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Neuropsychology of schizophrenia according to Kraepelin: disorders of volition and executive functioning

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Abstract Emil Kraepelin was the first to identify schizophrenia as a distinct disease in 1896. The purpose of this paper is to rediscover and reexamine the neuropsychology of schizophrenia according to Kraepelin. Kraepelin thought that the “dementia” of dementia praecox was primarily a disorder of volition, rather than one of intellect. “Volition” or “will” referred to the ability to make conscious decisions and to carry them out. By quoting relevant passages in his classic textbook, *Dementia Praecox and Paraphrenia*, the case is made that Kraepelin’s detailed description of volitional deficits in patients with dementia praecox clearly documents impairments in executive functioning in schizophrenic patients during the pre-neuroleptic era. To a large extent, these deficits may be responsible for the “dementia” of dementia praecox and the “chronicity” of chronic schizophrenia. If this hypothesis is correct, the long-range prognosis of patients with schizophrenia may be considerably improved by treatment programs designed to facilitate executive functioning.

Key words Schizophrenia · Cognition · Volition · Frontal lobe · Executive functioning

Introduction

The *causes* of dementia praecox are at the present time still wrapped in impenetrable darkness (Kraepelin 1919, 1971, p. 224).

How to avert this dementia continues to be the cardinal problem of psychiatry (George M. Robertson, 1919, editor’s preface, p. iv, in Kraepelin 1919, 1971).

The quotations given above, one from Kraepelin and the other from his editor, are still as true presently; over 75 years later, as they were when they were written in 1919. Kraepelin’s astute observations and insightful conceptualizations about schizophrenia made in the preneuroleptic era

provide important clues to the understanding and management of this disorder.

The purpose of this paper is to rediscover and reexamine the neuropsychology of schizophrenia according to Kraepelin. Kraepelin thought that the “dementia” of dementia praecox was primarily a disorder of volition, rather than one of intellect (Kraepelin 1919, 1971; Johnstone et al. 1978). His description of a volitional disorder closely resembles what is currently referred to as deficits in executive functioning.

Why reexamine Kraepelin’s description of dementia praecox?

Most of the discoveries of modern psychiatry represent a series of footnotes to and amplifications of Kraepelin’s textbooks (Andreasen 1984, p. 16).

Emil Kraepelin was the first to identify dementia praecox (i.e., schizophrenia) as a distinct disease in 1896 (Kraepelin 1919, 1971). His recognition of dementia praecox and manic-depressive insanity as two distinct diseases “laid the foundations of modern psychiatry” (Andreasen 1984). His classic textbook, *Dementia Praecox and Paraphrenia*, is replete with astute observations and conceptualizations about the disorder based on detailed histories of thousands of patients (Kraepelin 1919, 1971). Because this textbook is the original primary reference on the phenomenology of schizophrenia, it is a good starting place for a discussion of the neuropsychology of the disorder.

There are three major reasons why reexamining Kraepelin’s textbook could contribute to our understanding of the neuropsychology of schizophrenia. Firstly, because Kraepelin was the first to make detailed naturalistic observations of the disorder, his description is less biased by preconceived notions. Secondly, because his observations were made in the preneuroleptic era, any observed cognitive deficit cannot be a side effect of neuroleptic treatment. Thirdly, because Kraepelin was trained by Wilhelm Wundt in Europe’s first psychological laboratory, he approached the study of schizophrenia using methods and

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concepts from experimental psychology. Early in his career, Kraepelin established an experimental psychology laboratory and wrote "a long paper entitled 'Psychological Experiments in Psychiatry' which represents a kind of layout for what, during the following thirty years, he tried to develop as parts of the psychological basis of psychiatry" (Harms, in Kraepelin 1919, 1971, p. ix). Kraepelin issued "psychiatric and psychological studies, side by side, with the aim of winning psychological solidification of psychiatric concepts" (Harms, in Kraepelin 1919, 1971, p. ix).

In the 19th century the human psyche was conceptualized in terms of three functional systems: thinking, feeling, and volition (Kraepelin 1919, 1971). "Volition" or "will" referred to the ability to make conscious decisions and to carry them out. A recent discussion of Kraepelin's concept of a volitional deficit in dementia praecox assumed he was referring primarily to a motivational deficit (Johnstone et al. 1978). However, a careful reading of Kraepelin's textbook suggests that his concept of a volitional deficit in schizophrenia is very similar to what neuropsychologists and cognitive psychologists would presently categorize as an impairment of executive control or metacognition.

