Childhood Trauma, Psychosis and Neurofeedback

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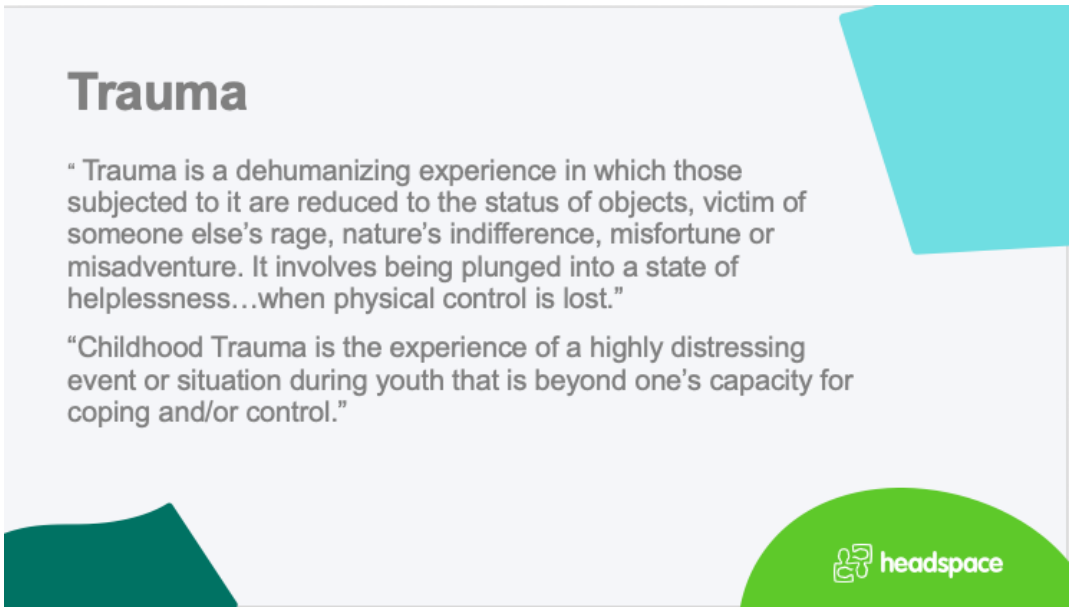
Headspace-Early Psychosis

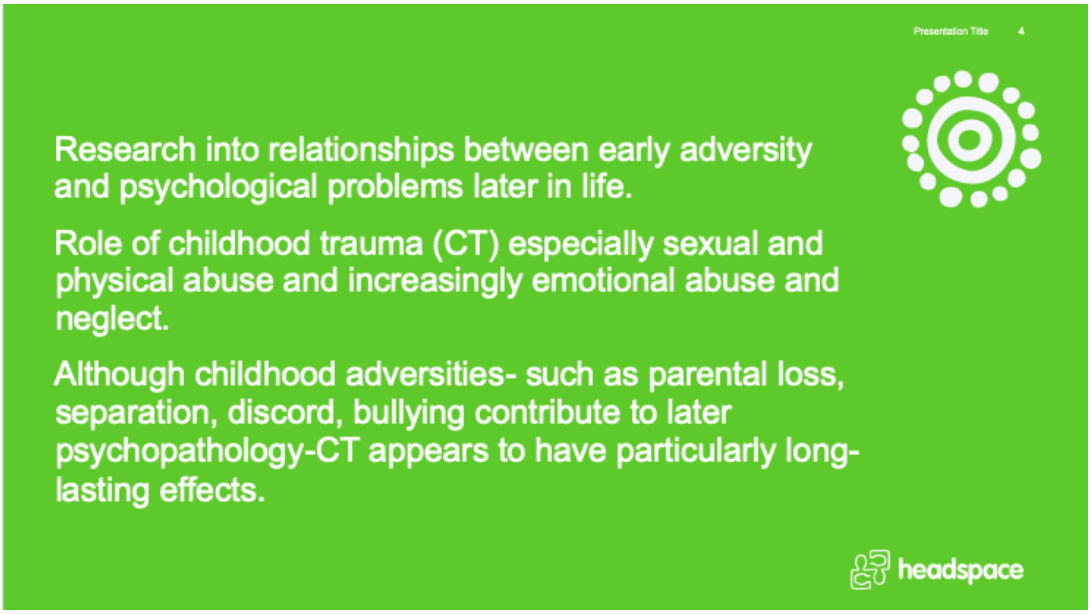


Trauma has been defined as a "Dehumanizing experience in which those subjected to it are reduced to the status of objects, victim of someone else's rage, nature's indifference, misfortune or misadventure. It involves being plunged into a state of helplessness…when physical control is lost."

Similarly, Childhood Trauma has been defined as "An experience of a highly distressing event or situation during youth that is beyond one's capacity for coping and/or control."

During medical school and later as psychiatrist I read a great deal about how trauma and stress can modulate human autonomic responses both in short term in the form of overarousal and long-term as affective and anxiety disorders. I also learnt how gene-environment interactions were responsible for development of chronic psychotic disorders such as schizophrenia. But this presentation I will talk about recent of the role of childhood trauma (or developmental trauma) in development of early psychosis and conversion to schizophrenia.

