

State of the Art and Clinical Applications of Network Psychometrics

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Overview

- ❑ Network Psychometrics: Brief Overview
- ❑ Clinical Applications
 - ❑ Psychotic Disorders
 - ❑ Towards Incorporating Environmental and Genetic Risk Scores into Network Models
- ❑ Future outlook

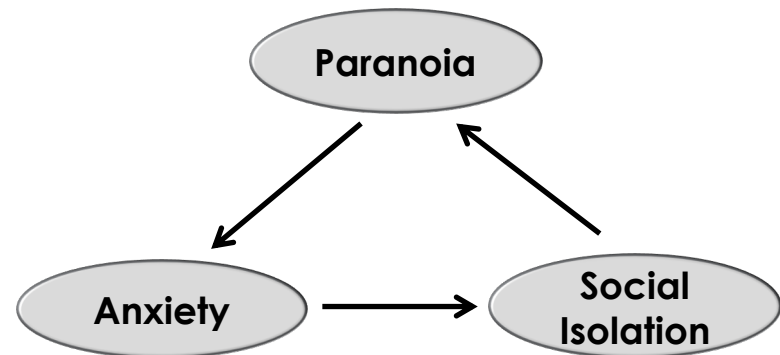
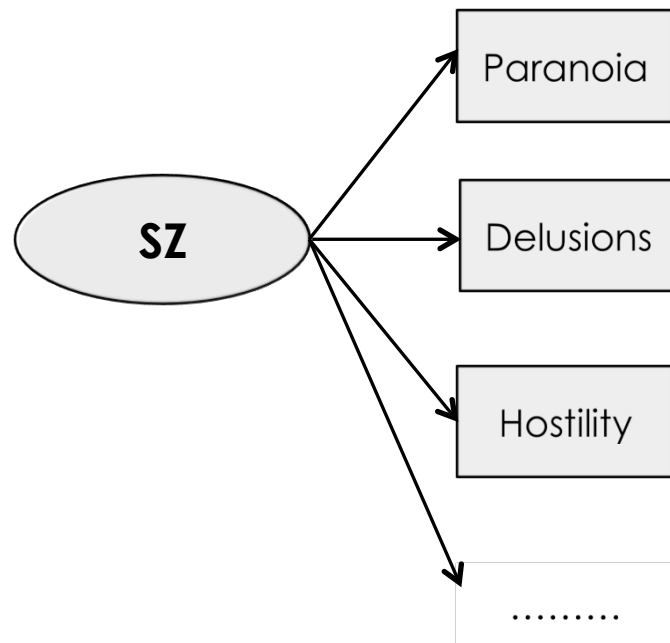
Overview

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Psychology as a Complex System

- ❑ Psychological processes are increasingly understood as complex dynamical systems of interacting components
 - ❑ Psychological
 - ❑ Biological
 - ❑ Sociological
 - ❑ ...
- ❑ Recent literature (~10 years) started embracing this complexity