Concepts of executive functioning and metacognition

Executive functioning refers to "those capabilities that enable a person to engage in independent, purposive, self-serving behavior successfully" (Lezak 1983). Metacognition, a closely related concept, is "an awareness of one's own cognitive skills and abilities, and the efficient use of this self-awareness to self-regulate cognitive activity" (Loper and Murphy 1985). Specific executive functions or metacognitive activities include planning, checking, monitoring, testing, evaluating, and revising (Wong 1985). It entails the ability to mobilize, allocate, and coordinate cognitive resources in order to solve problems and achieve goals, i.e., to self-manage one's own affairs.

The concept of metacognition developed from the research of John Flavell (1970) on "metamemory", i.e., knowledge of one's own memory skills and strategies (Brown 1978).

Metacognition refers to one's knowledge concerning one's own cognitive processes...[and] to the active monitoring and consequent regulation and orchestration of these processes..., usually in the service of some concrete goal or objective (Flavell 1970, p. 232).

Metacognitive processes in problem-solving include the following: 1) problem analysis, 2) thinking about what one knows or does not know that may be needed to solve the problem (information gathering), 3) planning, 4) monitoring progress toward a solution (Müller 1985, p. 206).

Lezak (1983) has stated that executive functioning is "the most subtle and central realm of human activity (p. 508)." Lezak (1983, 1995) identified four major component processes that comprise executive functioning: goal formulation, planning, carrying out goal-directed plans, and effective performance. Each of these is a complex process composed of many subprocesses. Goal formulation requires conceptual and abstraction ability, anticipatory thinking,

decision making, self-awareness, and motivation. Lezak emphasized that "persons who lack the capacity to formulate goals simply do not think of anything to do (p. 509)." Planning involves the ability to conceptualize, abstract, organize steps, generate alternatives, weigh and make choices, and sustain attention. Executing goal-directed plans involves the ability to initiate, maintain, switch, and stop sequences of complex behavior. It also requires flexibility and the ability to shift perceptual, cognitive, and behavioral sets. Effective performance involves the ability to self-monitor, self-correct, and self-regulate.

Stuss and Benson (1986) described executive functioning as the "ultimate mental activity (p. 246)." Executive functioning is "the ability to take the information extracted from other, higher brain systems, verbal and non-verbal, and to anticipate, select goals, experiment, modify, and otherwise act on this information to produce novel responses (p. 246)." Stuss and Benson further explained that "executive control functions" are "called into action in nonroutine or novel situations, and provide conscious direction to the functional systems for efficient processing of information (p. 244)."

Lezak (1983, 1995) has argued that intact executive functioning is both a necessary and sufficient condition for independent, adaptive behavior:

So long as the executive functions are intact, a person can sustain considerable cognitive loss and still continue to be independent, constructively self-serving, and productive. When executive functions are impaired, the individual may no longer be capable of satisfactory self-care, of performing remunerative or useful work on his own or of maintaining normal social relationships regardless of how well preserved are his cognitive capacities – or how high his scores on tests of skills, knowledge, and abilities (Lezak 1983, p. 38).

Listed in Appendix A are the 16 major "behavioral problems arising from impaired executive functions" in patients with brain damage, especially due to closed head injury, which were described by Lezak (1983, pp 38, 81, and 83). Kraepelin (1919, 1971) described these same impairments in executive functioning in patients with dementia praecox during the preneuroleptic era. Although there are many supporting statements that could be quoted from Kraepelin's textbook to document each of these behavioral manifestations of impaired executive functioning in patients with dementia praecox, due to space limitations I have included just one relevant quotation describing each type of executive dysfunction in Appendix A.

Impaired executive functions are most closely associated with frontal lobe damage (Lezak 1983). Stuss and Benson (1986) also closely link executive functioning to the frontal lobes:

The frontal lobes perform the supervisory, attentional tasks suggested by Shallice, the planning and design formulation proposed by Luria, the establishment of goals postulated by Damasio, and the executive function of Fuster, Lhermitte, Milner, and others (Stuss and Benson 1986, p. 246).

However, Lezak (1983, 1995) also pointed out that defective executive functions are also associated with subcortical damage, especially involving limbic structures.