I. Childhood Trauma and Psychosis Research



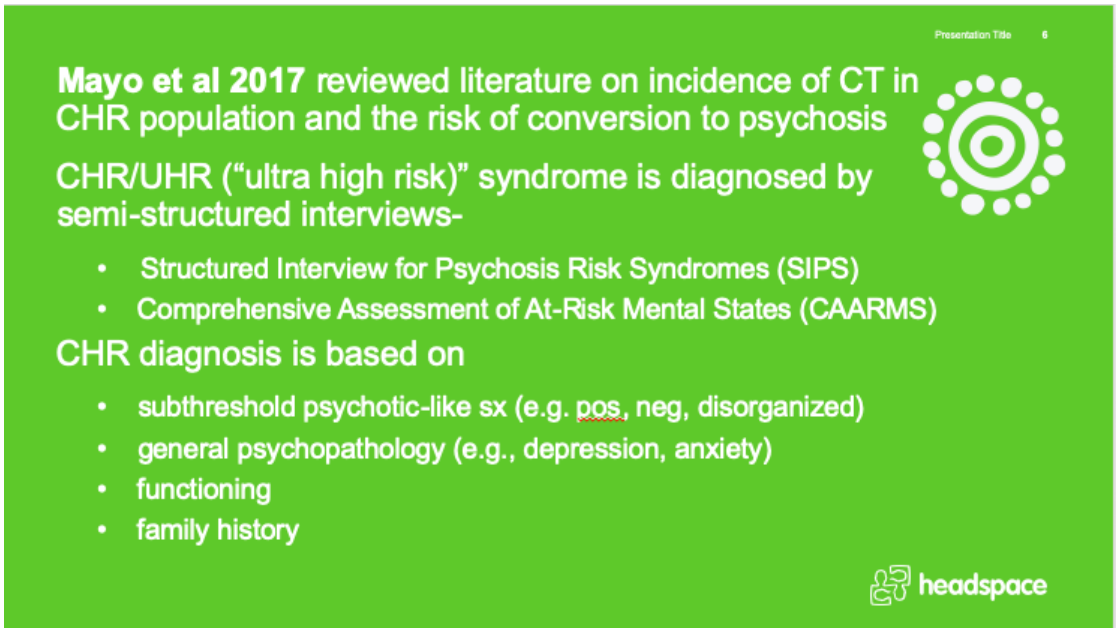
A large body of research has indeed improved our understanding of the relationships between early adversity and psychological problems later in life.

Crucial to this research has been the role of childhood trauma (CT), especially sexual and physical abuse, and, increasingly emotional abuse and neglect.

Although a variety of other forms of childhood adversity such as parental loss, separation/discord, and bullying may contribute to later psychopathology, childhood trauma appears to have particularly powerful and long-lasting effects.

Childhood trauma has been associated with the development of majority of psychiatric disorders including mood and anxiety disorders, eating disorders, personality disorders, dissociative disorders, and substance dependence.

Until recently, researchers were predominantly focussed on the relationship of childhood trauma with nonpsychotic disorders, but lately the role of CT in development of psychotic disorders have come to forefront. There have been some concerns regarding reliability of psychotic patients' accounts of being traumatized. However, recent research has repeatedly established that their trauma histories are resalable. Moreover, preliminary studies have also shown that trauma-related interventions are effective in this group.



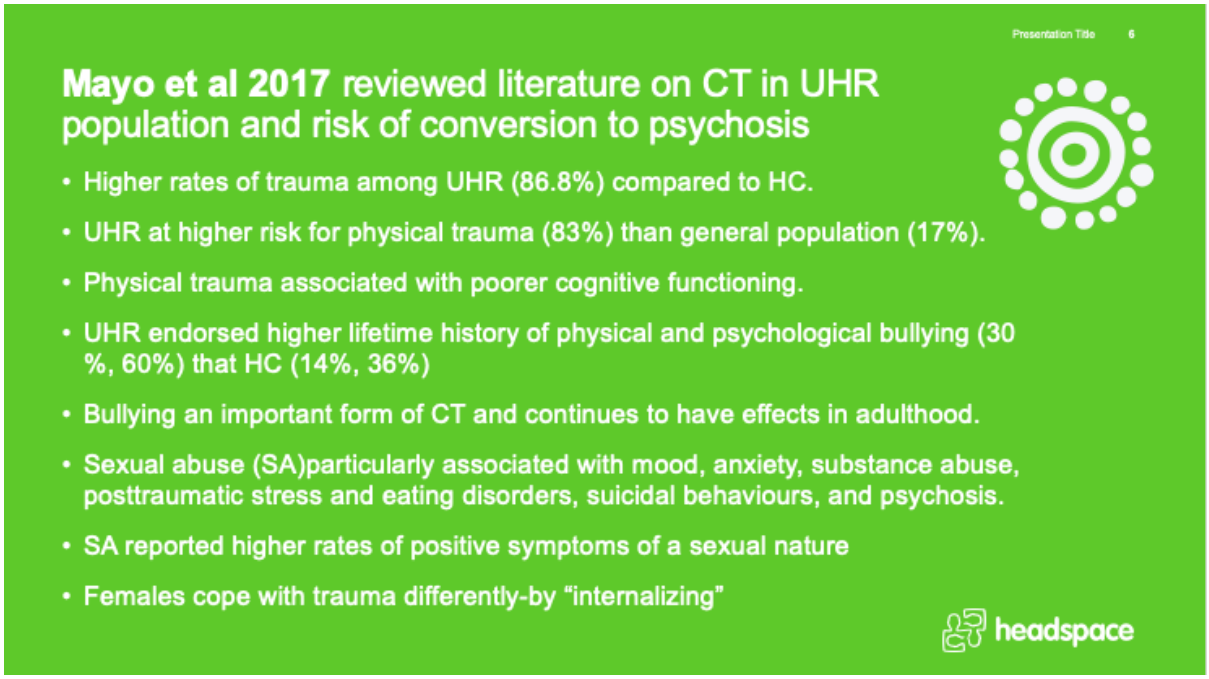
In a fairly recent review, **Mayo et al 2017** studied incidence of CT in CHR population and the risk of conversion to psychosis.

The Clinical high-risk syndrome (or CHR syndrome), also called "ultra-high risk" by other research groups, is typically diagnosed using one of two semi- structured interviews—the Structured Interview for Psychosis Risk Syndromes (SIPS) or the Comprehensive Assessment of At-Risk Mental States (CAARMS)

The diagnosis is based on a variety of subthreshold psychotic-like experiences (i.e., positive, negative, and disorganized symptoms), general psychopathology (e.g., depression, anxiety), functioning, and family history.

Such alarmingly high rates of CT endorsed by the CHR population is comparable to the prevalence rate among individuals with schizophrenia (85%)

This review included 24 studies, representing 14 distinct samples, which report on CT in CHR populations; of these, 11 followed the participants longitudinally to examine CT as a risk factor for developing psychosis. Of these 2 studies were from Australia from Personal Assessment and Clinical Evaluation (PACE) clinic in Melbourne.