The Network Perspective of Psycho(patho)logy



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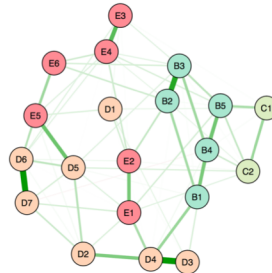
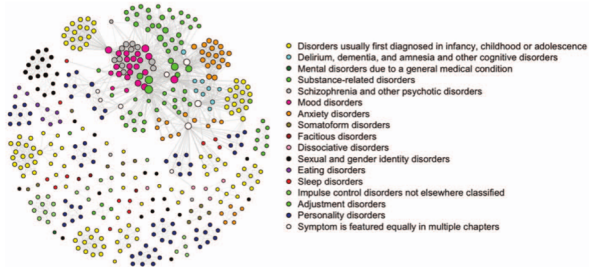
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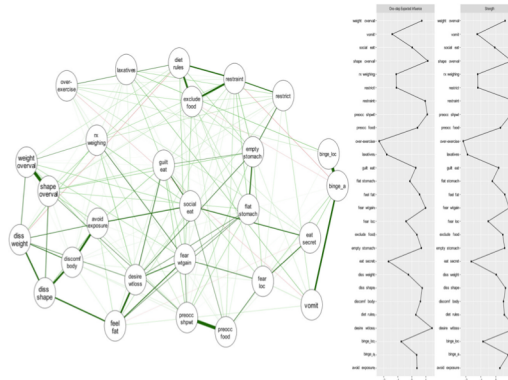
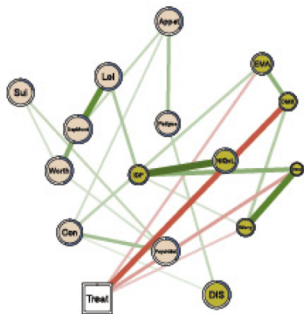
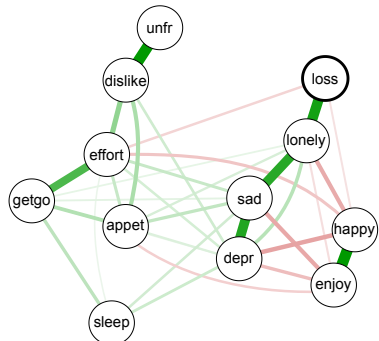
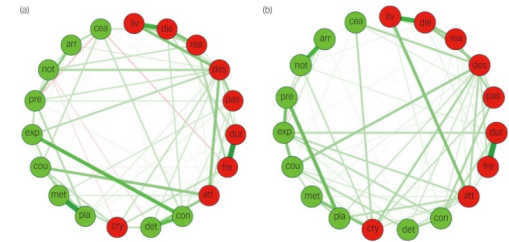
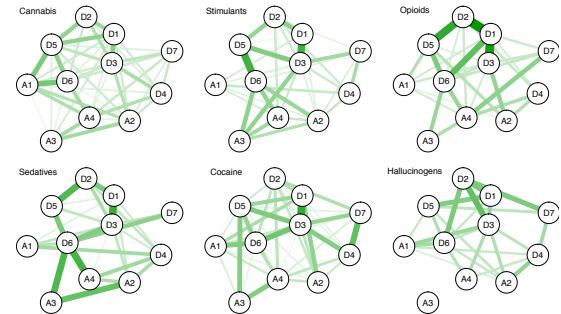
Clinical Applications



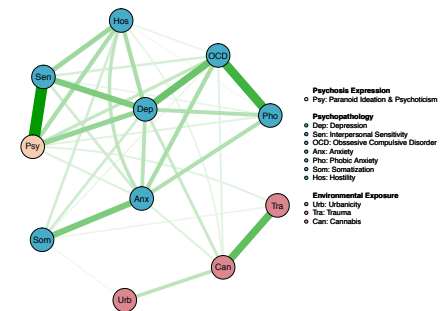
B1 - Intrusive thoughts
 B2 - Nightmares
 B3 - Flashbacks
 B4 - Emotional cue reactivity
 B5 - Physiological cue reactivity
 C1 - Avoidance of thoughts
 C2 - Avoidance of reminders
 D1 - Trauma-related amnesia
 D2 - Negative beliefs
 D3 - Blame of self or others
 D4 - Negative trauma-related emotions
 D5 - Loss of interest
 D6 - Detachment
 D7 - Restricted affect
 E1 - Irritability/anger
 E2 - Self-destructive/reckless behavior
 E3 - Hypervigilance
 E4 - Exaggerated startle response
 E5 - Difficulty concentrating
 E6 - Sleep disturbance

Main nodes
 con: societal contribution
 hap: happy
 phy: no. of physical problems
 soc: no. of social contacts
 socs: satisfaction about social contacts
 socs: successful

Other nodes
 advt: satisfaction about given advice
 age: age
 agt1: age of diagnosis
 car1: no. of care indications
 car2: satisfaction about received care
 cha: no. of strong characteristics
 com: no. of co-occurring diagnoses
 dly: level of daily activity
 dylt: no. of work hours
 edu: number of unfinished education
 fam: no. family members with ASD
 gen: (1) male (2) female
 IQ: IQ
 inf: blind out by (1) other (2) self
 int: no. of interests
 ite: (1) supported (2) unsupported living
 med: no. of medication one has used
 med1: open about diagnosis
 tra: no. of pre-diagnosis transition periods
 tre: no. of treatments one has had
 tre5: satisfaction about received treatment



(a) Interrelations Environmental Exposure & Symptomatology



Clinical Applications

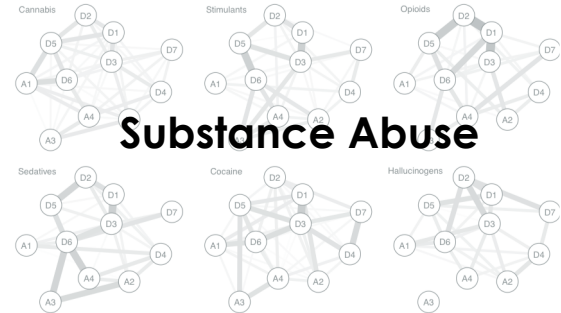
Comorbidity

- Disorders usually first diagnosed in infancy, childhood or adolescence
- Delirium, dementia, and amnesia and other cognitive disorders
- Mental disorders due to a general medical condition
- Substance-related disorders
- Schizophrenia and other psychotic disorders
- Mood disorders
- Anxiety disorders
- Sexual and gender identity disorders
- Eating disorders
- Sleep disorders
- Impulse control disorders not elsewhere classified
- Adjustment disorders
- Personality disorders
- Symptom is featured equally in multiple chapters