The major purpose of this paper is to document that Kraepelin described in great detail "executive functioning

deficits" in patients with dementia praecox during the pre-neuroleptic era. Observations relevant to the neuropsychology of schizophrenia are numerous, but scattered, throughout Kraepelin's textbook *Dementia Praecox and Paraphrenia*. To capture the richness of Kraepelin's observations, frequent quotations from his book are cited. Also because Kraepelin (1919, 1971) used the terms dementia praecox and schizophrenia interchangeably by his 1919 edition, I did the same in this paper.

Kraepelin's concept of a failure of volition in dementia praecox

In *Dementia Praecox and Paraphrenia*, Kraepelin (1919, 1971) proposed that dementia praecox was composed of two major groups of disorders: disorders of volition and disorders reflecting "psychic disintegration." But even "psychic disintegration" was viewed by Kraepelin as being ultimately linked to a loss of will. Thus, a defect in volition was central to Kraepelin's thinking about dementia praecox. The case is made in this paper that Kraepelin's description of volitional deficits in patients with dementia praecox clearly documents impairments in executive functioning in schizophrenic patients during the pre-neuroleptic era:

There are apparently two principal groups of disorders which characterize the malady. On the one hand we observe a *weakening of those emotional activities which permanently form the mainsprings of volition*...The second group of disorders, which gives dementia praecox its peculiar stamp...consists in the loss of the inner unity of the activities of intellects, emotion, and volition in themselves and among one another. Stransky speaks of an annihilation of the 'intrapsychic co-ordination'...(Kraepelin 1919, 1971, p. 74-75).

...the patients *lose the mastery over volition* and often feel this profound disorder more or less distinctly. They are heard describing their inner constraint always in new and emphatic expressions. Their will has been taken from them; it is weak, they have no will of their own anymore, are not masters over it; there is no independence in them (Kraepelin 1919, 1971, p. 52).

Disorders of volition, the first group of disorders, result in cognitive impairment, emotional dullness, arrested development, and a loss of independent, goal-directed behavior:

In connection with this, mental activity and instinct for occupation become mute. The result of this part of the morbid process is emotional dullness, failure of mental activities, loss of mastery over volition, of endeavor, and of ability for independent action. The essence of the personality is thereby destroyed, the best and most precious part of its being...torn from her. With the annihilation of personal will, the possibility of further development is lost, which is dependent wholly on the activity of volition (Kraepelin 1919, 1971, p. 74).

Kraepelin suggested that a defect in volition may be responsible for both the onset of dementia praecox and for the chronic terminal states that occur in many patients. Furthermore, Kraepelin argues that a failure of volition is responsible for the impaired regulation of conceptual and logical thinking and for the impaired regulation and integration of psychological processes:

The general trend of volition and also the higher emotions might form the first point of attack. But further the instrument of general conceptions with its regulating influence on the train of thought

would then also become worthless, if the will were no longer capable of using it...The injured "active apperception" signifies the dominion of volition over the formation and the course of psychic processes (Kraepelin 1919, 1971, p. 76).

We come therefore to the conclusion that the onset of incurable terminal states is announced chiefly by those disorders which signify the loss of mastery over volitional action, be it that the mainsprings of volition are broken, be it that the mechanisms are destroyed which make systematic co-operation of individual volitional actions possible [terminal states] (Kraepelin 1919, 1971, p. 207).

The inner unity of our will is conditioned by the general trend of volition which is always alive in us...We may therefore expect that a weakening or annihilation of the influence which general conceptions, higher emotions, and the permanent general trend of volition exercise on our thinking, feeling, and actions, must draw after it that inner *disintegration*, those "schizophrenic" disorders, which we meet in dementia praecox (Kraepelin 1919, 1971, p. 76).

Kraepelin attributed less importance to "pure" intellectual deficits than to volitional deficits in the general clinical picture and the onset of chronic terminal states:

The rapidity with which deep-seated and permanent dementia, sometimes develops in the domain of intellectual work makes the suggestion easy, that it also may itself be drawn by the disease into a sympathetic morbid state, even though it is invariably encroached on to a much less degree than emotion and volition (Kraepelin 1919, 1971, p. 74).

I would ascribe much less importance to pure disorders of intellect. They appear in general to be further removed from the point of attack of the morbid process, and therefore not so soon to signify incurable phenomena of decay [terminal states] (Kraepelin 1919, 1971, p. 207).

