of information which does not normally reach consciousness, causing the processing of 'irrelevant' information. WECKOWICZ (1957) proposed a breakdown in perceptual constancy to account for perceptual abnormalities.

Gestalt perception in schizophrenia: The work of CONRAD and MATUSSEK

CONRAD (1958) and MATUSSEK (1952a, b) suggested that a perceptual deficit in schizophrenia is primary and that Gestalt-perception, the ability to perceive coherent objects in their natural context, may be impaired. MATUSSEK and CONRAD were strongly influenced by Gestalt theory in their approach to psychopathology. Following the work of WERTHEIMER and METZGER on visual perception, MATUSSEK proposed that changes in visual perception in schizophrenia are closely related to delusional perception and involve two interdependent factors: 1) The splitting

or loosening of individual perceptual components from their natural context, 2) an intensified perception of the perceptual qualities of objects.

Each of these will be considered below.

Loosening of perceptual context

Whereas the normal visual field is characterized by coherence, in which objects are perceived in meaningful relationships to each other, MATUSSEK believed that this coherence is reduced in schizophrenia. In this view, loosening or splitting of visual context would lead to the perception of individual elements of a scene, but without necessarily grasping the natural relationships between the elements (and therefore the overall meaning of the scene). MATTUSSEK also hypothesized that the degree of loosening of visual context is greater in the more severe forms of the disorder.

In MATUSSEK's view, the focus on the detail at the expense of the whole can lead to a tendency to become fixated on object elements, which, at the same time, feeds back to influence their perception. MATUSSEK referred to a patient who was staring at a gently swinging cord of a light switch on the wall. His fixation of the string, however, made him not realize that another person had just touched it. Hence, he gained the impression that not the string but the wall was moving and he feared that the end of the world had arrived (1987, p.93).

The emergence of perceptual qualities

The second factor central to MATUSSEK's account of the phenomenology of visual perception in schizophrenia is the emergence or accentuation of perceptual qualities of objects. Following Gestalt theory (METZGER 1941), MATUSSEK differentiated perceptual qualities (*Ganzeigenschaften*) which give objects their expressive character from other perceptual qualities, such as structure (*Gefüge*) and physical qualities (*Beschaffenheit*). He postulated that altered perceptual experiences are mainly the result of accentuation of objects' 'expressive' qualities. He gave the following example of this. A patient walked through the countryside and saw a howling dog on a field. The dog came closer and the patient was struck by the wild and authentic nature of the dog. A while later, a young fowl on a barn created the same impression with its untamed jumping and running which led the patient to ruminate upon the power of nature and its beauty (1952a, p.290–291).

MATTUSSEK suggested that in schizophrenia, perception is not biased to perceptual qualities in general, but only to specific subsets. In addition, he suggested that in some patients, 'acquired' perceptual qualities dominate the perceptual experience. MATUSSEK (1952b) referred to a patient who was asked to report whether any objects in the consultation room had a specific meaning. On seeing an eraser, the patient described his sexual abuse by his brother and suggested that the handle of the eraser looked like a penis (p.196). In this case, these qualities of the object were not inherent to the object itself, but became part of the object's representation as the result of the patient's experience.

Klaus CONRAD (1958): Die Beginnende Schizophrenie. Versuch einer Gestaltanalyse des Wahns .

Whereas the work of Paul MATUSSEK provides a detailed description of the phenomenology of visual perception and its relevance for delusional perception, Klaus CONRAD was concerned with a much broader task: to outline a comprehensive, phenomenological model of the development of schizophrenia from its prodromal stages to acute stages of the disorder using Gestalt theory. Although a detailed analysis of CONRAD's work is beyond the scope of this paper, his emphasis on the relevance of changes in visual perception at the beginning of the disorder, in terms of a disintegration of Gestalt processes, are highly relevant for the present discussion.

