Delusion is a disorder of thought that is a critical characteristic of most psychotic disorders. Establishing presence of a delusion is vital in assessment and management of these disorders. This commentary review on delusion deals many such important yet 'uncared for' aspects. Various issues related to definitions and dimensions, course and presentation are dealt. Underlying theories and their current day position according to evidence base are highlighted. Related constructs that pose diagnostic dilemmas in clinical practice along with issues related to assessment and treatment are discussed. We conclude the review by suggesting certain methodological issues, future hypotheses and designs.

Keywords
Delusions; Psychopathology; Updates.

Introduction
The term delusion is derived from “delude”, a Latin word that implies mocking, defrauding or cheating. Delusion has been long considered to be a basic characteristic of madness and to be mad was considered to be deluded.[1] There are a number of issues that ponder around the understanding of the construct of delusion. We, in this review have tried to address issues related to the definition and dimensions of delusion, primary delusions and delusions in normal population. We also critically evaluate the existing theories on delusions along with attending matters related to assessment of delusions.

Issues with the definition of delusion: acceptable or accepted?

Classical training in psychiatry commonly use the definition given by Sims (2003),[2] according to which, delusion is a false, unshakeable idea or belief which is out of keeping with the patient's educational, cultural and social background. However, there are other definitions proposed as well:[3]

- Pathologically derived errors, not amenable to correction by logical proof to the contrary.[4]
- Judgment which cannot be accepted by people of the same class, education, race and period of life as the person who experiences it.[5]
An interpretation without reason, an intuition without cause, a mental attitude without basis.[6]

A false, unshakeable belief which arises from internal morbid processes.[7]

The definition given by Karl Jaspers in his book 'General Psychopathology'.[8] have the highest impact on psychopathology. However, the three core features, needed for diagnosis of delusion, - certainty (conviction), incorrigibility (unchanged by proof to the contrary) and falsity of content, have been seriously criticized. Firstly, contrasting the view of 'absolute conviction' is the fact that delusions often disappear with resolution or remission of an acute episode of psychosis. Longitudinal studies have suggested that delusions vary over time in conviction and might even disappear.[9,10] Secondly, contradicting the assumption of 'un amenable for external influence', Kaliuzhna et al. (2012)[11] has found that patients with delusions do take into account socially provided information and show less egocentric advice-discounting than controls. Thirdly, the most important issue of falsity- when on one hand even beliefs such as existence of god cannot be termed false; on the other hand a person having an 'unfaithful' sexual partner can be diagnosed with having a delusion of infidelity. Hence, the concept of 'various dimensions of delusions' came into focus.

**Issues with available dimensions**

Rather than suggesting a unitary definition, Kendler et al (1983)[12] have proposed several poorly correlated dimensions of delusional severity

a. Conviction- the degree to which patient is convinced of the reality of the delusional beliefs

b. Extension- the degree to which delusional belief involves areas of the patient's life.

c. Bizarreness- the degree to which the delusional believes departs from culturally determined consensual reality.

d. Disorganization- the degree to which the delusional believes are internally consistent logical systematized.

e. Pressure- the degree to which patient is preoccupied and concerned with the expressed delusional belief.

f. Deviant behaviour resulting sometimes from actingon delusions

**Principal processes that underlie various dimensions**

Garety and Hemsley (1987)[13] in principal component analysis of the items of their 'Characteristic of Delusional Experience' scale generated 4 components: distress, belief strength, obtrusiveness, concern and proposed that there may be at least 4 processes which underlie various elements of delusional experience. Only few other studies have focused on identifying such processes.