In another passage Kraepelin stated that the psychological disintegration characteristic of dementia praecox is due to the weakening of general conceptions, higher emotions and volition over thinking, feeling, and acting. According to Kraepelin these symptoms were direct manifestations of volitional disorders and are presently linked to executive control deficits:

What fashions our experiences into a firmly mortised building, in which each part must fit the other and subordinate itself to the general plan, are general conceptions and ideas...We may therefore expect that weakening or annihilation of the influence which general conceptions, higher emotions and permanent general trend of volition exercise in our thinking, feeling and acting, must draw after it that inner disintegration, those "schizophrenic" disorders, which we meet with in dementia praecox (Kraepelin 1919, 1971, p. 75-76).

Executive control deficits

Executive control deficits include the lack of self-questioning, self-monitoring, self-evaluation, and self-correcting (Lezak 1983, 1995; Stuss and Benson 1988; Wong 1985). Kraepelin clearly described these deficits in patients with dementia praecox:

The patients do not try to give any account of the reliability of their observations and conclusions, do not search for explanations of their remarkable experiences, their persecutions, their good fortune; they make no difficulties and pay no regard if any are pointed out to them, but rather hold the more to their insane ideas without further proof (Kraepelin 1919, 1971, p. 32).

According to Kraepelin (1919, 1971), "in the whole conduct of the patients the *devastation of their will* makes it-

self conspicuous above everything [simple depressive dementia] (p. 106).” The patients generally are “tired, weak, lazy, without initiative, irresolute, let themselves become destitute, live carelessly a day at a time, fling away money and possessions senselessly, let themselves drift according to chance influences and therefore come quickly down in the world especially when they begin to drink [simple depressive dementia] (pp 106–107).” Failure of volition also produces patients who “are usually docile, let themselves be driven as a herd, so that they form the necessary nucleus of those crowds which conform willingly to the monotonous daily round in large institutions (p. 37).”

Kraepelin (1919, 1971) also attributed impairments in the following executive functions to a disorder of volition: attention (p. 5), mental activities (p. 74), mental efficiency (p. 23), capacity for deliberation (p. 75) and circumspection (p. 55), endeavor (p. 74), self-reliance (p. 55), the ability for independent action (p. 74), and the instinct for occupation (p. 37, 74). The destruction of intrapsychic unity, which is caused by a volitional disorder, is manifested in disorders of association (p. 75), *incoherence of the train of thought* [catatonia] (p. 198), sharp change of moods (p. 75) desultoriness (p. 70, 75), derailments in practical work (p. 75), and automatic obedience and negativism (p. 222).

Kraepelin enumerates deficits in the following higher cognitive and executive control functions in two other passages: judgment, critical thinking, mental activity, creative ability, aesthetic appreciation, social sensibilities, the ability to formulate and implement plans, emotion, and motivation:

...the weakening of judgment, of mental activity and of creative ability, the dulling of emotional interest and the loss of energy, lastly, the loosening of the inner unity of the psychic life would have to be reckoned among the fundamental disorders of dementia praecox (Kraepelin 1919, 1971, p 248).

...judgement is lost, the critical faculty, the creative gift, especially the capacity to make a higher use of knowledge and ability...the sense of beauty, the joy of understanding, sympathy, tact, reverence, desert them, as also the intelligent, continuous emotional relations to the events of life...they are wholly incapable of arranging their lives according to rational principles or of consistently carrying out a well-considered plan (Kraepelin 1919, 1971, pp 221–222).

Other symptoms of schizophrenia described by Kraepelin that fall under the rubric of impaired executive functioning and that he attributed to a volitional disorder include derailments of action (p. 222), susceptibility of the will to influence (p. 37, 222), impulsive actions (p. 248), stereotypy (p. 21, 222) and mannerisms (p. 45, 222), parabulia and negativism (p. 47, 222), *cessation of the need to express oneself* (p. 55), emotional dullness (p. 32, 35), and loss of opportunity for further development (p. 74):

Special importance in the establishing of dementia praecox has, not without justification, been attributed to the demonstration of the so-called “catatonic” morbid symptoms. Under this term must principally be understood the *volitional disorders* first described by Kahlbaum as accompanying phenomena of catatonia, automatic obedience, negativism, mannerisms, stereotypies, impulsive actions (Kraepelin 1919, 1971, p. 257).

