Cognition and Psychopathology

Lecture 10:
Schizophrenia

Schizophrenia

Schizophrenia is a type of Psychotic Disorder.

Psychotic is a term that has had a variety of definitions, and none are fully accepted.

The narrowest definition of "psychotic" refers to delusions or prominent hallucinations that occur without insight into their pathological nature.

Other accounts of the term drop the requirement of lack of insight.
Broader definitions have additionally included other so-called "positive" symptoms of schizophrenia: disorganized speech, grossly disorganized or catatonic behaviour.

Conceptually, psychosis has been defined as a loss of ego boundaries or a gross impairment in reality testing.

As the DSM-IV notes, its varying diagnostic categories for the Psychotic Disorders somewhat reflect these differing definitions (e.g., "psychotic symptoms" in Schizophrenia refer broadly to the positive symptoms; in Delusional Disorder, only to delusions).

There are a number of Psychotic Disorders, but the most widely known and studied is Schizophrenia.
Schizophrenia is a widely varying disorder, can present with many differences in symptoms, and has a number of subtypes.

(Some researchers have argued that this variation in fact indicates that schizophrenia is not a unitary disorder.)

**Schizophrenic symptoms**

Generally, schizophrenia involves the presence of a mixture of characteristic symptoms present for a significant portion of a month.

These symptoms involve a range of cognitive and emotional dysfunctions that include perception, inferential thinking, language and communication, behavioural monitoring, affect, fluency and productivity of thought and speech, hedonic capacity, volition and drive, and attention.
The symptoms of schizophrenia are thought to break down into two broad categories:

- **positive symptoms**, which appear to reflect an excess or distortion of normal functions
- **negative symptoms**, which involve a diminution or loss of normal function.

Positive symptoms themselves may further involve two dimensions:

- the **psychotic dimension**, which includes delusions and hallucinations
- the **disorganization dimension**, which covers disorganized speech or behaviour.
Negative symptoms include restrictions in

- the range and intensity of emotional expression (affective flattening)
- the fluency and productivity of thought and speech (aloria)
- the initiation of goal-directed behaviour (avolition)

Delusions

Delusions are erroneous beliefs that usually involve a misrepresentation of perceptions or experiences.

Their content is often thematic (e.g., persecutions, referential, somatic, religious, or grandiose).
Persecutory delusions are most common: the person believes they are being tormented, followed, tricked, spied on, etc.

Referential delusions involve the belief that environmental cues are specifically directed at the individual (e.g., song lyrics, passages from books, gestures or comments by strangers, etc.).

"Bizarre" delusions are especially characteristic of schizophrenia. Judgements of bizarreness may be difficult, but generally delusions are bizarre if they are clearly implausible and do not derive form ordinary life experiences.

- E.g., believing that one is under police surveillance is not a bizarre delusion, whereas believing that one's organs have been removed and replaced with someone else's without leaving wounds or scars is.
Common bizarre delusions involve loss of control of mind or body:

- the person's thoughts are being removed by an outside force (*thought withdrawal*)
- outside thoughts are being put into the person's mind (*thought insertion*)
- the person's body or actions are controlled by some outside force (*delusions of control*).

**Hallucinations**

Hallucinations can occur in any sensory modality, but auditory hallucinations are by far the most common.

Such hallucinations are generally perceived as voices distinct from a person's own thoughts.

The content of the hallucinations may vary, although pejorative or threatening voices are especially common.
Disorganized Thinking and Speech

Disorganized thinking has been argued by some to be the single most important feature of schizophrenia.

However, it is very difficult to define objectively, and in the DSM-IV, the disordered nature of speech is emphasized since it is more easily observable.

- Speech in schizophrenic individuals may slip from one topic to another (derailment or loose associations)
- answers to questions may be obliquely related or unrelated (tangentiality)
- rarely, speech may be so severely disorganized as to be incomprehensible (incoherence)
Disorganized Behaviour

Disorganized behaviour may manifest in a variety of ways, from childlike silliness to unpredictable agitation.