**Issues with the concept of 'primary delusions'**

**Primary and secondary delusions**

The essence of primary delusional experience is that a new meaning arises in connection with some other psychological event. Conrad suggested that the term 'apophany' would be better than 'primary delusional experience'. Primary delusions are delusional mood, delusional perception (apophanous perception), sudden delusional idea (autochthonous delusion), delusional memory and delusional awareness. Secondary delusions can be understood as arising from some other morbid processes i.e. mood, hallucinations or a sensitive personality.
Concept of 'ununderstandability'

The term 'ununderstandable' was coined by Jaspers (1963)[8] to describe primary delusions. Some authors believe any delusion that does not share the mechanism of primary delusions are not really delusions at all.[14]

A lucid definition is provided by Owen et al. (2004).[15] According to him firstly, there is a radical change in subjectivity (one comes to believe new things or 'change in meaning') and secondly, arriving at such beliefs in a new way (transformation because of awareness of that meaning).

Why are primary delusions so crucial for a schizophrenia diagnosis?

Classically, processes underlying delusions are described as schizophrenia, paranoia, organic or affective in origin.[16] Paranoia is understood as to be a secondary specific personality character and currently is categorized as delusional disorder.[17] Additionally, delusions in delusional disorder are thought to be lying at the end of a continuum that includes overvalued ideas.[18] In this way it is 'understandable!'. The terms 'organic' and 'affective' themselves mean that the delusions are underlying some specific organic (epilepsy, head injury etc. i.e. specific conspicuous neuronal hyperactivity or loss) or affective (depressive, manic etc.) processes, respectively. Now when we come to schizophrenia, specific underlying processes are unknown. As primary delusions are considered 'ununderstandable' they cannot be said to accompany disorders whose underlying processes are understandable; and hence they become diagnostic of schizophrenia.

When are primary delusions assessed best?

Classic literature [19] suggests that once 'delusional work' sets in, eliciting primary delusions correctly is not likely. However, there is hardly any literature that suggests till what particular time, in the course of schizophrenia (or any disorder), are primary delusions best assessed.

Issues with stability and persistence of delusions

Heterogeneity in the stability of delusions

The statement 'delusions are deeply held beliefs and they are resistant to change' is widely used in classical writings. Contrasting these views is the fact that delusions often disappear with resolution or remission of an acute episode of psychosis. There are longitudinal studies which suggest that delusions vary over time and might even disappear entirely in some cases.[9-10]

What predicts persistence of a delusion?

Appelbaum et al. (2004)[20] found that being never married, older age, a diagnosis of schizophrenia, delusions of body/mind control and thought broadcasting, higher levels (more preoccupation, higher conviction etc.) of psychopathology and functional impairment are predictors for a delusion to persist over time.

Are delusional themes stable or changeable?

Consistence, in delusional theme, from first to the subsequent episodes occurs in about 25% [21] to 47% [22] of patients. Additionally, Sinha and Chaturvedi (1990)[21] found that Hindu religion, rural background and being married predicted this consistence over episodes. Recently, Ellersgaard (2011) [23] found that theme consistency gradually reduced over a 5 year period from 50% at baseline.

Theories of delusions- a critical evaluation

Although there are different classifications of theories of delusions, they can be broadly classified into psychodynamic, cognitive, perceptual, affective and biological approaches.
Psychodynamic theories

Psychodynamic mechanisms regard delusion motivated i.e. formation and maintenance of delusion is attributed to psychological benefits. This approach is mostly of historical interest and has been challenged strongly by cognitive approaches. Modern day proponents of this approach are only a few and they back this approach by suggesting that delusions are constructed defensively in order to maintain self-esteem.[24-25] However, this model relates specifically to persecutory delusions only.

Cognitive theories

Deductive reasoning

Psychiatrist Eilhard von Domarus's principle [26] of faulty logical or deductive reasoning has failed to find empirical evidence.[27] It was basically described as a hypothesis on how the subconscious operates. He suggested that as schizophrenia patients lose conscious control of their minds, they apparently exhibit raw, subconscious reasoning.

Probabilistic reasoning

In tasks of probabilistic reasoning, there can be two types of biases- bayesian bias (over adjustment of probabilistic assumptions) and 'jump to conclusion' bias (stop to decide). Huq et al. (1988)[28] was the first study to investigate probabilistic reasoning in patients with delusion. Further studies [29-30] failed to demonstrate bayesian bias (although found frequent shifts in assumptions). However, evidence for 'jumping to conclusions' has been robust for patients with delusion.[30, 31-32].