CONRAD's theory, emphasizing the relevance of perceptual changes in schizophrenia, differed significantly from the dominant thinking of his time. He rejected BLEULER's notion that schizophrenia is a heterogeneous clinical disorder which can be differentiated into different subtypes, and instead proposed a stage model where the development of the condition follows a strict pattern. CONRAD allowed, however, for the fact that outcomes are very different, suggesting seven different types. The pathological substratum, in CONRAD's view, was to be found in the brain. In his view, a neurophysiological abnormality in 'differential and integral Gestalt functions' caused impairment in higher cognitive functions (p.161).

The first phase in CONRAD's model is the 'trema'. The word trema, an old German slang word, can be translated as 'stage fright.' CONRAD chose this word to describe the increased tension experienced by a person in the early prodromal stages of schizophrenia and the changes in mood during this stage, such as anxiety, depression and even euphoria. It is during this stage that a person starts to conflict with the demands of his environment. At the end of this stage, delusional mood occurs in which the world is experienced as subtly altered.

In the Apophanous phase, the events and objects in the environment acquire new meanings for the person, and lead to delusional perception. The development of delusional perception, according to CONRAD, can be subdivided into three phases. In the first phase, the object indicates to the person that it has significance for him, but he cannot say to what extent. Here, the loosening of perceptual context is only minimal and the perceptual qualities are only subtly pronounced. In the second phase, the object has an immediate significance for the person. During this phase, a marked loosening of perceptual context occurs and perceptual qualities are beginning to emerge. In the third phase, the person perceives an object to have a very specific meaning for him, and there is an increasingly loosened perceptual context and an increased emergence of perceptual qualities. This constitutes delusional perception in the proper sense. The apophanous phase not only affects the external space but also the field structure of internal space, the representational aspects of mental life. According to CONRAD, loss of the figure/ground distinction between internally generated mental events and the external world causes auditory hallucinations, thought disorder and thought broadcasting.

The illness may advance to the apocalyptic phase if the disintegration of the Gestalt character of consciousness continues. The apocalyptic phase represents the most severe form of the illness corresponding to a catatonic type, which is characterized by a dream-like quality of experience where fragments of experience dominate over organized Gestalten. During the consolidating and residual phases, the apophanous mode of experience subsides and a consolidation sets in which may be incomplete, leading to the residual phase characterized by cognitive deficits in attention, apathy and a general reduction in 'energetic potential.'

Gestalt-perception and the self in the early stages of schizophrenia

The pioneering work of CONRAD and MATTUSSEK provided a radical alternative to the views of KRAEPELIN and BLEULER by highlighting the fundamental changes in visual perception and awareness in schizophrenia. These changes are best described in the language of Gestalt theory as a disturbance in 'Gestalt perception', the ability to perceive coherent objects within their natural context. In schizophrenia, we find varying degrees of disturbances in Gestalt-perception. Visual context may be disturbed to produce a lack of cohesion in the overall visual scene as described by MATUSSEK but can also extend to the Gestalt-coherence of objects in producing a splitting of object parts (ARIETI 1962). The breakdown in Gestalt perception causes a number of other changes. The loosening of the visual context dissolves the inherent meaning we encounter in every object of consciousness with the result that the world is experienced as meaningless details, stripped of its usual meaning and defying any standard description. This is illustrated 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).

This example also suggests that the breakdown in Gestalt perception affects consciousness as a whole and hence the relationship between self and the world. Consciousness has lost its natural 'flow' and the schizophrenic encounters a world that is meaningless and fragmented, which creates a profound sense of alienation (SASS 1992). Out of the loss of meaning may well arise the urge to create new meanings which manifests itself in the emergence of delusional beliefs as suggested by MATUSSEK and CONRAD. The creation of new meaning, however, is not based on the common understanding of objective reality but on the idiosyncratic interpretation of the changed world. In MATUSSEK's view, for example, the loosening of the visual context leads to idiosyncratic combinations of object meanings and qualities, and this is the basis of delusional beliefs. The following patient report exemplifies this point:

"Out of these perception came the absolute awareness that my ability to see connections had been multiplied many times over" (MATUSSEK 1987, p.96).