PTSD

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- B3 - Flashbacks
- B4 - Emotional cue reactivity
- B5 - Physiological cue reactivity
- C1 - Avoidance of thoughts
- C2 - Avoidance of reminders
- D1 - Trauma-related amnesia
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- E4 - Exaggerated startle response
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- E6 - Sleep disturbance

Substance Abuse

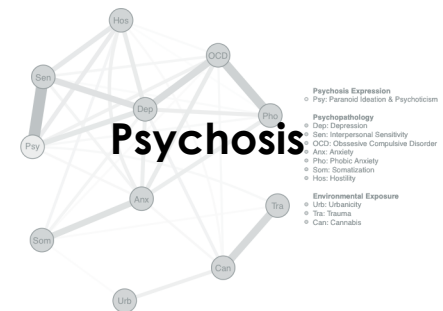


Suicidal Behavior



(a) Interrelations Environmental Exposure & Symptomatology

Psychosis

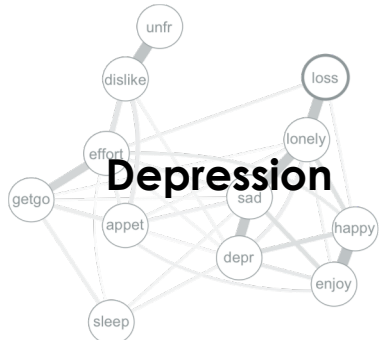


- Psychosis Expression
 - Psy: Personal Illusion & Psychoticism
- Psychopathology
 - Dep: Depression
 - Sens: Interpersonal Sensitivity
 - OCD: Obsessive Compulsive Disorder
 - Anx: Anxiety
 - Pho: Phobic Anxiety
 - Som: Somatization
 - Host: Hostility
- Environmental Exposure
 - Urb: Urbanicity
 - Tra: Trauma
 - Can: Cannabis

Eating Disorders



Depression



Insomnia



Clinical Applications

Comorbidity

- Disorders usually first diagnosed in infancy, childhood or adolescence
- Delirium, dementia, and amnesia and other cognitive disorders
- Mental disorders due to a general medical condition
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PTSD

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Autism

- Main nodes
- con: social contribution
 - hap: happy
 - phy: no. of physical problems
 - soc: no. of social contacts
 - soci: satisfaction about social contacts
 - socw: successful
- Other nodes
- advr: satisfaction about given advice
 - age: age
 - age1: age of diagnosis
 - car1: no. of care indications
 - car2: satisfaction about received care
 - cha: no. of strong characteristics
 - com: no. of co-occurring diagnoses
 - dat: level of daily activities
 - dyfr1: no. of drugs taken
 - edu: number of educational education
 - edu1: family members with ADHD
 - gen: (1) male (2) female
 - inf: blood test by (1) other (2) self
 - int: no. of interests
 - is: (1) reported (2) unreported living
 - med: no. of medication one has used
 - med1: open about diagnosis
 - no: no. of performance transition periods
 - no1: no. of treatments one has had
 - no2: satisfaction about received treatment

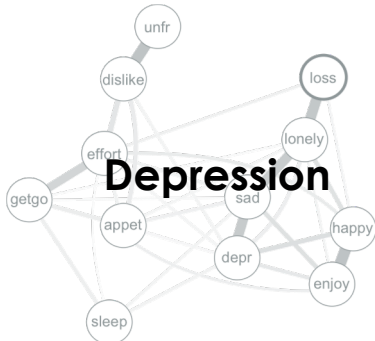
Substance Abuse



Suicidal Behavior



Depression



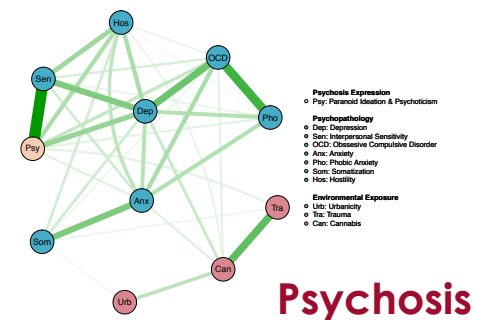
Insomnia



Eating Disorders



(a) Interrelations Environmental Exposure & Symptomatology



Psychosis

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Psychosis

- ❑ Disorders within the psychosis spectrum are highly heterogeneous and multifactorial
- ❑ Causes and pathogenesis of psychosis are still unclear
- ❑ No genetic marker has been consistently linked to developing a psychotic disorder