Belief flexibility

It is another of the reasoning biases that has been recognized lately. Belief flexibility in psychosis refers to “a metacognitive process about thinking about one's own delusional beliefs, changing them in the light of reflection and evidence and generating and considering alternatives”.[32] Colbert et al. (2010)[33] has proposed that belief flexibility is not specific to the delusional beliefs themselves, but may be a characteristic thinking style in individuals with delusions.

Social cognitive processes

Two social cognitive measures relevant to delusions are attributional bias and theory of mind deficits. Firstly, 'Attributional bias' was evidenced initially by studies by Bentall and colleagues.[24] Particularly, externalizing bias was linked to delusions. Criticism of the study by Jolley et al. (2006)[34] in which delusions were not related to any particular attributional style led to development of new scales like the Achievement and Relationships Attributions Task (ARAT)[35] and conventional methods like Conditioned Avoidance Response (CAR) task were suggested for measuring attributional biases.[36]

Secondly, coming to 'theory of mind deficit', it has been the most researched psychological process in psychosis with respect to delusions. Freeman (2007)[37] in his systematic review, comments that this is the most stringently tested factor compared to other psychological elements. He found that that although these deficits are related to negative symptoms, their association with delusions is weak.

Perceptual theories

Perceptual approach proposed by Maher, alone was not able to explain for both formation and maintenance of delusions hence it has been integrated as a second factor in the 'two factor' or 'two deficit' model along with other cognitive theories like disturbed probabilistic reasoning, attributional bias, theory of mind deficits and belief flexibility.[38] This model seemed the most excepted psychological theory to for
delusions as criticisms against this model were sparse.

**Affective theories**

Anxiety has constantly been found to be associated both occurrence and persistence of delusions especially persecutory.[39] Moreover, related genetic markers (DAOA/G30 locus and G72/G30 gene) for delusions and anxiety have been found.[40-41] Strong evidence has also been found for association between other anxiety-related processes like safety behaviors and delusions.[39]

**Biological theories**

Delusions are common in many conditions and hence a common factor in all these conditions- dopamine theory is suggested to underlie delusions.[42] Role of other neurotransmitters like gamma amino butyric acid (GABA), glutamate and endocannabinoids is considered 'less direct'. Studies convincingly suggest a definite 'increase' in dopamine levels. However, there are issues with the site; some suggest attenuation of normal dopamine suppression in the frontal cortex whereas some suggest that abnormality within the temporal lobe i.e. hippocampus might also determine dopamine dysregulation.[42] GABAergic signals from the ventral pallidum and glutamatergic afferents from prefrontal cortex mediate this dysregulation.[43]

Corlett et al. (2010)[44] suggested differential anatomical circuits for various secondary delusions- a circuit incorporating the midbrain dopaminergic nuclei, the associative striatum and frontal cortex for delusion of reference; a circuit consisting of midbrain, prefrontal cortex, parietal cortex, cerebellum and the bimodal cells of the putamen for delusion of control; and a circuit containing midbrain, amygdala, frontal and parietal cortices for delusion of persecution. The study additionally suggested that these circuits interact and mutually reinforce each other.

Figure 1 shows measure of acceptance available for each of the theories explained so far. Note that probabilistic bias, belief flexibility, perceptual and affective theories score high.

Are these theories apt for all types of delusions?

Majority of work has focused on persecutory delusions. Although there are studies that have tried to explore these models across different delusions (like Garety et al (2013)[43]) and different disorders (like Hutton et al (2013),[44] they are very new and quite sparse.
Issues on the differentiation of delusion, overvalued idea and obsessions

Bürgy (2007)[45] showed that there is no definitive connection between obsession and delusion in the strict sense. The suggestion that obsessions, overvalued ideas and delusions lie in a continuum and that although obsessions and delusions can be defined exclusively, overvalued ideas are not quantitatively measurable [46] seems to be the most satisfactory. They need to be explained in different aspects dimensionally. Table 1 shows the conceptual comparison between delusion, overvalued idea and obsessions.