Placing gestalt-based contributions within the context of the development of cognitive theories of schizophrenia

In this section, we propose that a cognitive model of cognitive deficit in schizophrenia that has its roots in Gestalt psychology is the most powerful framework from within which to understand cognitive impairments in schizophrenia. In addition, it will be seen that current data from cognitive psychopathology and neuroscience are highly consistent with the earlier, but largely ignored, positions of CONRAD and MATTUSSEK on disordered Gestalt processes in schizophrenia.

Traditionally, the most popular models of cognitive deficit in schizophrenia were those positing: 1) a slowness in processing; 2) a reduction in processing capacity; or 3) a deficient attentional filter. The slowed processing hypothesis emerged from studies of visual backward masking in schizophrenia, which demonstrated that patients needed more time between presentation of the target and masking stimulus in order to correctly identify the target (BRAFF & SACCUZZO 1981). The reduced processing capacity hypothesis in schizophrenia grew out of studies demonstrating that patients could quickly process equivalent amounts of visual information as controls when processing load was low, but that as the amount of information to be processed increased, patients' performance declined proportionally (Neale 1971). The deficient filter hypothesis grew out of the dichotic listening literature, which demonstrated that schizophrenia patients would report frequent intrusions of material presented to the "unattended" ear during the task, whereas other groups were able to successfully ignore this information and report only material presented to the "attended" ear (WISHNER & WAHL 1974). In addition to these hypotheses, since the late 1970's experimental psychopathology studies had been published (see below) demonstrating that schizophrenia was characterized by a perceptual organization deficit.

In 1984, KNIGHT recognized the futility of having multiple cognitive models of schizophrenia, where each was tied to a specific paradigm and no effort at integration was undertaken. In a landmark paper, he reviewed each theory in order to determine whether each could account for the data from the studies that generated the other models. One of his conclusions was that while none of the other models could account for the data from studies of perceptual organization in schizophrenia, especially for the findings of schizophrenia patients performing better than control subjects (see below), the perceptual organization model could account for data that generated each of the other models. For example, the backward masking study findings could be explained by schizophrenia patients' difficulties perceptually organizing the target image (KNIGHT 1984). Similarly, findings from the degraded stimulus continuous performance test, a widely used measure of attentional capacity in which patients have to respond every time a "0" is presented on a computer screen, can be accounted for by patients' difficulties in perceptual organization of the degraded images (KNIGHT & SILVERSTEIN 1998). Currently, the slowness of processing and deficient filter views of schizophrenia are regarded as outdated and invalid. The reduced processing capacity view continues to have adherents (i.e., MILLER, et al. 1990), however, the controversy over the validity of this model in the normal cognition literature the ability to account for findings from studies using this model in terms of other processes

(KNIGHT & SILVERSTEIN 1998), and the inherent circularity of its argument have weakened its usefulness. In contrast, research on perceptual organization in nonpatients continues to identify its cognitive and physiological mechanisms and recent research and theoretical developments on perceptual organization in schizophrenia are integrating behavioral, cognitive, and neurophysiological data.

Perhaps the strongest experimental demonstration of a perceptual organization deficit in schizophrenia, as hypothesized by CONRAD and MATUSSEK, is that of PLACE and GILMORE (1980). Their hypothesis was that controls would do better than schizophrenia patients at counting the number of lines in tachistoscopically presented (20 milliseconds exposure duration) arrays when the lines (2–6 horizontal and/or vertical line segments arranged at the points of an imaginary hexagon) were arranged in a way that allowed for quick grouping (e.g., having lines of only one type, or grouping all horizontal segments together and all vertical segments together). This prediction was based on the assumption of impaired grouping processes in schizophrenia. PLACE and GILMORE also predicted, however, that in a condition where lines of differing orientations were randomly intermixed, the schizophrenia patients, who were hypothesized to be deficient in grouping processes, would be more accurate than controls. In other words, it was assumed that controls, as a result of their intact grouping processes, would need to wait until serial processing began (at approximately 200 milliseconds post-stimulus) before they could begin counting individual lines, but that schizophrenia patients, who are deficient in these processes, could process the display in a sequential fashion from the outset, leading to superior performance in the random condition. All of these predictions were confirmed, in addition to the overall performance of schizophrenia patients, collapsed across all three conditions, being superior to that of controls. Performance superiority for schizophrenia patients is an extremely rare finding, and the PLACE and GILMORE (1980) study was thus convincing evidence for a perceptual organization deficit in schizophrenia.