Psychosis

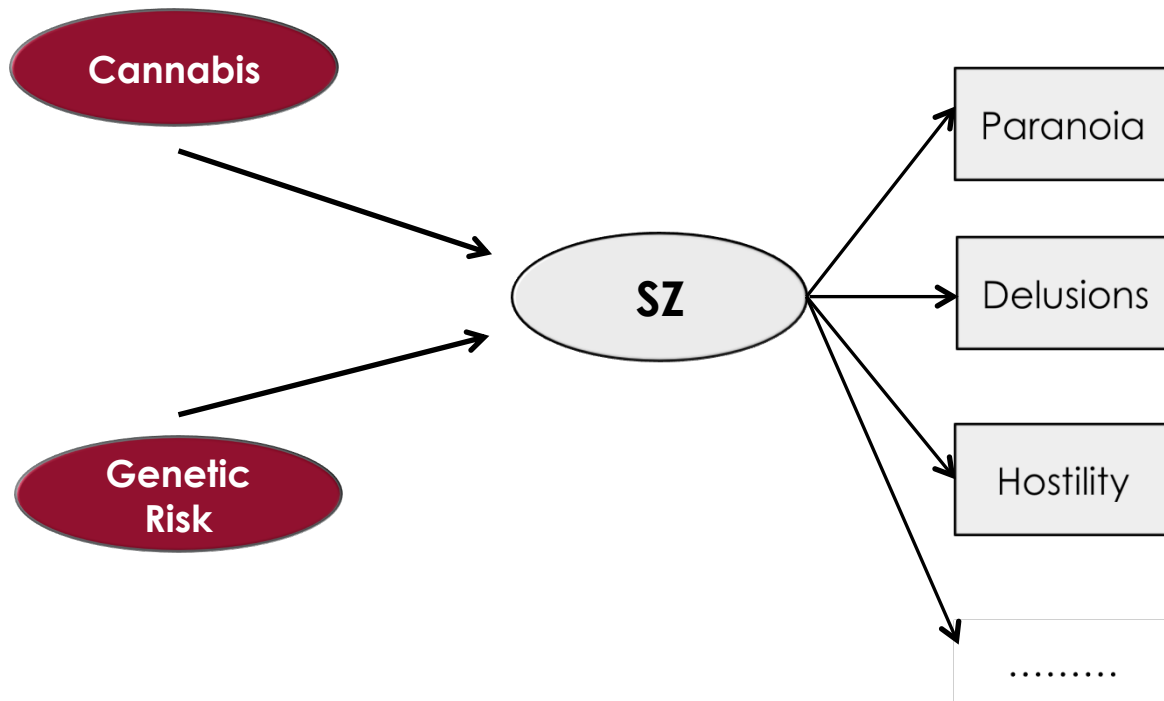
“For the past twenty years, we have been biding time and asserting that certain etiological information is just around the corner; we still wait. A reconsideration of our basic strategies and fundamental assumptions may be in order.”

More than symptoms?