...the states of excitement depression and stupor, further the manifold disorders of volition, negativism, automatic obedience,

stereotypy, mannerisms, impulsive actions, would be regarded more as secondary accompanying phenomena (Kraepelin 1919, 1971, p. 248).

Disorders of attention and meta-attention

Kraepelin (1919, 1971) observed that a “disorder of attention” (p. 5) is very often “conspicuously developed” (p. 6) in patients with dementia praecox (p. 5). The patients were described as having difficulty focusing and sustaining their attention, i.e., voluntary control of attention was impaired:

It is quite common for them to lose both inclination and ability on their own initiative to keep their attention fixed for any length of time. It is often difficult enough to make them attend at all (Kraepelin 1919, 1971, p. 6).

Meta-attention is the control of attention by executive functions (Müller 1982, p. 206). Among the meta-attentional processes described by Miller (1982, p. 206) are the following: (1) monitoring one’s ongoing attention (Am I paying attention?); (2) checking to see whether the attentional strategy chosen actually is facilitating performance, and (3) reality testing by checking answers on the basis of common sense or internal consistency. In the following passage Kraepelin clearly describes deficits in each of these three meta-attentional processes in patients with dementia praecox:

Further there is seen the tendency of groups of patients, when they transcribe to copy carefully all mistakes, corrections, interpolations, and marginal notes. In psychological experiments the patients cannot stick to the appointed exercise; they feel no need to collect their thoughts in the appointed manner, or to reach a satisfactory solution (Kraepelin 1919, 1971, p. 6).

In the next passage Kraepelin again clearly described that patients with dementia praecox do not self-monitor ongoing behavior in order to know whether they are paying adequate attention. This passage also describes their difficulty focusing and sustaining attention, and difficulty switching attentional set. “Coordinating and controlling the various attentional behaviors such as actively shutting out distractions” (Miller 1983, p. 206) is another meta-attentional process that the following passage by Kraepelin indicates is impaired in patients with dementia praecox:

With this loss of capacity to follow a lead is connected a certain unsteadiness of attention; the patients digress, do not stick to the point, let their thoughts wander without voluntary control in most varied directions. On the other hand the attention is often rigidly fixed for a long time, so that the patients stare at the same point, or the same object, continue the same line of thought, or do not let themselves be interrupted in some definite piece of work...but in the end there is occasionally noticed a kind of irresistible attraction of the attention to casual external impressions. The patients involuntarily introduce into their speech words that they have heard, react to each movement of their neighbors, or imitate them (Kraepelin 1919, 1971, pp 6–7).

In another passage Kraepelin described the lack of self-monitoring and incapability in exerting the necessary “effort” to adequately process information:

It was especially striking in the experiments...to find that the patients usually made, along with a few correct statements, a great

many wholly false ones. For instance, in the perception of letters they uttered repeatedly the same arbitrary series or sometimes parts of the alphabet. It was evident that they could not make the effort to retain and to reproduce what they really saw; instead of this they named at random, whatever happened to occur to them (Kraepelin 1919, 1971, p. 5).

Kraepelin defined attention as the “inner activity of volition (p. 7).” He considered the attentional disorders in dementia praecox as one of several manifestations of a more fundamental disorder of volition:

We shall later see that all these disorders of that inner activity of volition, which we call attention, represent only partial manifestations of general morbid changes in the processes of volition (Kraepelin 1919, 1971, p. 7).

Another manifestation of the volitional disorders in dementia praecox described by Kraepelin is impaired judgment, which is discussed in the next section.

Impairment of judgment

In the following passage Kraepelin described fundamental impairments in self-awareness and self-regulation in patients with dementia praecox. He ascribed these deficits in metacognition and executive functioning to a disorder of will or volition. Distinct metacognitive deficits described in this passage include impairments in judgement, self-awareness or insight, self-questioning, self-correcting, elaboration of new learning, novel problem-solving, critical thinking, concept formation, abstract thought, logical and rational thinking, decision making, and the ability to organize, monitor, evaluate, and edit one’s ideas:

The faculty of judgement in the patient suffers without exception severe injury. What always surprises the observer anew is the quiet complacency with which the most nonsensical ideas can be uttered by them and the most incomprehensible actions carried out. It is true that they often move with tolerable certainty in accustomed paths, but in the psychic elaboration of new experiences, in the judgement of circumstances not hitherto experienced, and in particular of their own state, in the drawing of obvious conclusions, in the bringing forward and trail of objections, they not infrequently commit the grossest blunders. One has the impression that the patients are not in a position to accomplish the mental grouping of ideas which is requisite for their survey and comparison, their subordination among one another for the discovery of contradictions. In this respect they resemble dreamers in whom likewise the ability to sift the ideas which come into the mind, to arrange them and to correct them according to the standards gained by former experiences and general ideas is abolished. These disorders, on whose great fundamental significance Bleuler also lays most emphatic stress, suggest an encroachment on the inner action of will (Kraepelin 1919, 1971, p. 25).