Summary of this review was:

- There are higher rates of trauma among CHR individuals (86.8%) compared to HC
- CHR individuals may be at greater risk for physical trauma (83%) than the general population (17%). Physical trauma is also associated with poorer cognitive functioning
- CHR youth endorsed a lifetime history of physical and psychological bullying (30 and 60%, respectively) that was much higher than HC (14 and 36%, respectively)
- They found that Bullying victimization is becoming increasingly recognized as an important form of adverse childhood experience, effects of which may continue into adulthood.
- Individuals with a sexual abuse history are at higher risk for developing mood and anxiety disorders, substance abuse, posttraumatic stress disorder (PTSD), eating disorders, suicidal behaviours, and psychosis
- Individuals with sexual abuse history endorsed higher rates of positive symptoms of a sexual nature (e.g., feelings of being watched while bathing, hearing voices say sexual statements)
- A study on gender differences showed that stress-sensitivity scores among CHR females (but not males) mediated the association between trauma and attenuated positive psychotic symptoms, which suggests that females cope with trauma differently and tend to internalize their experiences

- Strong relationship between CT and severity of psychosis in the UHR population.
- Sexual abuse, followed by physical abuse, were most associated with conversion to psychosis.
- Trauma appears to predict conversion to psychosis, but not independently of other known risk factors such as more severe positive symptoms, cognition, and functioning.

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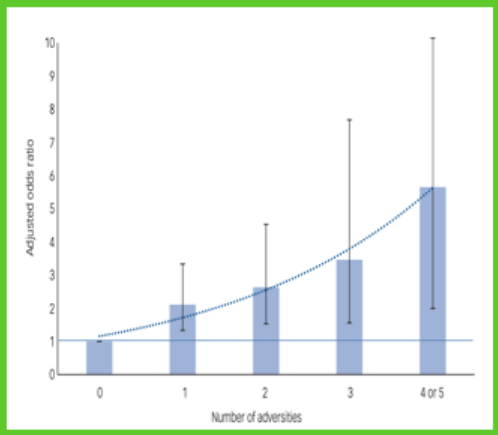
- And Finally, strong relationship between CT and severity of psychosis symptoms in the CHR population
- Role of SLEs in triggering transition to psychosis has not been clearly substantiated
- Sexual abuse is the most common form of CT associated with later psychosis conversion, followed by physical abuse. Moreover, emotional abuse and physical neglect have been identified as potential risk factors for psychosis conversion
- Trauma appears to predict conversion to psychosis, but may not function independently of other known risk factors such as more severe positive symptoms, cognition, and functioning

Morgan et. al. (2020) in a case (n=374) control (n=301) study [*"Childhood Adversity and Psychosis (CAPsy)"*]

- 2- to 4-fold increased odds of psychosis with childhood adversity
- Dose-dependent increase of odds with exposure to multiple adversities
- Bullying, sexual abuse strongly associated with psychosis if first occurrence in adolescence
- Period of "brain plasticity" when young people are acutely sensitive to peer issues



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In a more recent study in case (n=374)-control (n=301) study of FEP (first episode psychosis) by **Morgan et al 2020** ("Childhood Adversity and Psychosis (CAPsy)study"] established that all forms of childhood adversity were associated with around a two- to fourfold increased

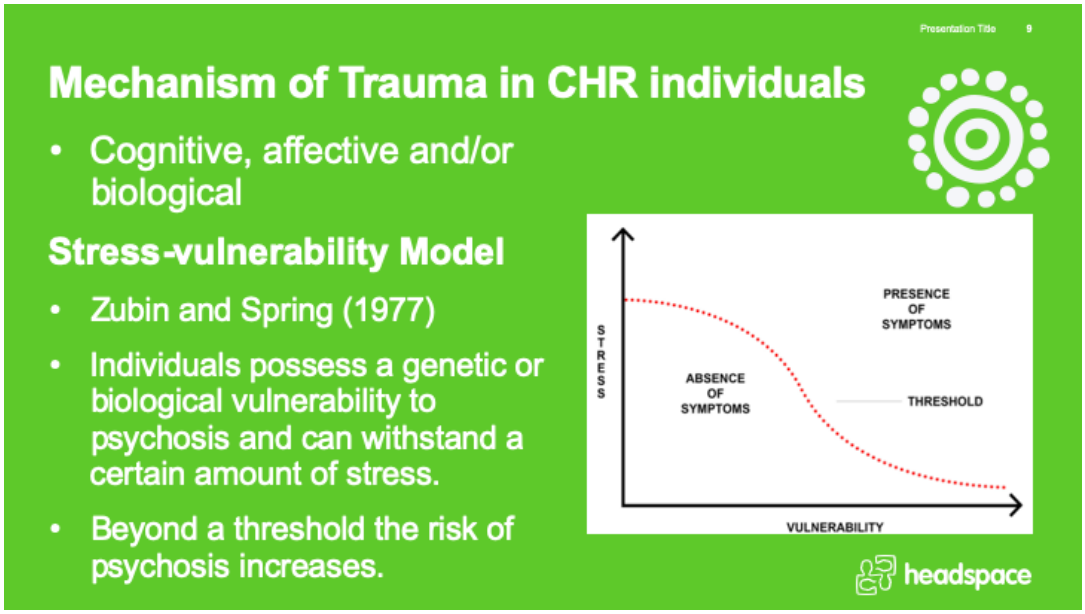
odds of psychotic disorder and that exposure to multiple adversities was associated with a linear increase in odds in a dose dependent manner.

This study involved 5 different types of early adversities i.e. House hold discord, Psychological abuse, Physical abuse, Sexual abuse, Bullying- all of which were associated with increased odds

They also found that the odds of psychotic disorder are greatest for those who reported-

(i) early adversity (i.e. age under 11 years),
(ii) frequent (i.e. at least weekly) and
(iii) severe (i.e. involving extreme threat, hostility, violence) exposure.

In addition, they found that some adversities (e. g. bullying, sexual abuse) were more strongly associated with psychotic disorder if first occurrence was in adolescence considering considerable brain plasticity when young people are acutely sensitive to peer influence and comparison, leading to especially strong effects.