Many studies have now demonstrated that auditory and visual grouping are impaired in schizophrenia (COX & LEVENTHAL 1978; KNIGHT 1984, 1992, 1993; KNIGHT & SILVERSTEIN 1998; PLACE & GILMORE 1980; RABINOWICZ, OPLER, et al. 1996; SILVERSTEIN, BAKSI, et al. 1998a; SILVERSTEIN, KNIGHT, et al. 1996a; SILVERSTEIN, KOVACS, et al. 2000; SILVERSTEIN, MATTESON, et al. 1996b; WELLS & LEVENTHAL 1984). These impairments have been demonstrated to be a specific feature of the illness itself. They are not an epiphenomenon of treatment, because: a) there is no relation between either oral dose or blood level of depot medication and performance on perceptual organization tasks (KNIGHT, 1992); b) patients medicated using traditional neuroleptics and unmedicated patients do not perform differently on these tasks (RABINOWICZ, OWEN, et al. 1994) and c) impairments have been demonstrated in unmedicated patients (FRITH, STEVENS, et al. 1983).

Perceptual grouping is far from being completely absent in schizophrenia, however. Patients perform adequately when the task involves stimuli with continuous contour or strong configural properties (CHEY & HOLMAN 1997; KNIGHT & SILVERSTEIN 1998; SILVERSTEIN et al. 1998a; SILVERSTEIN, OSBORN, et al. 1998b). In the absence of strong cues to grouping, however, schizophrenia patients show clear impairments in combining noncontiguous elements (e.g., dot or line pat-

terns) into perceptual wholes (COX & LEVENTHAL 1978; PLACE & GILMORE 1980; SILVERSTEIN et al. 1996, 1998b, 2000).

Patients are also impaired in their ability to alter perceptual organization of ambiguous stimuli based on current context (SILVERSTEIN, MATTESON, & KNIGHT 1996), or to develop perceptual organization for unstructured patterns after repeated exposure (PLACE & GILMORE 1980; SILVERSTEIN et al. 1998a). Furthermore, perceptual organization in schizophrenia was normalized by strengthening contextual input, suggesting that a greater than normal degree of contextual input is for adequate stimulus grouping in this illness (SILVERSTEIN et al. 1996a). In addition, symmetrical stimuli comprised of noncontiguous components are not processed as groups by schizophrenia patients without strong top-down influences that use context (KNIGHT 1992; SILVERSTEIN et al. 1996a, 1998a). Schizophrenia thus involves a reduced ability to group stimulus elements into wholes, but this is most pronounced when cues to grouping are weak, as is often the case with novel or complex inputs.

Convergence of the phenomenological perspectives of MATUSSEK and CONRAD and research in experimental psychopathology of Schizophrenia