Kraepelin (1919, 1971) observed that many patients with dementia praecox terminate in a state of simple weak-mindedness. The hallmark of this state is impaired judgment and impaired volition. In the next passage Kraepelin described impairments in the following executive functions in these patients: judgment, conceptual and abstraction ability, anticipatory thinking, ability to generate alternatives, application of knowledge (which leads to a poverty of thought and loss of knowledge), attention, goal-directed behavior, the formulation and execution of plans, and ability to monitor and utilize feedback:

...a distinct *weakness of judgement* appears as a rule. The patients have become incapable of taking a general view of more complicated relations, of distinguishing the essential from side issues, of foreseeing the consequences of their own or other people’s actions. Their circle of ideas appears narrowed. Although occasionally still a considerable residuum of knowledge formerly acquired may come to the surface,...the patients have lost the capability of making use of it, and of working with it, a circumstance which naturally brings about its loss by degrees. The patients therefore lose a great part of their knowledge; they become impoverished in thought, monotonous in their mental activities. As at the same time their attention is blunted, they have but little inclination or ability to learn anything new, to pursue aims, to carry out a more extended plan...In slighter cases, however, acquired proficiency remains fairly well preserved. Many patients play cards or chess well; others can do arithmetic, draw and write with great perseverance, but are perhaps quite incapable of appreciating corrections, mistakes in spelling, of interpolations properly, or of planning anything themselves [terminal states, simple weak-mindedness] (Kraepelin 1919, 1971, p. 190).

Kraepelin described an impairment in abstraction ability in patients with dementia praecox and inferred from this that these patients must have damage in the frontal lobes. Abstraction, according to Kraepelin (1919, 1971), “transforms perceptions to general ideas, sensations to emotions, impulses to permanent trends of volition (p. 220).” In the following passage he explains how abstraction may regulate psychic life and mental activity:

These abstract creations of the higher psychic activity are what the essence of the psychic personality is compacted of. As a permanent deposit of the experiences of life they dominate the thought, feeling and will of man for long periods, and up to a certain degree make it independent of the experiences of the moment, which through it are reinforced, moderated, corrected, or in certain circumstances even shown to be false. One may probably with impunity lay stress upon the fact, that in dementia praecox apparently it is the loss of those permanent foundations of the psychic life, as they are created by abstraction, which influences the clinical picture often in the highest degree in incoherence of thought, in contradictory change of emotions, in impulsiveness of action (Kraepelin 1919, 1971, p. 220).

Blunting of emotion and motivation

In the following passage Kraepelin (1919, 1971) suggested that the profound emotional and motivational blunting, often found in patients with dementia praecox, may be linked to “the disorders of attention (p. 5).” Because he elsewhere defined attention as “the inner action of the will,” a volitional deficit in these patients may ultimately be responsible for the “emotional dullness (p. 35)” and “loss of interest (p. 32)” characteristic of schizophrenia. The dulling of emotion and motivation in turn could affect their ability to think and act.

Very striking and profound damage occurs as a rule in the emotional life of our patients. The most important of these changes is their *emotional dullness*. The disorders of attention which have already been mentioned might be essentially connected with the loss of interest, the loss of inner sympathy, the giving away of those emotional main-springs which move us to exert our mental powers, to accomplish our tasks, to follow trains of thought (Kraepelin 1919, 1971, pp 32–33).

Deterioration of higher mental functions

Kraepelin maintained that the higher cognitive deficits observed in patients with dementia praecox appeared to be a deterioration from premorbid levels. In the patient's own words (Kraepelin 1919, 1971, p. 26): "My thoughts went away and will never come back;" "my whole mental power has disappeared, I have sunk intellectually below the level of a beast"; "I have become very stupid lately."