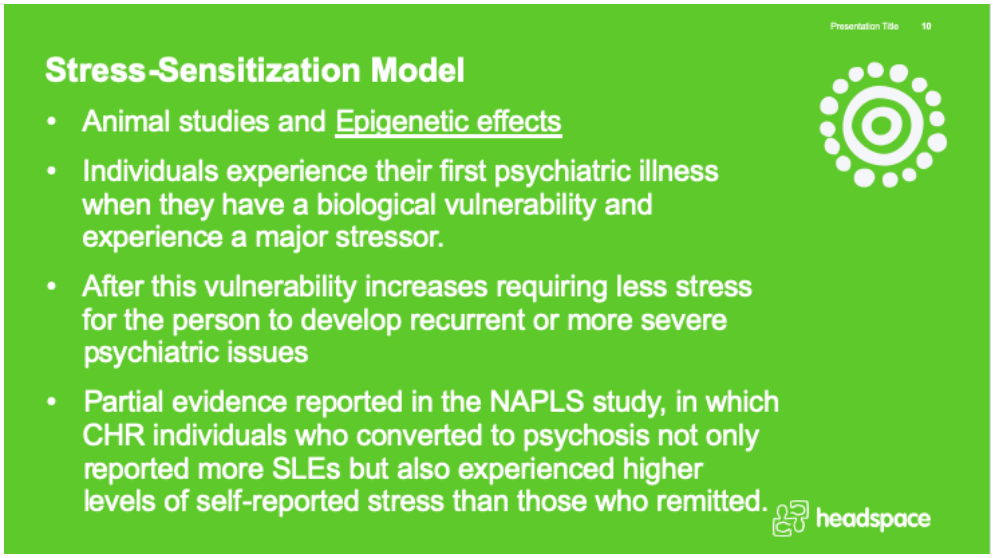


Mechanism of Trauma and stress in CHR population

Various mechanisms are involved in CHR population that lead to later psychosis which can be divided into cognitive, affective and/or biological.

Stress-vulnerability Model

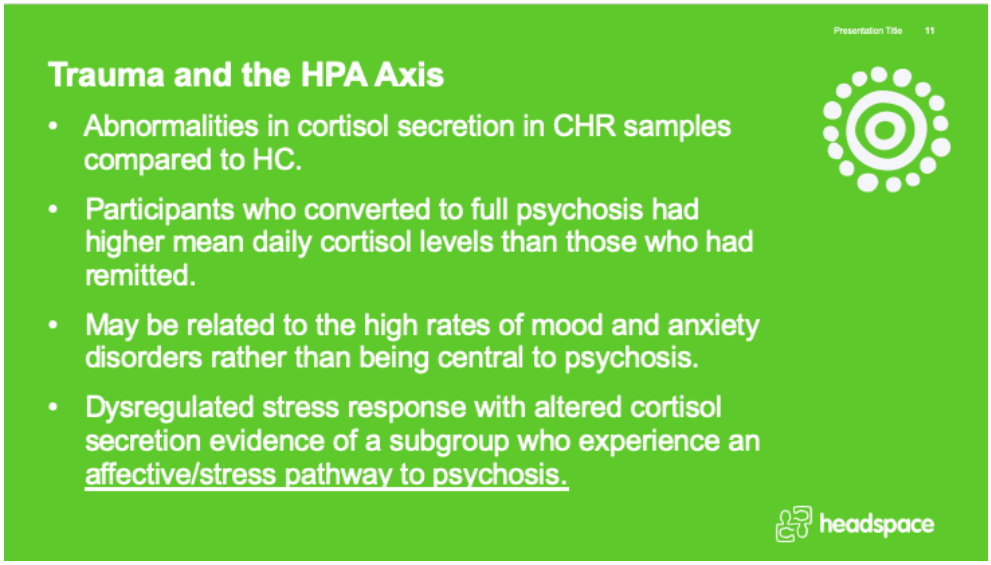
This is one of the most well-known models was put forth by Zubin and Spring. This model posits that individuals possess a genetic or biological vulnerability to psychosis that can withstand a certain amount of stress due to genes and other biological risk factors. Be yond t threshold the risk of psychosis development increases.



Stress-Sensitization Model

This model comes from animal studies and may underlie the epigenetic effects of trauma.This theory hypothesizes that Individuals experience their first psychiatric illness when they have a biological vulnerability and experience a major stressor. After this vulnerability increases, requiring less stress for the person to develop recurrent or more severe psychiatric issues

Partial evidence of stress sensitization was reported from the NAPLS study, in which CHR individuals who converted to psychosis not only reported more SLEs but also experienced higher levels of self-reported stress than CHR participants whose symptoms remitted.

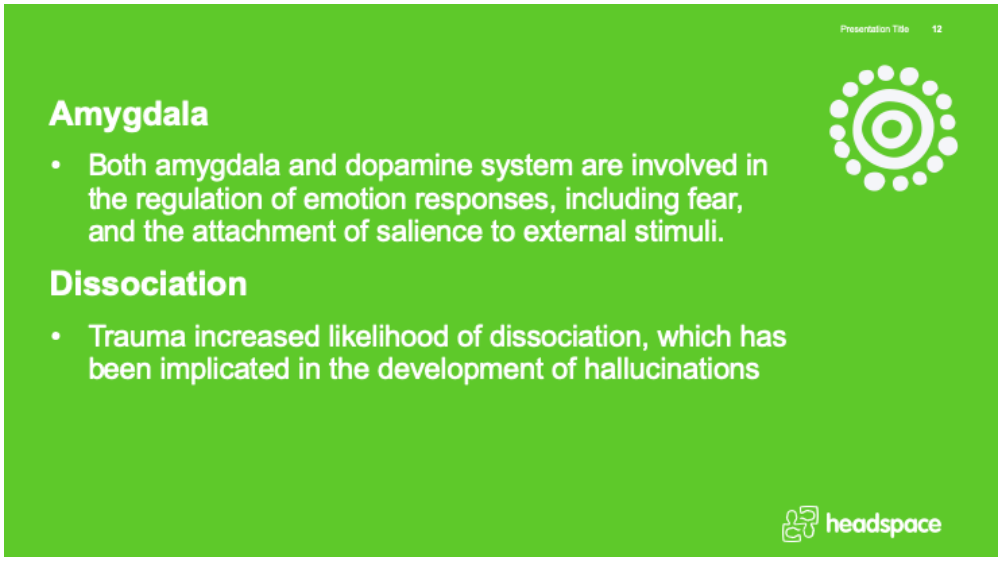


Trauma and the HPA Axis

Studies has demonstrated abnormalities in cortisol secretion in CHR samples compared to healthy controls.

Participants who converted to full psychosis in the CHR group had higher mean daily cortisol levels than those who remitted. This may be related to the high rates of mood and anxiety disorders in this group rather than be central to psychosis

A dysregulated stress response with altered cortisol secretion may be evidence of a subgroup of CHR individuals who experience an affective/stress pathway to psychosis.