The evidence reviewed earlier strongly suggests that the visual deficits in schizophrenia described by MATUSSEK and CONRAD more than 50 years ago do not represent secondary impairments as a result of attentional deficits or reduced processing capacity but are indeed due to basic deficits in perceptual organization. This represents an impressive convergence of evidence from phenomenology and experimental research in schizophrenia. Moreover, a number of other specific hypotheses proposed by MATUSSEK and CONRAD regarding deficits in perceptual organization have now been confirmed. For example, they suggested that the degree of impairment in visual context is related to the severity of the illness. KNIGHT (1984) and SILVERSTEIN et al. (1996a) demonstrated that perceptual organization impairment is found mainly among schizophrenia patients with histories of poor premorbid social functioning, and SILVERSTEIN et al. further demonstrated that: 1) among patients with poor premorbid histories, the impairment is most pronounced during periods of symptom exacerbation (SILVERSTEIN et al. 1996a); and 2) greater degree of perceptual organization impairment on admission to a state hospital predicted a less likelihood of being discharged within the next three years (KNIGHT & SILVERSTEIN 1998). In addition, four studies have now demonstrated relationships between level of perceptual organization impairment and degree of disorganized thinking and behavior (KNIGHT & SILVERSTEIN 1998; SILVERSTEIN et al. 1998a, 2000). MATUSSEK (1987, p.91) also proposed that awareness of appropriate contextual relationships could be brought about by drawing attention to relevant information, but that this awareness of context would be of only limited duration and would soon disintegrate. The ability to improve perceptual organization and other forms of context processing in schizophrenia through attentional manipulations has now been demonstrated experimentally (SILVERSTEIN et al. 1996a, Study 2), as has the temporary nature of the effect (CROMWELL 1975; KAPLAN 1974; NUECHTERLEIN 1977).

Theoretical implications of the perceptual organization deficit for Gestalt psychology-informed theory of schizophrenia

According to Gestalt theory, Gestalt laws do not apply only to perceptual organization in vision. They are thought to apply also to other cognitive processes (KÖHLER 1947) suggesting that organization is a fundamental feature of consciousness (GURWITSCH 1964). Findings of perceptual organization deficits in both visual and auditory perception in schizophrenia (SILVERSTEIN et al. 1996a, 1996b) raised the possibility that other aspects of stimulus (i.e., cognitive representation) grouping, both internal and external, might be impaired in schizophrenia, and that these impairments would be related. Evidence suggests that this is so. In five studies, abnormalities in perceptual organization in schizophrenia were associated with greater disorganized (but not positive, negative, or general) symptoms (IZAWA & YAMAMOTO 2001; KNIGHT & SILVERSTEIN 1998, SILVERSTEIN, et al. 1998a, 2000). In a fifth study (KNIGHT & SILVERSTEIN 1998), abnormal perceptual organization was related to increased disorganized and associative thought disturbance, but not combinatory or idiosyncratic thought disturbance in schizophrenia. These data support the hypothesis that abnormal perceptual organization in schizophrenia is one manifestation of a larger disturbance in the combining of context-related stimuli (CARR & WALE 1986; SILVERSTEIN & SCHENKEL 1997). In the language of contemporary cognitive psychology, perceptual organization in vision is seen as a form of "object thinking" (GLEZER 1995) involving the binding of image elements into a context-appropriate coherent whole, where the context can be seen as the other elements that combine to make up the line, curve, or object (LAMME 1995; KOVÁCS 1996; PHILLIPS & SINGER 1997). This is seen as analogous to the binding of words or concepts into coherent thought and linguistic structures, except that in these cases, the binding is based on context-appropriate meaning (LOGAN & ZBRODOFF 1999). Indeed, several investigators have hypothesized that the formation of propositional visual representations (i.e., those that represent the spatial relationships between object components) is necessary to process visual images, and that these are structurally similar to the propositional representations underlying thought and language (CHECHILE, ANDERSON, et al. 1996). Further evidence for a common mechanism underlying linguistic and visual representations comes from studies of individuals with parietal lobe damage, where deficits in both the "comprehension" of spatial relations (i.e., perceptual organization) and the comprehension of logical relations are commonly observed (GLEZER 1995). There is now growing support for the existence of common cortical processing algorithms (GROSSBERG 1999; PHILLIPS & SINGER 1997; STOET & HOMMEL 1999), as well as evidence that contextual coordination operates across domains to implement processes such as perceptual grouping in vision, lexical disambiguation in language comprehension and speech production, selective attention, and motor behavior and action planning. All of these functions are impaired in schizophrenia (CARR & WALE 1986; SILVERSTEIN et al. 1996, 1998a; COHEN & SERVAN-SCHREIBER 1992; COHEN, BARCH, et al. 1999; PATTERSON, SPOHN, et al. 1986).