Goal-directed behaviour may be impaired, making such things as daily meals and personal hygiene problematic.

The person may appear markedly dishevelled, dress in an unusual manner, display inappropriate sexual behaviour or unpredictable agitation.

Catatonic motor behaviours

Catatonic motor behaviours include

- a marked decrease in reactivity to the environment
- maintenance of a rigid posture
- active resistance to instructions to move
- the assumption of inappropriate or bizarre postures
Negative Symptoms

The negative symptoms account for much of the impairment associated with schizophrenia.

Affective flattening is characterized by little apparent variation in emotion, as demonstrated by

- the individual's face appearing immobile and unresponsive
- poor eye contact
- reduced body language

- Alogia ("poverty of speech") is characterized by brief, laconic, empty replies, decreased fluency and productivity of speech, apparently caused by diminution of thought.

- Avolition involves an inability to initiate and persist in goal-directed activities.

Although not diagnostically characteristic, other associated negative symptoms include anhedonia (loss of interest or pleasure), and lack of interest in eating.
The specific diagnostic criteria for Schizophrenia are complex:

- Two or more of the following symptoms, present for a month or more:
  - delusions - hallucinations - disorganized speech (e.g., frequent derailment or incoherence) - grossly disorganized or catatonic behaviour - negative symptoms (affective flattening, alogia, or avolition)

- If delusions are bizarre, or hallucinations consist of a voice keeping up a running commentary on person's behaviours or thoughts [voices commenting], or two or more voices conversing with each other [voices conversing], no other symptom need be present.
Further

- functioning must be significantly impaired
- the symptoms must not be the result of other disorders
- low-level symptoms (usually negative symptoms) must have been present for six months

Properly diagnosed schizophrenia will fall into one of five specified subtypes: Paranoid, Disorganized, Catatonic, Undifferentiated, or Residual.

These subtypes primarily differ by what type(s) of symptoms are most prominent.

- E.g., in Paranoid Schizophrenia delusions and hallucinations are prominent. (Often, these will involve notions of persecution, but despite the name, such a theme, or "paranoia", is not necessary for this subtype, merely the prominence of delusions and hallucinations.)
Associated Disorders

Schizophrenic individuals often have co-morbid Substance-Related Disorders.

Such disorders may be the results of crude attempts at self-medication

- e.g., getting drunk to pass out as a way of eliminating "voices in the head"

Unusually, there is an extremely high rate of Nicotine Dependence in schizophrenic individuals

- (smoking rates of over 90%)

- hypothesized to result specifically from possible involvement of dysfunction of nicotinic receptors in the brain that may be involved in schizophrenic symptoms

- smoking may thus help somewhat to alleviate symptoms
Schizotypal, Schizoid, or Paranoid Personality Disorder may sometimes precede the onset of Schizophrenia,

- it is unclear whether they constitute a separate earlier disorder or are simply prodromal (precursor symptoms of a later disorder).

Prevalence, Course, Morbidity

Prevalence is hard to gauge, in part because of the fluidity of definition of schizophrenia and difficulty with diagnosis. However, generally accepted lifetime rates are estimated between 0.5% and 1.0%.

Onset generally occurs between late teens and mid-30s.

Although rates are similar in both genders, women generally show later onset, more prominent mood symptoms, and better prognosis.
The course of schizophrenia is extremely variable

- some individuals showing exacerbations and remissions

- others have a more chronic pattern.
  - in chronic cases, some may remain relatively stable, whereas others progressively worsen.

Generally, full remission is not common.

Early intervention improves prognosis

- Emphasis on first-episode treatment

- Increasing emphasis on identification of at-risk individuals
There is a clear genetic component to schizophrenia:

- first-degree biological relatives of schizophrenic individuals are 10 times more likely to become schizophrenic than the general population

- adoptive relatives show no such increase.