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Are delusions different in disorders different?

Delusions existing simultaneously with schizophrenia will be different from ones existing along with the delusional syndrome or paraphrenia or affective disorders. A primary pathological process (paranoia, schizophrenia or affective disorder) determines the structure of a delusional syndrome.[47]
Delusions of delusional disorder are logically coherent; nevertheless they are based on false, mistaken premises. They tend to form a solid, coherent delusional system.[47]

Whereas, delusions in schizophrenia are organized in a paralogical manner; delusional themes are disconnected from reality, no firm delusional system, they are bizarre, their influence on behavior is inconstant; and the intensity of a delusional belief varies.[47]

Delusions in an affective disorder or a schizoaffective disorder are short lasting, ill organized with frequent variations in the intensity that are brought about by the change in the affective tone and they are rarely bizarre.[48]

Two studies done at our Institute found that conviction and the pattern of resolution of delusions across schizophrenia and mania patients is dissimilar.[49-50]

Difference between organic and functional (schizophrenia) delusions

Question arises “are delusions caused by various organic factors different from those seen in schizophrenia or delusional disorder”? Cornelius et al. (1991)[51] found that while patients with organic delusions present with more symptoms of acquired intellectual impairment, impaired sensorium and, hallucinations of smell, taste, or touch, schizophrenia patients demonstrated more affective flattening and thought disorganization.

Methods for diagnosing delusions

The diagnostic criteria for delusions are criticized for being conceptually confusing and subject to significant counter-examples.[52] Various methods used to diagnose delusions are:

1. Structured interview
2. Vignette assessment
3. Scales for assessing psychosis- Scale for the Assessment of Positive Symptoms (SAPS)[53]; Comprehensive Assessment of Symptoms and History (CASH)[54]; Positive and Negative.

Which method is the best?

In their review, Bell et al. (2006b)[57] suggested that the diagnosis of delusions using structured interview can be made with an acceptable level of inter-rater reliability (0.61- 0.80). Additionally, they recommend use of standardized scales SAPS and PANSS specifically have been recommended.

Scales for assessing dimensions of delusion

Several rating scales have been developed with the aim to measure individual dimensions of delusions

1. Characteristic of Delusional Experience scale (CDRS)[14]
2. Dimensions of Delusional Experience (DDE)[13]
3. Maudsley Assessment of Delusions Schedule[58]
4. Belief Rating Scale (BRS)[59]
5. Brown Assessment of Beliefs Scale (BABS)[60]
6. Peters et al. Delusions Inventory (PDI)[16]
7. MacArthur-Maudsley Delusions Assessment
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**Issues in the assessment of Delusions**

Assessment aspect of delusions has received little attention compared to the theoretical understanding of delusions that includes phenomenology and study of underlying processes.

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A reliable diagnostic method is demonstrated. With criticism that reliability of bizarreness so far actually was considered only in terms of the content but not other dimensions of delusion, Cermolacce et al. (2010)[66] too suggested that with the current knowledge bizarre delusion should not be considered as a criteria. In DSM V the special attribution to bizarre delusion for diagnosis of schizophrenia has been removed.

Can delusions be self-assessed?

Although accepted for use in the general population, self-report scales or self-ratings of positive symptoms have been considered unreliable due to neurocognitive disturbances and lack of insight. Although any scale that assesses delusions can be used for self-assessment, there are certain specific scales used for this purpose like the computerized self-assessment of psychosis severity questionnaire (COSAPSQ).[67]

Issues with treatment of delusions

Intensity or severity of delusions determines the subsequent general psychopathology scores and the global functioning.[68] And delusions take significantly longer time to respond when compared to other psychotic symptoms like hallucinations and duration of untreated psychosis is the only predictor of this response time.[69] Hence early treatment of delusions is very important for the prognosis of the disorder.
The psychology-biology exchange

As delusions have both psychological and biological underpinnings, psychotherapies like cognitive behavioral therapy more specifically reasoning training and pharmacological agents like antipsychotics are used in their treatment.