These data support models wherein: 1) perceptual organization impairment is seen as one manifestation of a broader deficit in the grouping of contextually related

stimuli (CARR & WALE 1986; SILVERSTEIN & PALUMBO 1995, SILVERSTEIN & SCHENKEL 1997) 2) perceptual grouping is viewed as a concrete form of context processing (GROSSBERG, MINGOLLA & ROSS 1997; PHILLIPS & SINGER 1997); and 3) sentence comprehension and the production of coherent verbal output are viewed as examples of context processing in the sense that early sentence components establish contextual constraints on the interpretation of later sentence components (in comprehension) or on the choice of words that are subsequently generated to be spoken (PATTERSON, et al. 1986). Other data supporting this view come from studies demonstrating relationships between non-perceptual context processing deficits and disorganized (but not positive, negative, or general) symptoms (COHEN, et al. 1999), and between context processing deficits and formal thought disorder (KUPERBERG, McGUIRE, et al. 1998) in schizophrenia. In those studies, the nature of the contexts investigated was relatively abstract (e.g., in a lexical disambiguation task), whereas in the studies reviewed in this paper it was concrete and visual. Taken together, these data suggest that there may be commonalities between the way that visual context structures object representations in vision, and the way that meaning serves as a context to structure linguistic and conceptual representations.

Commonalties between these different cognitive domains have also been emphasized by Gestalt theorists. KOFFKA (1935, p.211), for example, suggested that "All perceptual organization is organization within a framework." BOCK (1991) applied the notion of frameworks to an analysis of speech acts to show that frameworks are highly relevant for language in constraining, for example, the inherent ambiguity in the interpretation of meaning in language. Similarly, ARNHEIM (1989) noted that thinking and perception share a number of common principles, such as context sensitivity and organization. The data reviewed above also suggest that schizophrenia may be characterized by an impairment in the formation of propositional representations across a number of domains of cognitive functioning, and that this impairment may produce analogous impairments in the structuring of perception, memory, thought, and language. While the language used in these recent reports is different from that used by the early Gestalt psychologists and psychiatrists, the conceptual similarities are obvious, as is the relevance of such views in our search for the fundamental nature of schizophrenia.

Gestalt theory and the electrophysiology and neurobiology of schizophrenia

Gestalt theory may not only be relevant for an understanding of the cognitive deficits in schizophrenia, but may also help identify their underlying neurophysiology. CONRAD (1958) hypothesized that changes in Gestalt perception in schizophrenia are the result of quantitative changes in cerebral organization which are not localized but affect the organization of brain processes as a whole (p.162). Recent research (FRISTON 1999; PHILLIPS & SILVERSTEIN, 2003; TONONI & EDELMAN 2000) suggests that critical aspects of pathophysiology in schizophrenia may not be the result of specific localized lesions, but may result from impairments in neural integration between and within brain areas. Impairments in these neural mechanisms are seen as neurodevelopmental in origin (HOFFMAN & McGLASHAN 1993) leading to abnormal corticocortical connectivity between and within brain regions.

As noted earlier, synchronization of neural responses in the gamma band range is considered to be a possible neural substrate for perceptual grouping and coordination between and within streams of processing (PHILLIPS & SINGER 1997). The deficits in perceptual grouping in schizophrenia make impairments in these processes a plausible hypothesis, and recent research provides preliminary evidence to support this view. For example, HAIG, GORDON et al. (2000) investigated gamma activity in schizophrenics and normal controls in an auditory oddball paradigm. Schizophrenics showed a significant decrease in gamma-response amplitude for non-targets reflecting an impairment in contextual integration of relevant information. Similar findings of deficits in gamma range oscillations in schizophrenia have been reported by KWON, et al. (1999) and GORDON, et al. (2001), who also demonstrated that disorganization was negatively correlated with gamma activity for non-target stimuli.