Kraepelin went on to say that in association with this decline in mental activity there is a loss of goal-directed behavior. Purposeful behavior is lost because of impairments in both motivation and ability to perform effectively:

Ambition and pleasure in the usual games and occasional occupations become extinct, wishes and plans for the future are silent; inclination and ability for useful occupation disappear. The patient has neither endurance nor understanding, works confusedly, begins everything the wrong way about, tries as far as possible to withdraw himself from claims on him [dementia simplex] (Kraepelin 1919, 1971, pp 92-92).

Kraepelin also commented that a discrepancy between knowledge and ability (in modern terminology between crystallized intelligence and fluid intelligence) is indicative of a decline in functioning. The patients appeared to have particular difficulty with the application of knowledge, i.e., in applying previously acquired knowledge to new situations:

Sometimes it is possible from the comparison of present performances with earlier school reports, essays, letters, to establish the fact of the mental falling off, and from that to conclude that the case is probably one of dementia praecox... As by dementia praecox what is remembered is less injured than the ability to use it, we often still find surprising knowledge, while efficiency has suffered most severe losses. Imbeciles on the contrary can often manage fairly well in their daily tasks, even when their knowledge is of the very lowest degree (Kraepelin 1919, 1971, p. 260).

Patients with dementia praecox were clearly described by Kraepelin as having a *deterioration* in mental efficiency and performance. The scholastic histories of these patients indicate that premorbidly they had higher (and often very good) levels of intellectual functioning. Abnormal personality traits, on the other hand, are often very evident in the premorbid histories of these patients. The decline in mental ability is mainly in the area of executive or metacognitive functions, e.g., judgment and application of knowledge to new situation. Memory and acquired knowledge often, although not always, remain relatively well preserved.

Frontal and temporal lobe involvement in dementia praecox

The frontal and temporal lobes were implicated in the origin of dementia praecox by Kraepelin largely on the basis of the clinical picture (Kraepelin 1919, 1971). Kraepelin argued that the profound impairment of higher intellectual abilities as opposed to relatively intact memory and acquired abilities suggested frontal lobe involvement. On

the other hand, he thought that the unusual speech disorders and auditory hallucinations exhibited by patients with dementia praecox suggested an irritative phenomena in the temporal lobes:

If it should be confirmed that the disease attacks by preference the frontal areas of the brain, the central convolutions and the temporal lobes, this distribution would in a certain measure agree with our present views about the site of the psychic mechanisms which are principally injured by the disease. On various grounds it is easy to believe that the frontal cortex, which is specially well developed in man, stands in closer relation to his higher intellectual abilities, and these are the faculties which in our patients invariably suffer profound loss in contrast to memory and acquired capabilities...On the other hand the peculiar speech disorders resembling sensory aphasia and the auditory hallucinations, which play such a large part, probably point to the temporal lobe being involved. Here also, however, there is no true auditory aphasia, but only a weakening of the regulating influence...The auditory hallucinations, which exhibit predominantly speech content, we must probably interpret as irritative phenomena in the temporal lobe; it might not be due to chance that we invariably observe them along with confusion of speech and neologisms (Kraepelin 1919, 1971, p. 219).

According to Kraepelin, "the higher psychic stages of development...reach their highest perfection in man, especially in the frontal lobes (Kraepelin 1919, 1971, p. 220)." He regarded the frontal lobes as "the organ of psychic life (p. 221)" that "contain mechanisms which mediate a general connection of all the psychic workshops among each other (p. 221)." And because Kraepelin believed that "the real fundamental disorder in dementia praecox (p. 221)" was "the destruction of the psychic personality, of this inner harmony of all the parts of the psychic mechanism (p. 221)," he concluded that the frontal lobes had to be involved in this disorder. In the following passage Kraepelin ascribed the following executive functions to the frontal lobes: abstraction, elaboration, judgment, evaluation, decision making, and integration.

The hypothesis, therefore, is easy that besides the task of abstraction, perhaps in connection with it, they [the frontal lobes] have also the task of mediating between the activities of the deeper layers which are more confined to circumscribed areas, especially sensory perceptions and volitional impulses. The real psychic elaboration of external experience, the linking of it on to past experiences, the critical judgement of it by means of formerly acquired standards, the connecting of it to new psychic structures, to conclusions and creative ideas, could even so be ascribed to an organ gathering things together in that way, as the preparation for action by weighing values, the ripening of decisions on the ground of deliberation. It is evident that the activities named here must before everything else be regarded as foundations of the inner unity and consistency of the psychic life (Kraepelin 1919, 1971, p. 221).