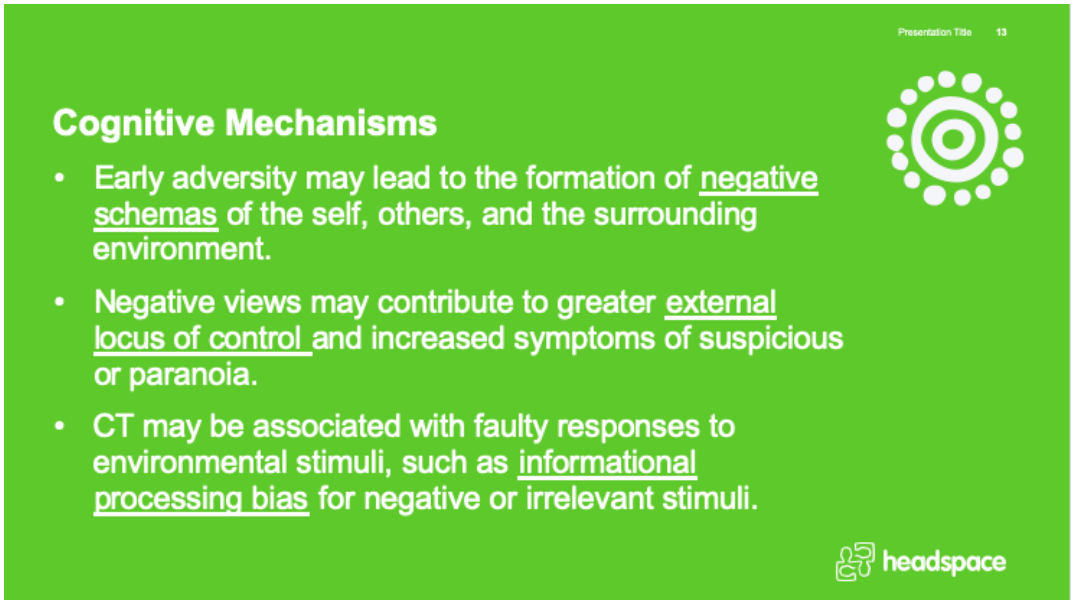


Amygdala

both the amygdala and dopamine system are involved in the regulation of emotion responses, including fear, and the attachment of salience to external stimuli.

Dissociation

Trauma increased the likelihood of dissociation, which has been implicated in the development of hallucinations



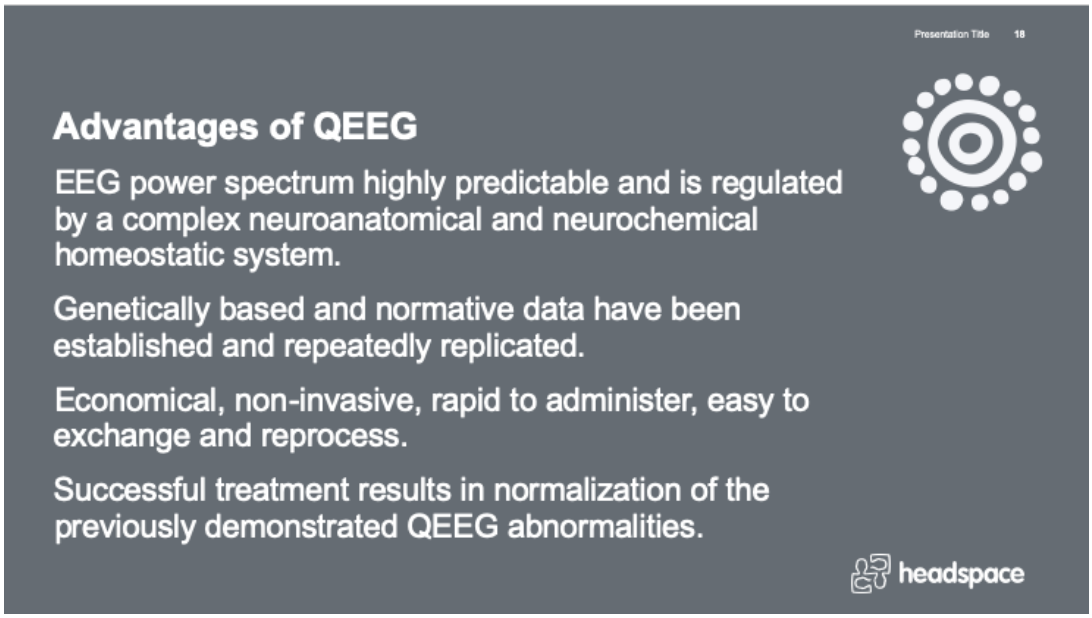
Cognitive Mechanisms

Early adversity may lead to the formation of negative schemas of the self, others, and the surrounding environment.

Such negative views may eventually contribute to greater external locus of control and increased symptoms of suspicious or paranoia.

CT may be associated with faulty responses to environmental stimuli, such as informational processing bias for negative or irrelevant stimuli.