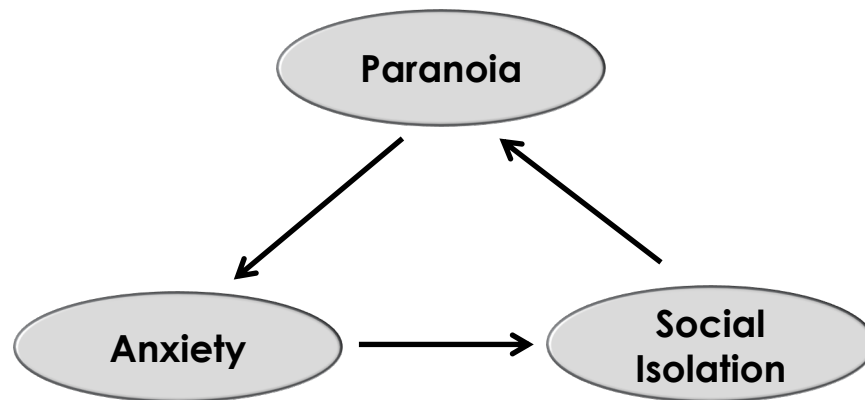
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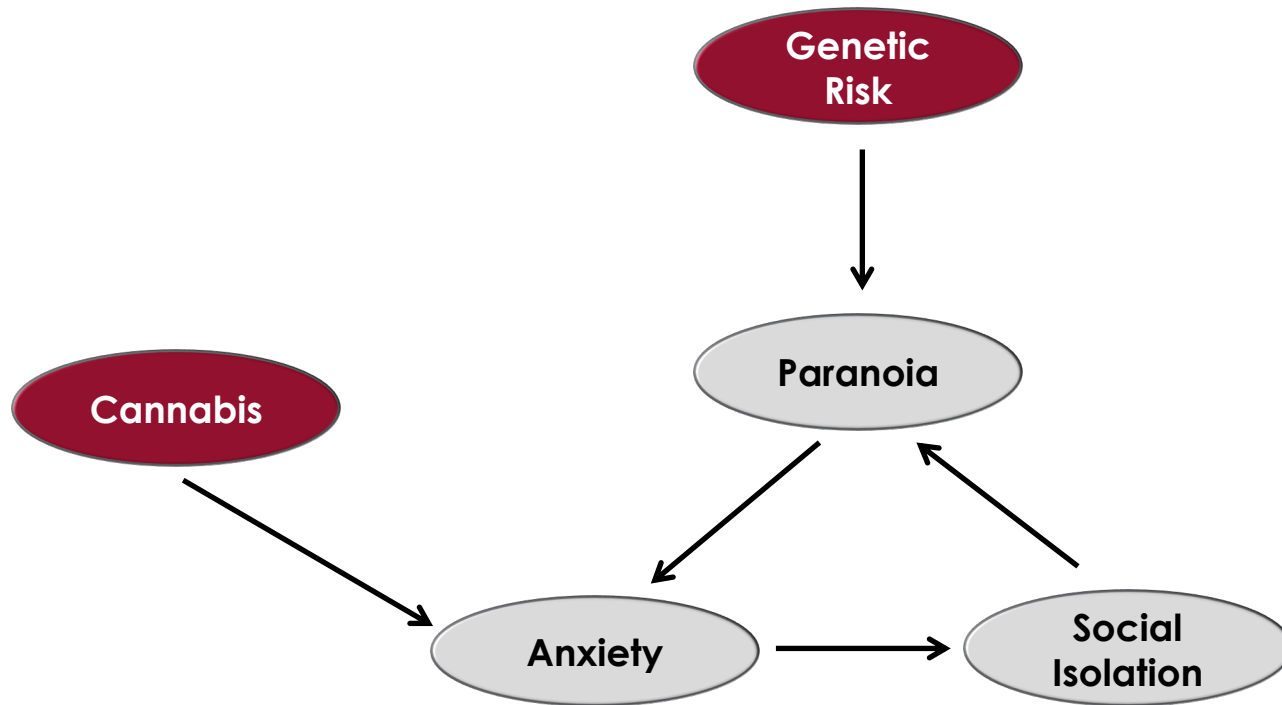
External Influence on Common Cause Model