However, there is a substantial *discordance rate* in monozygotic twins (i.e., both twins from the same fertilized egg, who are genetically identical, do not always both develop schizophrenia), suggesting that environmental factors are also involved in onset.
Approximately 10% of schizophrenic individuals commit suicide.

Famous sufferers:
Famous sufferers:

John Nash
mathematician
Famous sufferers:

John Nash
mathematician

Mary Todd Lincoln
US First Lady

John Nash
mathematician

Mary Todd Lincoln
US First Lady

Syd Barrett
co-founded
Pink Floyd
Accounts of Schizophrenia

Schizophrenia is likely the most prominent psychiatric disorder, and its symptomatology has garnered considerable attention for many centuries.

Pre-scientific accounts of delusions and hallucinations often involved notions of the effects of supernatural beings (either "good", as in gods, or "evil", as in demons) or magical efforts (such as spells or hexes).

This was especially true for those who had religious or supernatural delusions or hallucinations (e.g., seeing gods or saints, hearing the voice of God, etc.)
(It should be noted that, strictly speaking, the cultural context can determine whether such experiences are "delusional" or simply an accepted part of the culture [e.g., shamanistic societies, extremely religious cultures]).

Psychodynamic accounts of schizophrenia were developed in the early part of the century

- argued that schizophrenia arose due to environmental factors.
By contrast, other early diagnostic approaches to the disorder by researchers such as Kraepelin and Bleuler argued for a specific neurobiological cause.

- At the turn of the century, Emil Kraepelin ("the father of modern psychiatry") was the first to provide a modern grouping of previously varied psychotic syndromes under a single diagnostic category ("dementia praecox").

Although Kraepelin's diagnostic approach was rather atheoretical, his view of the thought disorder aspects of "dementia praecox" involved the presumption of disordered attentional processes.

- he argued that the registration of stimuli in the disorder was relatively intact, but that active, sustained, directed attention was deficient.

This view is very similar to modern approaches.
Eugen Bleuler, like Kraepelin, argued for a specific underlying biological cause.

However, in the first part of the 20th Century he was the first to argue that such a biological factor would produce a single specific psychological deficit

- disruption of the associative processes

He thought this was the fundamental psychological cause of the illness.

(This hypothesis also has strong similarities to certain modern cognitive approaches.)

Bleuler also argued that symptoms of the disorder could arise from two different causes:

- those caused directly by the disorder ("fundamental" symptoms)

- compensatory reactions to the primary breakdown ("accessory" symptoms).
The "anti-psychiatry" and related movements in the middle of this century (e.g., Szasz, Laing, Foucault) have argued against the notion that schizophrenia (in particular, and mental illness in general) is in fact a disorder.

They saw it as a "different mode of living", a valid response to "insane" societal conditions, or an alternate way of viewing reality that is just as valid as "normal" experience, but is sanctioned against by society.

This position may be bolstered somewhat by the radically varying nature of the symptoms in schizophrenia, and by the fact that some behaviours that are sanctioned in some cultures are marked as "delusional" or "hallucinatory" in others (such as religious or supernatural experiences).

However, this view has a very difficult time accounting for negative symptoms, as well as the biological evidence such as genetics and abnormalities in observed brain anatomy and function.
Most recent accounts have argued that schizophrenia arises largely due to biological dysfunction or dysregulation of some sort, but the specifics are a matter of much disagreement.

There is some evidence that excess availability of the neurotransmitter dopamine may be involved (the "Dopamine Theory").

- Antipsychotic drugs generally seem to block dopamine receptors.

- Chronic use of amphetamine, which causes release of dopamine, can eventually result in psychotic symptoms, as can overmedication of Parkinson's Disease (a condition caused by lack of dopamine in some brain systems) with dopamine agonists (substances that enhance the effects of dopamine), such as L-Dopa.
How excess dopamine might cause the observed symptoms in schizophrenia is unclear, as is if it is the only system involved (i.e., if it can account for all the observed symptoms).