In summary, Kraepelin observed profound deficits in abstraction and psychic integration in patients with dementia praecox, and he attributed these higher intellectual deficits to damage in the frontal lobes. The speech disorders and auditory hallucinations implicated an irritative problem in the temporal lobes.

Discussion

The purpose of this paper was to rediscover and reexamine the neuropsychology of schizophrenia according to Kraepelin. Emil Kraepelin was the first to identify dementia praecox as a distinct disease in 1896. He carefully observed a great many patients over several decades and described their symptoms and the course of their illness in rich detail. His observations are relatively unbiased in that they preceded all the theorizing on schizophrenia that has taken place subsequently. His training in psychology provided him with a scientific and psychological sophistication that lends greater credence to his observations as they pertain to the neuropsychology of schizophrenia. In addition, his description of their symptoms was not confounded by the powerful effects of psychotropic medications, because his observations were made in the preneuroleptic era.

Kraepelin thought that the "dementia" of dementia praecox was primarily a disorder of volition, rather than one of intellect. "Volition" or "will" referred to the ability to make conscious decisions and to carry them out. Kraepelin's detailed description of volitional deficits in patients with dementia praecox in his classic textbook, *Dementia Praecox and Paraphrenia*, clearly documents impairments in executive functioning in schizophrenic patients during the preneuroleptic era. He described impairments in anticipation, judgment, problem-solving, planning, and goal-directed behavior. He also described deficits in cognitive control, including meta-attention, self-questioning, self-monitoring, self-evaluating, self-correcting, and self-regulation.

To a large extent, this impairment in volition or executive functioning may be responsible for the "dementia" of dementia praecox and the "chronicity" of chronic schizophrenia. If this hypothesis is correct, the long-range prognosis of patients with schizophrenia may be considerably improved by treatment programs designed to facilitate executive functioning.

Appendix A

Manifestations of impaired executive functioning in closed-head-injury patients according to Lezak (1983) and in patients with dementia praecox according to Kraepelin (1919).

1. Defective capacity for self-control (Lezak 1983): "susceptibility of the will to influence (Kraepelin 1919, p. 37)."
2. Emotional lability (Lezak 1983): "sharp change of moods (Kraepelin 1919, p. 75)."
3. Emotional flattening (Lezak 1983): "emotional dullness (Kraepelin 1919, p. 32)."
4. Impulsivity (Lezak 1983): "impulsiveness in action (Kraepelin 1919, p. 220)."
5. Erratic carelessness (Lezak 1983): "live carelessly a day at a time (Kraepelin 1919, p. 106)."
6. Rigidity and difficulty in making shifts of attention (Lezak 1983): "attention is often rigidly fixed (Kraepelin 1919, p. 6)."
7. Deterioration in personal grooming and cleanliness (Lezak 1983): "in their outer appearance, they become disorderly, negligent, dirty, peculiar...they do not wash themselves anymore (Kraepelin 1919, p. 97)."
8. Impaired ability to initiate activity and problems of starting (Lezak 1983): "without initiative (Kraepelin 1919, p. 106)."
9. Decreased or absent motivation (anergia) (Lezak 1983): "former interests are weakened or extinguished (Kraepelin 1919, p. 32)."
10. Defects in planning (Lezak 1983): "incapable of planning anything themselves (Kraepelin 1919, p. 190)."
11. Deficits in carrying out goal-directed behavior (Lezak 1983): "loss of ability for independent action (Kraepelin 1919, p. 74)."
12. An inability to perceive performance errors (Lezak 1983): "the critical faculty is lost (Kraepelin 1919, p. 221)."
13. Concreteness (Lezak 1983): "the loss of those permanent foundations of the psychic life, as they are created by abstraction (Kraepelin 1919, p. 220)."
14. Poor judgement (Lezak 1983): "the faculty of judgement suffers without exception severe injury (Kraepelin 1919, p. 25)."
15. Poor adaptation to new situations (Lezak 1983): "in the psychic elaboration of new experiences, in the judgement of circumstances not hitherto experienced, they not infrequently commit the grossest blunders (Kraepelin 1919, p. 25)."
16. Impaired mental efficiency (Lezak 1983): "mental efficiency is always diminished to a considerable extent (Kraepelin 1919, p. 23)."

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