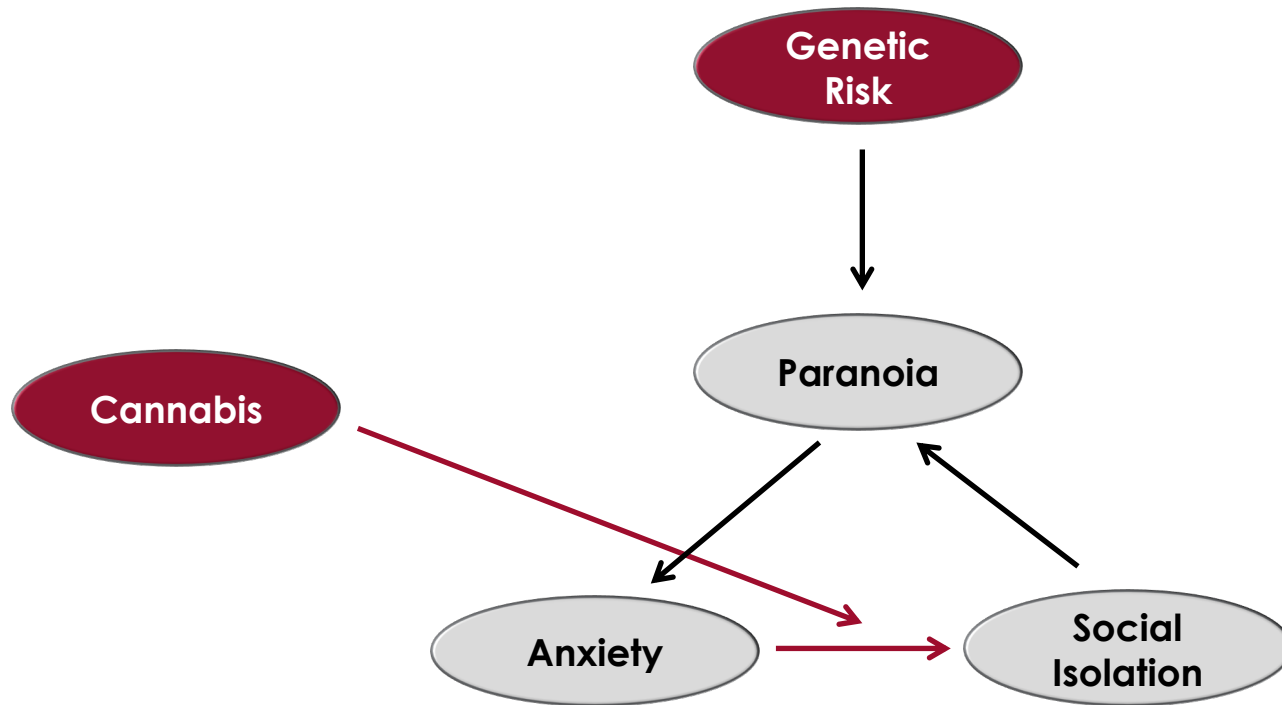
External Influence on Network Model



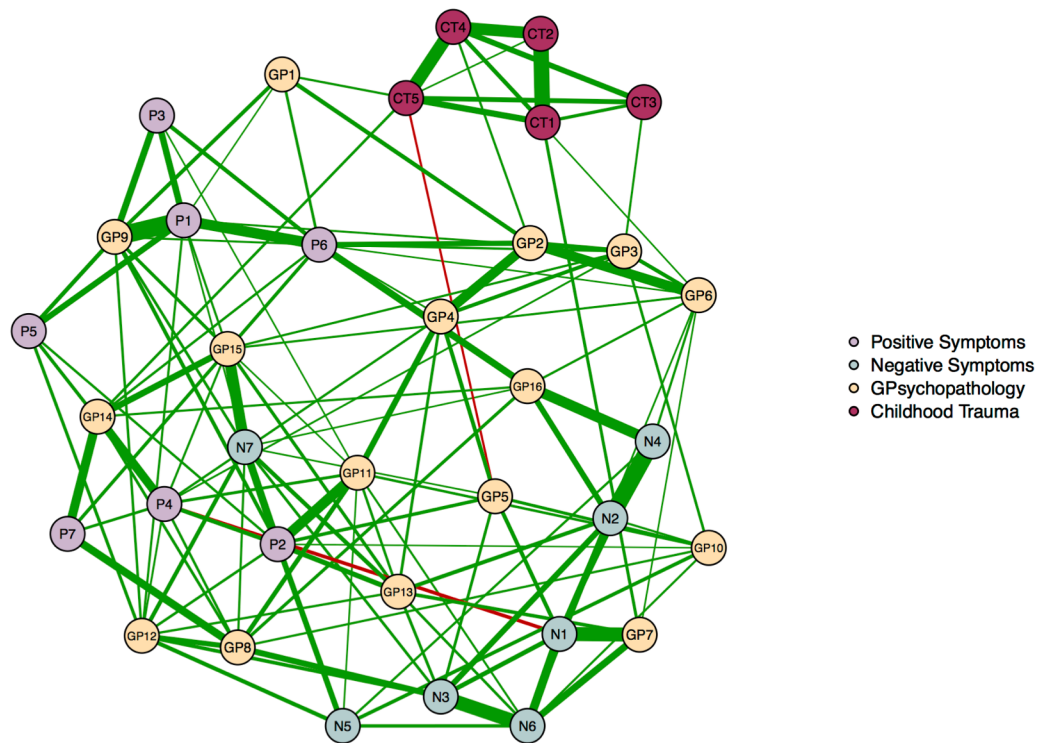
External Influence on Network Model



External Influence on Network Model

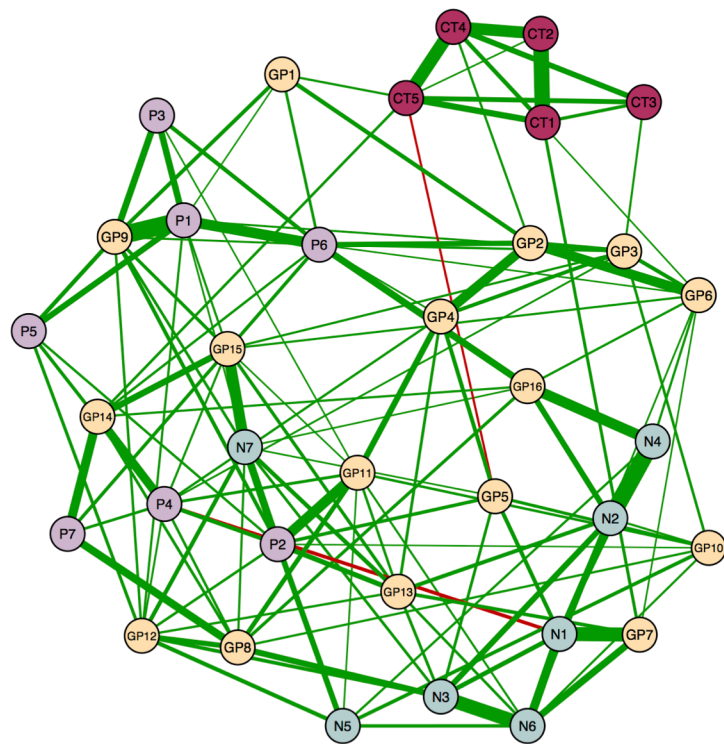


Pathways Between Childhood Trauma and Psychotic Symptoms