Antipsychotics-psychology

So et al. (2010)[70] in a systematic review of 17 longitudinal and cross-sectional studies found that antipsychotic treatment leads to an improvement in belief flexibility and theory of mind. Additionally 'belief flexibility' was suggested to be a mediator for the treatment response. However, 'jumping to conclusions' was resistant to antipsychotic treatment.

Psychotherapy-biology

Although studies investigating the effect of psychotherapies on biological systems are sparse with respect to psychosis (more specifically delusions), cognitive behavioral therapy is known to modulate functioning of various neuro-anatomical structures like prefrontal cortex and various limbic structures.[71] These areas have been implicated in the biology of delusion (see the section on issues with theories of delusion).

Which is more effective- antipsychotic treatment or cognitive behavioral strategies?

Antipsychotic medications, by reducing dopamine levels, create a state of 'detachment' from delusions i.e. (reduced preoccupation) but do not eradicate symptoms. Antipsychotic medication does not affect the narrative delusional explanations of the psychotic experiences or past delusions.[72] However recently, Ross et al. (2011)[73] found that 'jumping to conclusions' significantly reduced in patients with delusions after a brief reasoning training. Significant improvements were also found in belief flexibility. But for this training to be undertaken patients have to be stabilized i.e. detached from experiences and active preoccupation of delusions; this requires antipsychotic treatment. Most studies on psychological techniques for treatment of delusions included patients who were on antipsychotic treatment at baseline.[70] These evidences suggest both psychological and pharmacotherapeutic interventions are required for treating delusions; no one specific treatment is shown to be completely effective.

Issues with 'culture and delusions'

When we consider various dimensions of delusions, culture has the highest influence on the content of delusions. Content of delusions are considered to be selected in accordance with the preferred channels of relatedness in a particular culture rather than being determined by universal biological factors.[74]

Culture increases the heterogeneity in diagnosing delusions!

Beliefs presented by one person may be diagnosed as delusion, whereas the similar pattern of beliefs presented by another person in a different cultural setting may not be termed as delusion. This further increases the heterogeneity in diagnosing delusions. In this context there arises an issue whether or not a delusion was determined properly or not (symptom under-determination) and whether it is just relative to cultural differences (symptom relativism).[75] This specific influence of culture on diagnosing culture has been defended from the fact that beliefs are physiologically irreducible.[75] Another defense can be that there can be differences in accepting one another's cultural beliefs. However, one has to be known about beliefs in other cultures as well for a better management of delusions; socio cultural considerations when ignored might lead to a
misdiagnosis of delusion and might result in poor management.[76]

Boundaries of cultural beliefs

Another problem is that beliefs are not under a particular boundary of a particular culture, rather any person can believe in any other culture's perspective. Some authors have present a discussion in this context that when there is folie a deu or familie then there can also be a diagnosis of folie a trente.[75] Similarly can there be folie culture bound syndrome when one starts believing in any other culture's irrational belief.

Conclusions

To conclude we would like to emphasize on issues or raise new issues that require further investigation.

- Firstly, there is a need to identify principal factors for the numerous dimensions mentioned in the literature. This would help in constructing a meaningful and comprehensive definition of delusion.
- Future work also needs to emphasize the issue of primary delusions. Owing to resurgence of psychodynamic school of thought in various psychiatric conditions, we expect a similar revival of theories describing delusions based on psychodynamics.
- Consistency of delusions may be compared across various groups of psychosis like schizophrenia, mania, depression, schizoaffective disorder etc.
- Although cognitive neuroscience has contributed enormously to the understanding of delusions, relatively no work has been conducted on event related potential paradigms.
- Our neurology counterparts should work to tease out the subtle differences in the neuronal activity that underlie various psychotic symptoms rather than recommending delusions and hallucinations are essentially the same'.
- Dimensional approach to delusions might generate answers on the various problems posed by cultural heterogeneities on an individual's belief system.

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