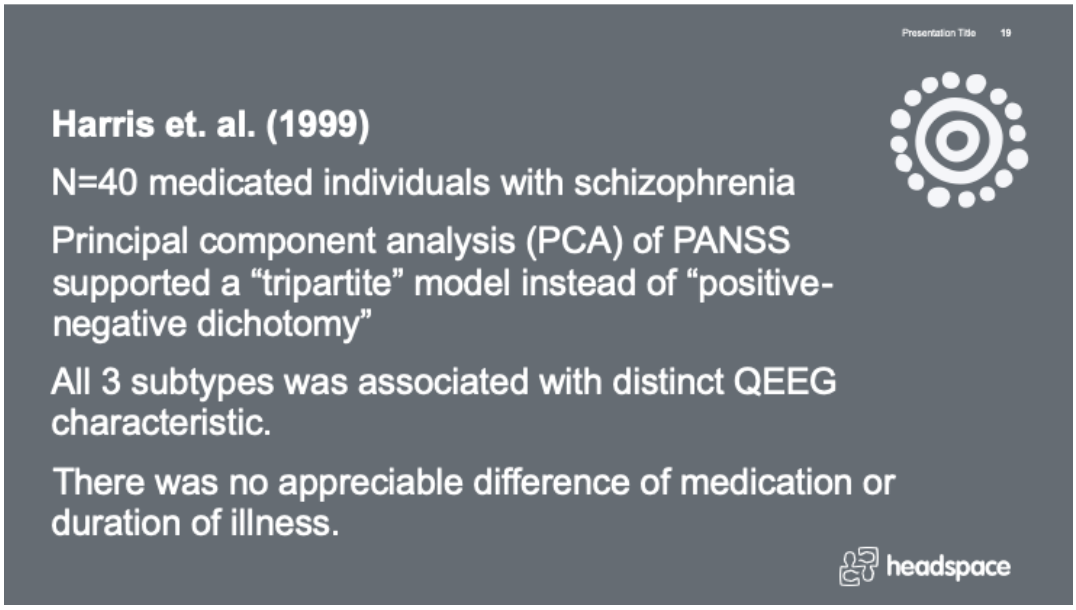
II. QEEG research in Psychosis



Advantages of QEEG

Power spectrum of the resting EEG of healthy, normally functioning individuals is highly predict- able and is regulated by a complex neuroanatomical and neurochemical homeostatic system. This system is genetically based and normative data across a wide age range have been established and repeatedly replicated in many countries

EEG procurement is economical, non-invasive, rapid to administer, easy to exchange and reprocess. A substantial body of evidence supports the proposition that successful treatment with psychiatric patients results in normalization of the previously demonstrated QEEG abnormalities.

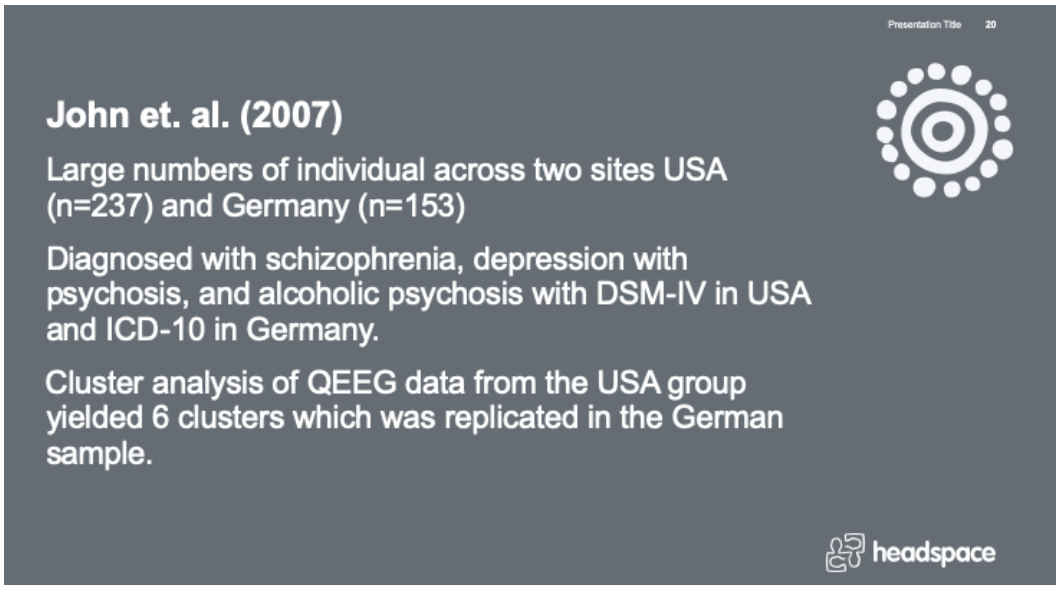


Harris et al 1999 studied 40 medicated individuals with Sz

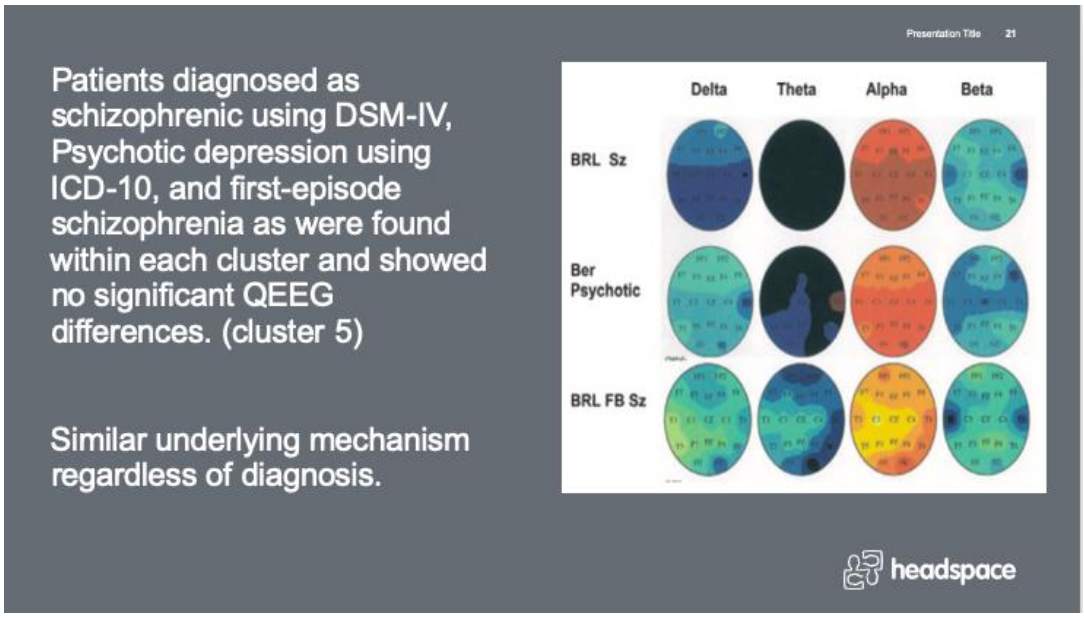
They performed principal component analysis of PANSS items which supported a “tripartite” model instead of then prevent “positive-negative dichotomy” in schizophrenia.

They also found they each subtype was associated with distinct QEEG characteristic.

In addition, there was no appreciable difference of medication or duration of illness on the significance of results.



John et al 2007 authored this study where they included a large number of individuals with schizophrenia, depression with psychosis, and alcoholic psychosis from two sites USA (clinical diagnosis was based on DSM-IV) and Germany (diagnosis based on ICD 10). Cluster analysis of QEEG from the USA group yielded 6 clusters which was replicated in the German sample.