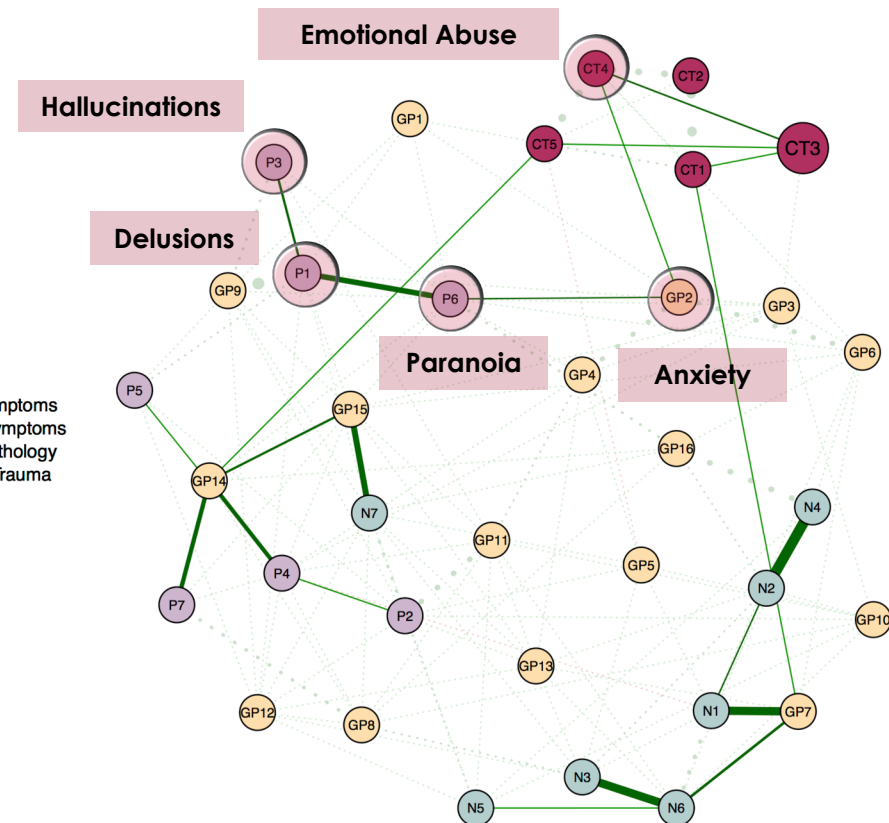
Isvoranu, A. M., van Borkulo, C. D., Boyette, L. L., Wigman, J. T. W., Vinkers, C. H., Borsboom, D. (2017). A Network Approach to Psychosis: Pathways Between Childhood Trauma and Psychotic Symptoms. *Schizophrenia Bulletin*, 43(1), 187-196.