Numerous functional and anatomical brain abnormalities have also been observed in schizophrenia.

- In some cases their relevance is unclear (e.g., enlarged ventricles and temporal lobe asymmetries).
Other such finding may be suggestive of possible psychological mechanisms by which schizophrenia arises.

- One such finding is a reduction in activity in the frontal lobes.
  - this brain area is associated with "executive functions" such as decision-making
  - may also be involved in inhibition of irrelevant stimuli and other aspects of selective processing (as well as some affective processes)

Cognition in Schizophrenia

Like biological approaches to the disorder, cognitive accounts of schizophrenia are highly varied, and do not often encompass all the feature of the disorder or all subtypes.

Cognitive theories have focussed, not surprisingly, almost exclusively on the positive symptoms of the disorder, primarily on the disorders in thought (i.e., hallucinations, delusions) and speech (disordered and disorganized speech).
Generally, most cognitive approaches to schizophrenia postulate *deficits* as the source of cognitive disturbance (cf. affect disorders).

- Often such accounts attempt to tie a deficit in an elementary cognitive process to the secondary formation of delusions, hallucinations, and other more manifest symptoms (like Bleuler).

The deficits most often identified involve *attentional processes*.

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**Empirical Research**

Examining aspects of schizophrenic cognition in the laboratory is difficult, in large part because many non-cognitive factors can influence performance, such as motor function, reduced motivation, medication, hospitalization, etc.
How to get around such problems?

- Look for *differential performance* on multiple tasks
- Look for *superior performance* on tasks
- Examine *at-risk individuals*, such as relatives of schizophrenics (especially good for separating primary factors from abnormalities secondary to the psychotic state)
- Examine normals who score high on *schizotypal characteristics* (presumes a continuity between "normal" and psychosis)

*Attention and inhibition*

Frith (1979) argued that a defect in the mechanism that controls conscious awareness of stimuli could account for many of the positive symptoms.

Specifically, Frith argued for a failure in the *inhibitory mechanisms* that control and limit the contents of consciousness.

- Such mechanisms had earlier been postulated by cognitive theorists to work after pre-attentive processing of stimuli, and serve to help select material for further processing.
Frith thought a breakdown in cognitive inhibition could result in, e.g.,

- failure to suppress irrelevant word associations that usually do not reach consciousness (thought/speech disorder)
- faulty preconscious perception of sounds that ordinarily wouldn't reach awareness (auditory hallucinations)
- irrelevant information intruding on consciousness that needed to be explained and interpreted (delusions)

Recently, the *negative priming* methodology has been used to examine inhibitory processes in schizophrenia.

Tipper (1985) developed the negative priming paradigm, based on the notion that (in normal individuals) unattended irrelevant information is actively inhibited, rather than just ignored.

Because of this inhibition, responding to the presentation of a target stimulus that had previously served as an irrelevant distractor should be slowed (compared to a previously unseen target).
• The typical negative priming paradigm involves presenting two stimuli simultaneously, a target item and a distractor.

• The target is indicated in some fashion on the display (often by a specified color), and the individual is to respond with the name of the target.

spoon

leaf
Key manipulation: relationship between distractor on one trial and target on next.

- Prime condition:

chair

spoon
spoon

leaf

- Control condition:
chair
cloud

spoon
leaf
In normal subjects, when a target item on one trial was the distractor item of the previous trial, RT for the target is longer.

This slowing is termed "negative priming" (in contrast to the speeding of responses, or "positive priming", found when a target is repeated across two trials).

Given that negative priming results from the function of inhibitory processes, if such processes are functioning poorly in schizophrenics, they should show less negative priming (i.e., perform better on the task than "normals").
Numerous studies have been recently conducted using the negative priming paradigm to examine schizophrenia.