Impairments in cortical integration secondary to reduced synchronization of neural responses within the gamma range have also been related to the neurobiology of schizophrenia. NMDA channels have been hypothesized to be involved in contextual modulation of neural signals due to their role in experience dependent modification of long-range interactions in the visual cortex (V1) (PHILLIPS & SINGER 1997; SINGER 1995). There is increasing evidence that hypofunction of glutamatergic NMDA receptors is involved in schizophrenia (OLNEY & FARBER 1995). For example, subanesthetic doses of NMDA antagonists, e.g. Ketamine and PCP, produce both the positive and negative symptoms of schizophrenia in healthy volunteers (LUBY, GOTTLIEB, et al. 1961; MALHOTRA, PINALS, et al. 1996) and provoke relapse in schizophrenic patients (ALLEN & YOUNG 1978). Effects on cognition include changes in perception, attention and memory (e.g. KRYSTAL, KARPER, et al. 1994). NMDA antagonists also produce the disorganized features of schizophrenic symptoms (e.g., thought disorder) (ABI-SAAB, D'SOUZA, et al. 1998). As noted above, the similarity between phenomenological experiences of perceptual organization, and their associated synchronized neural activity involving long-range interactions in what have been termed "association fields" (FIELD, HAYES & HESS 1993) or "contextual fields" (PHILLIPS & SINGER 1997), may be thought of as consistent with the Gestalt principle of isomorphism.

Issues for future research

The relationship between impairment in Gestalt-perception and delusions

Delusions remain one of the basic problems in psychiatry (ROBERTS 1992) and a number of competing hypothesis emphasize, for example, deficits in theory of mind (FRITH 1992) or abnormal reasoning (GARETY & HEMSLEY 1992) to explain delusions in schizophrenia. CONRAD and MATUSSEK both implicated changes in Gestalt perception as a central to the development of delusions in the early stages of schizophrenia. This view has much in common with a model of delusional thinking by MAHER (1974) which suggests that delusions in schizophrenia are generated by cognitive activity that is essentially indistinguishable from that found in the normal population but applied to abnormal sensory input. According to MAHER, dedifferentiation of the figure/ground relationship in the visual field causes irrelevant informa-

tion, which normally constitutes the ground, to compete for attention. The radically altered perception of the environment creates intense anxiety in the patient which is resolved with a formulation of a belief which is consistent with his experiences. As noted earlier, the hypothesis of impaired Gestalt perception leading to the development of delusional perception has received relatively little attention thus far. CARR and WALE (1986), however, proposed an influential cognitive model of schizophrenia which proposes a view of delusion formation similar to that proposed by CONRAD and MATTUSEK. In this framework, delusions serve an organizing function in the early stages of the disorder by causing a decline of anxiety brought about by disorganization. Testing this hypothesis would involve assessing the adequacy of cognitive grouping operations early in the disorder or prodrome, and then determining whether there were temporal relationships between grouping impairments and the development of delusions. To date, such studies have not been undertaken. However, the recent development of high-risk and first episode clinics (YUNG, McGORRY et al. 1996) makes it possible to now conduct such studies. Another hypothesis in need of further investigation is MATUSSEK's and CONRAD's idea about changes in perceptual qualities and the development of delusional perception. MATUSSEK and CONRAD both implicated changes in perceptual qualities as being present in the early stages of schizophrenia and as relevant for the development of delusional perception. MATUSSEK in particular suggested that loosening of visual context and changes in perceptual qualities evolve in parallel and are interdependent.