Patients diagnosed as schizophrenia using DSM-IV criteria, psychotic depressive using CD-10 criteria, and first-episode patients were found within each cluster and showed no significant QEEG differences. The figure shows cluster 5 from their classification containing different diagnosis with very similar QEEG features.

This data suggests there are similar underlying electrophysiological mechanism might be present regardless of clinical diagnosis. One significant limitation of this study was that they did not find clinical correlation of symptoms with different QEEG profiles.

III. Neurofeedback research in Psychosis

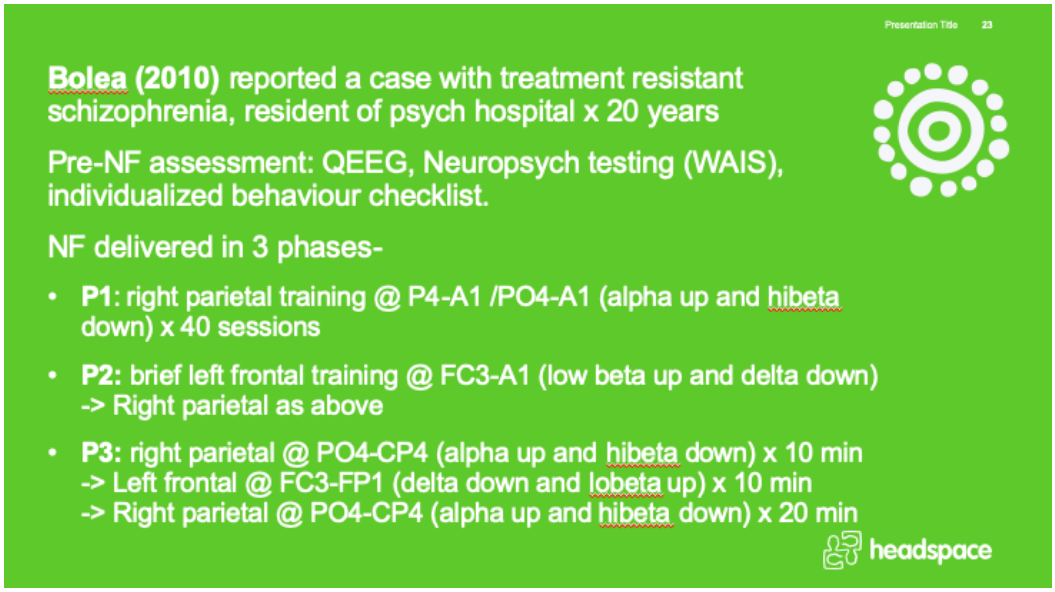


TABLE 1. Changes in cognitive, affective, and self-regulation of chronic schizophrenia treated with neurofeedback.

Behaviors	Pre-Treatment Weekly Occurances	Post-Treatment Weekly Occurances*	Direction of Change
1. Violent outbursts	3	O	+
2. Physical altercations	4	0	+
3. In restraint room	4	0	+
4. Repetitive demands	more than 100	2	+
5. Loud screaming Screams, howling	10	1	+
6. Self grooming	0	5	+
7. Bilateral hand tremor	constant	1	+
8. Positive statements about self and others	0	3	+
9. Conversational language	0	2	+
10. Helping someone else	0	2	+

Positive changes noted in behavioral self-regulation, cognitive, and affective changes but also by being able to resume living within the community.

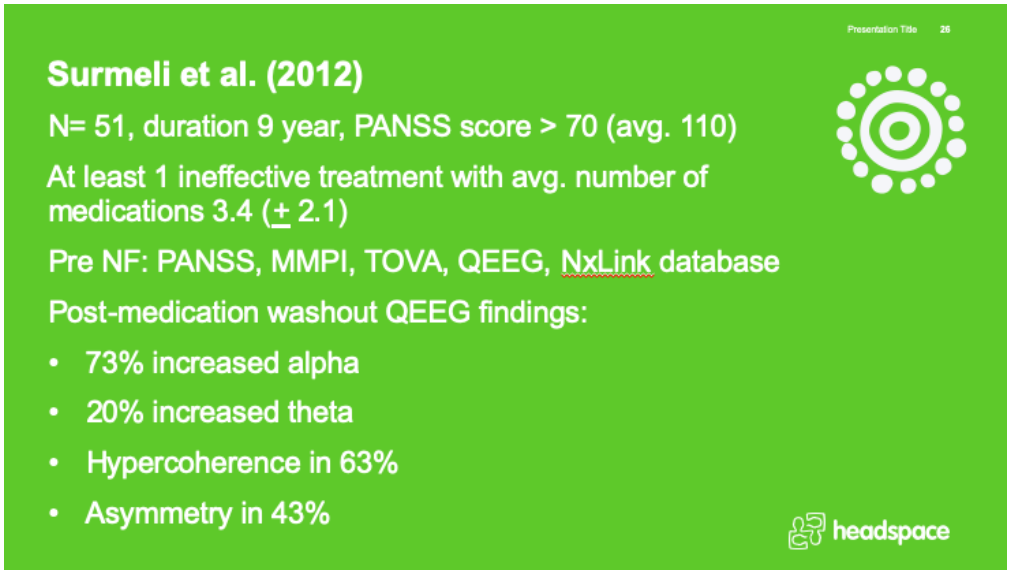
A 2-year follow-up documented continued satisfactory adjustment with stabilization on less than half the number and dosage of medication in comparison with the onset of treatment.

TABLE 2. First-time positive behavior was observed during neurofeedback treatment of chronic schizophrenia.*

Behavior Observed	Number of Sessions Required
1. Acceptable Sensor Hook up	5
2. Gentle eye contact	15
3. Gentle (non-demanding) request	20
4. Show of gratitude, "thank you"	50
5. Tried to suppress curse outburst	67
6. Held back compulsive repetitions	72
7. Hand steadiness (loss of tremor)	80
8. Discharge to Community Living	130

The above table shows how many sessions it took for the "first time" behaviours to emerge.

Similar outcomes in 70 other chronic inpatients with most of the being transitioned into community living.