Williams (1996) looked at negative priming in three different subtypes of patients, divided by symptom clusters:

- Disorganization (primarily thought disorder)
- Reality Distortion (primarily delusions and hallucinations)
- Psychomotor Poverty (primarily negative symptoms, with little positive symptomatology)
- The Psychomotor Poverty subtype showed negative priming similar to that found in normal subjects.

- By contrast, the other two groups (which showed mostly positive "cognitive" symptoms) demonstrated a facilitation in the usual negative priming condition. Instead of slowing responses, they were actually faster when the distractor later became the target.

- This study suggests that positive symptoms may be associated with a deficit in inhibition (and further that schizophrenia may have subtypes that are cognitively distinct).

  [Similar results have been found for subtypes of schizotypy in non-clinical subjects (Williams, 1995), and these results extend the earlier work by Beech which showed reduced negative priming in undifferentiated groups of schizophrenics and high-schizotypy subjects.]
Other studies have shown that schizophrenics are less sensitive to contextual effects, which may also reflect this failure of inhibition.

- Polyakov (1969) found that, when presented with a degraded stimulus, normals use contextual constraints more than schizophrenics to identify it.

When presented with the auditory sentence "The photographer made a pretty..." and a word masked by noise:

- normals most frequently identify the masked word as "picture"

- when this word is in fact presented, their performance is better than schizophrenics.

- however, schizophrenics provide more accurate identifications when the masked word is unlikely in that context (e.g., "tiger").
Brennan and Hemsley (1984) presented non-paranoid schizophrenics, paranoid schizophrenics, and normals with repeated word pairs involving the same initial word and three possible partners (e.g., bacon-eggs, bacon-notebook, bacon-tiger).

- One pairing was highly associated, the other two were not

- all three pairs were presented an equal number of times (one-third of all presentation involved each pairing). Subjects estimated the frequency of the highly associated pairing in the presentation.

- *Normal subjects* reported an illusory correlation for the associated pair, estimating it made up 39.9% of the presentations.

- By contrast, the *non-paranoid group* was almost accurate, reporting 34.1%, suggesting they failed to be influenced by the pre-existing relationship of the associated pair.

- Interestingly, the *paranoid group* showed the highest illusory correlation, 43.5%

  - (in keeping with cognitive accounts of paranoia as an inappropriate tendency to draw connections).
These results support the notion that some schizophrenics fail to be influenced by context (also suggests a further distinction among types of schizophrenia).

(Note that all of the above tasks show better performance by schizophrenics than normals.)

Executive functions

- A number of studies have also shown impairments on higher level cognitive functions.

- These studies usually use neuropsychological tests designed to measure executive functions, processes that coordinate or conjoin discrete, low-level functions and enable the performance of complex tasks.
Executive functions are thought to be carried out neurologically in the frontal lobes, hence these processes are also called "frontal" functions or skills.

(Recall that functional neuroimaging shows frontal lobe activity is generally reduced in schizophrenia.)

Morie and Delahunty (1996) has schizophrenics perform a number of "frontal" tasks, including working memory tasks and the "Tower of London" task.

• They showed impairments in cognitive flexibility and forward planning.

• Interestingly, it was primarily on the most complex tasks that deficits appeared; simpler tasks show relatively little impairment

  (in other words, impairment is not necessarily an "all-or-nothing" phenomenon).
Communication impairments

One of the hallmarks of schizophrenia is impaired communication, resulting from disordered or incoherent speech. Numerous studies have examined this facet of schizophrenic symptomatology.

Generally, it has been found that schizophrenics do not have a deficit in language comprehension, and when presented with their own utterances after a delay, rate their communication as less clear than that of normals (Harrow, Lanin-Kettering, & Miller, 1989).
However, when producing speech they appear to have trouble self-editing irrelevant associations, especially when the communication demands are difficult (Cohen, Nachmani, & Rosenberg, 1974).

These results would be in keeping with attentional or inhibitory deficits, and could also arise from problems with executive function.

Please read the sections on communication and language in the Dobson & Kendall book on reserve -- pp. 439-445 and 450-453.