Conclusion

The term 'schizophrenia', coined by Eugen BLEULER in 1912, is best translated as 'fragmented mind' (ANDREASEN 1999). BLEULER chose this word to highlight the fragmentation of mental life in schizophrenia which is the hallmark of the disorder. In this paper, we have argued that Gestalt psychology could potentially be useful in the search for the cognitive and neurobiological impairments underlying the 'fragmented mind' in schizophrenia. The available evidence suggests that schizophrenia may be characterized by impairments in Gestalt processes. Although a number of competing hypothesis have been advanced in experimental psychopathology, a view of perceptual deficits in schizophrenia that grew out of the Gestalt tradition (e.g., the perceptual organization deficit hypothesis) has greater explanatory power than competing cognitive models. Finally, there is a convergence of cognitive and neurobiological evidence regarding both the validity of early Gestalt views of normal brain-behavior relationships, as well as of disordered brain-behavior relationships in schizophrenia. Thus, impairments in Gestalt perception in schizophrenia may be isomorphically related to impairments in synchronization of neural responses in the gamma band range. Deficits in Gestalt perception may not only be relevant for the visual domain, however. As we have emphasized throughout the review, and consistent with the views of Gestalt psychology, coherence and context sensitivity are principles not confined to vision but a characteristic of consciousness and cognition in general and are fundamental to brain processes supporting these functions (PHILLIPS & SINGER 1997). Thus, schizophrenia may be characterized by a general impairment in Gestalt processes affecting consciousness as a whole and its neural substrate.

Gestalt psychology may also prove useful as a paradigm for future developments in abnormal psychology in general. Gestalt psychology advocates an integration of brain and mind in science and as noted earlier on, cognitive neuropsychiatry is seen as future paradigm in the study of psychopathology (KANDEL 1998). The success of this program of research will depend, in part, on the appropriate level of description to link mental and brain processes. We believe that Gestalt psychology, with its emphasis on macroscopic phenomena, is particularly relevant for such efforts as its concepts are applicable at both levels of descriptions. Furthermore, Gestalt psychology emphasizes the importance of phenomenology, which has a long history in psychopathology research but has very often been seen as antithetical to biological and cognitive approaches. In this review we have emphasized that phenomenology can be complimentary and supportive to these perspectives. Phenomenology can be considered a starting point for investigations in psychiatry since the majority of patients' symptoms are not objective signs but present themselves as subjective symptoms which are only accessible to detailed descriptions of a patient's mental state. A phenomenological 'grounding' of psychological and physiological investigations thus explicitly relates concepts to the experience of the patient without premature reduction in terms of a purely physiological explanation. SASS (1992) suggests, for example, that any theory which attempts to account for schizophrenia must be necessarily compatible with the phenomenology of the disorder. The seminal research by the Gestalt psychiatrists MATUSSEK and CONRAD supports such an approach, and suggests the continuing relevance of Gestalt psychology for the field of psychopathology as a whole.

Summary

Contributions of Gestalt psychology towards the understanding of psychopathology haven been largely ignored in the scientific literature. In this article, we have tried to demonstrate that concepts derived from Gestalt psychology allow fruitful insights into psychopathology, especially into psychotic disorders, such as schizophrenia. Convergence of findings from Gestalt psychology and cognitive neuroscience show that it is possible to characterize schizophrenia in terms of a loss in the gestaltstructure of cognitive and neuronal processes. The loss of gestaltstructure is particularly pronounced in visual perception. This change in cognition, however, is also characteristic of other cognitive deficits, such as language perception, and is related to a comprehensive impairment in the coordination of cognitive and neural processes in schizophrenia.

Zusammenfassung

Gestaltpsychologische Beiträge zum Verständnis der Psychopathologie haben bisher in der wissenschaftlichen Literatur wenig Beachtung gefunden. Unser Aufsatz hat versucht darzustellen, daß Erkenntnisse der Gestaltpsychologie fruchtbare Einsichten in die Psychopathologie ermöglichen. Dies gilt insbesondere für ein Verständnis psychotischer Störungen, wie z. B. der Schizophrenie. Die Konvergenz gestaltpsychologischer Theorien mit neueren Erkenntnissen der kognitiven Neurowissenschaften zeigt, daß es möglich ist, die Schizophrenie im Sinne eines Zerfalls der Gestaltstruktur kognitiver und neuronaler Prozesse zu charakterisieren. Der Verlust der Gestaltstruktur ist besonders ausgeprägt im Bereich der visuellen Wahrnehmung. Dieser Verlust charakterisiert jedoch weitere kognitive Störungen, wie z. B. der Sprachwahrnehmung, und könnte somit eine umfassende Störung in der Koordination kognitiver und neuronaler Prozesse in der Schizophrenie repräsentieren.

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