Surmeli et al. (2012) conducted a NF study on 51 individuals with clinical diagnosis of schizophrenia

Average duration was 9 year, all had PANSS score > 70 with mean of 110

All had at least 1 ineffective treatment with avg. number of medications 3.4 (± 2.1)

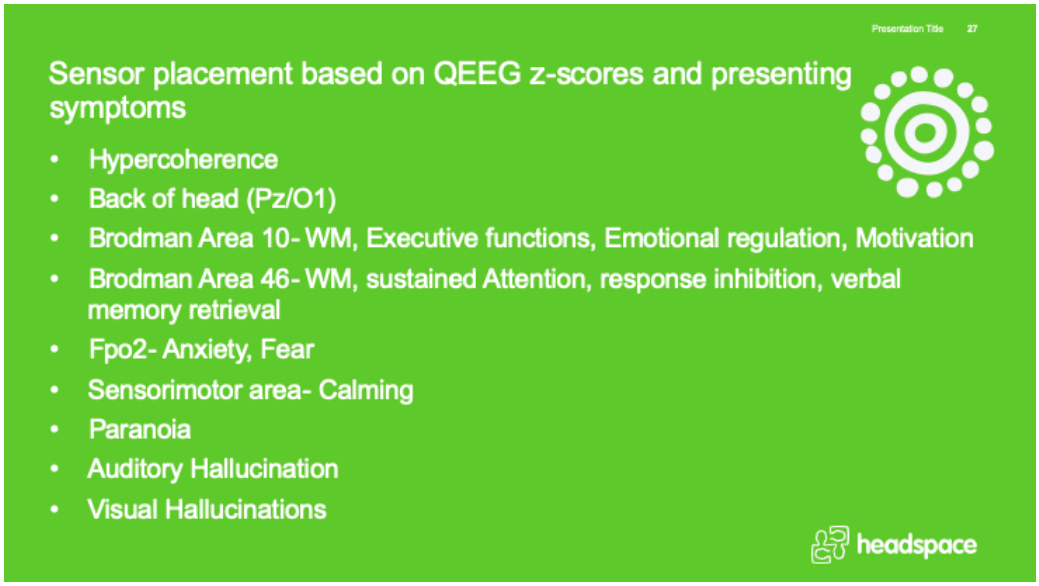
Pre NF-assessment included PANSS, MMPI, TOVA, QEEG, NxLink database

Medication washedout done prior to QEEG.

Most salient QEEG findings were

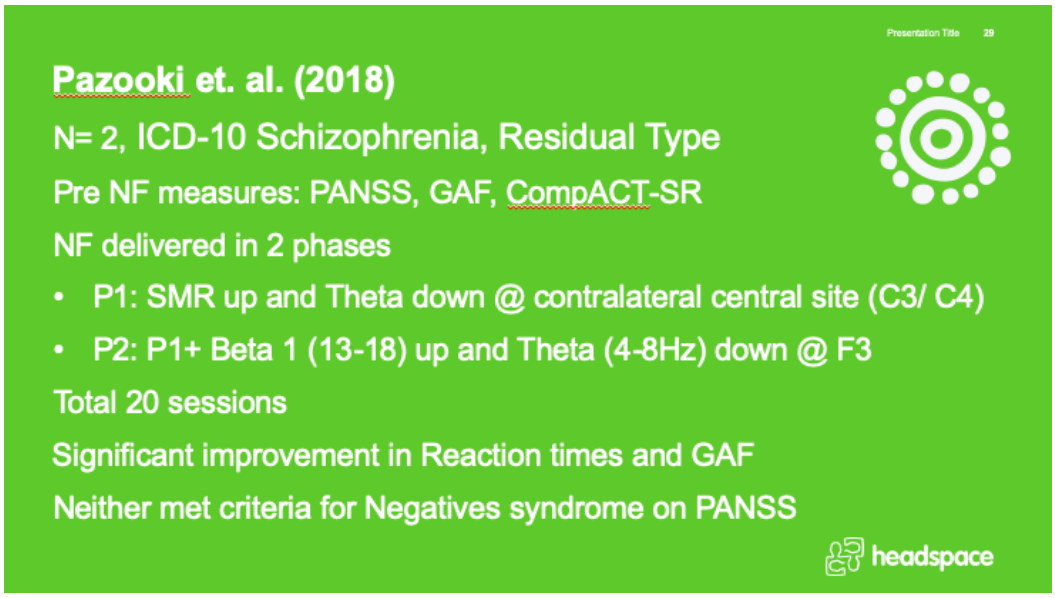
- 73% showed increased alpha
- 20% increased theta
- Hypercoherence was seen in 63%

- Asymmetry in 43%



Results of this study were

- 48 out of 51 completed the program
- mean number of sessions was 58
- Mean PANSS scores reduction was 82%
- 47 showed “response” based on >20% reduction on PANSS
- Overall compliance high (”68”)
- Trend towards “Normalization” of all MMPI scores
- NxLink database showed that 19 no longer classified as schizophrenia "electro physiologically" although "clinical" diagnosis remained
- 27 remained medication free and an additional 14 required a single agent



Pazooki et. al. (2018)

Treated two individuals diagnosed with negative symptoms schizophrenia.

Pre NF measures were PANSS, GAF, CompACT-SR (reaction time, alert- ness and selective attention under Go/no-go conditions)

Total 20 sessions were done and significant improvement were noted in reaction times and GAF. Finally, neither of the two met criteria for Negatives syndrome on PANSS

Benefits of NF

Effects of medication is not consistent. Newer antipsychotics may be helpful in reliving negative symptoms but perhaps not in reliving mood and cognitive symptoms. That is perhaps the reason why polypharmacy is very common in this population so are side effects of multiple medications including sedation.

The ability to self-regulate neural activity through neurofeedback has been found to have potential cognitive/affective effects, including improving working memory, intelligence, and identification of emotional prosody.

Meta-analyses have shown efficacy in ADHD and Epilepsy and it has been suggested that modulation of neural networks associated with underlying defects is “stable” yielding longer lasting results.

Emerging evidence for efficacy is seen in OCD and autism among other conditions.

Our project aims to utilize NF, which has shown good promise in treatment of both trauma-based conditions (such as PTSD) and individuals with established psychosis. We hope this will augment our armamentarium of trauma-based treatment that we currently provide to individual with high risk of psychosis and FEP.

Other speakers in this webinar will focus specifically on evidence of efficacy of NF in PTSD and the outline or our pilot project, respectively.

I thank Headspace, Early Psychosis and specifically Dr Roger Gurr who gave me an opportunity to be a part of this project.

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