Pathways Between Childhood Trauma and Psychotic Symptoms



- Positive Symptoms
- Negative Symptoms
- GPPsychopathology
- Childhood Trauma

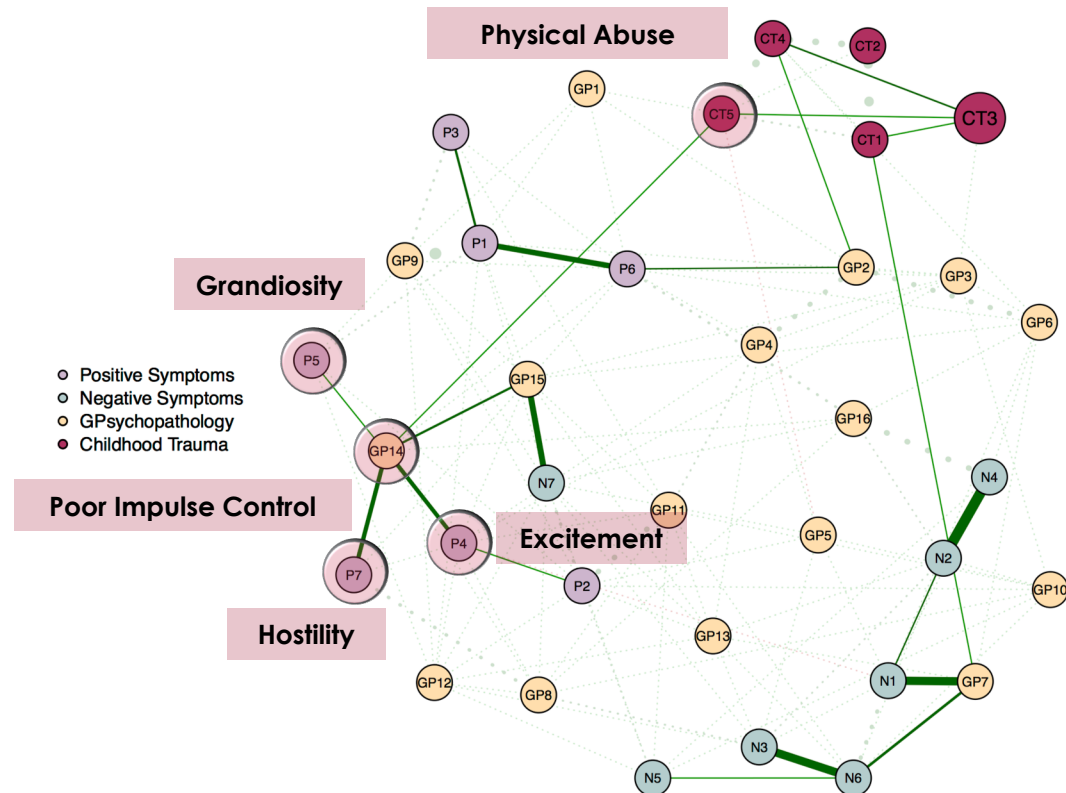
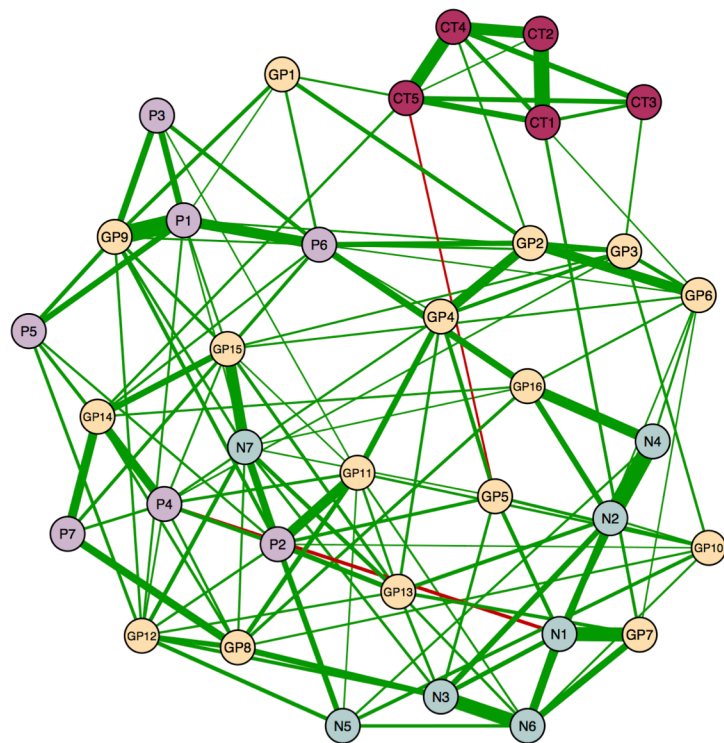
a. Shortest Paths: Sexual Abuse – Positive and Negative Symptoms



Isvoranu, A. M., van Borkulo, C. D., Boyette, L. L., Wigman, J. T. W., Vinkers, C. H., Borsboom, D. (2017). A Network Approach to Psychosis: Pathways Between Childhood Trauma and Psychotic Symptoms. *Schizophrenia Bulletin*, 43(1), 187-196.

Pathways Between Childhood Trauma and Psychotic Symptoms

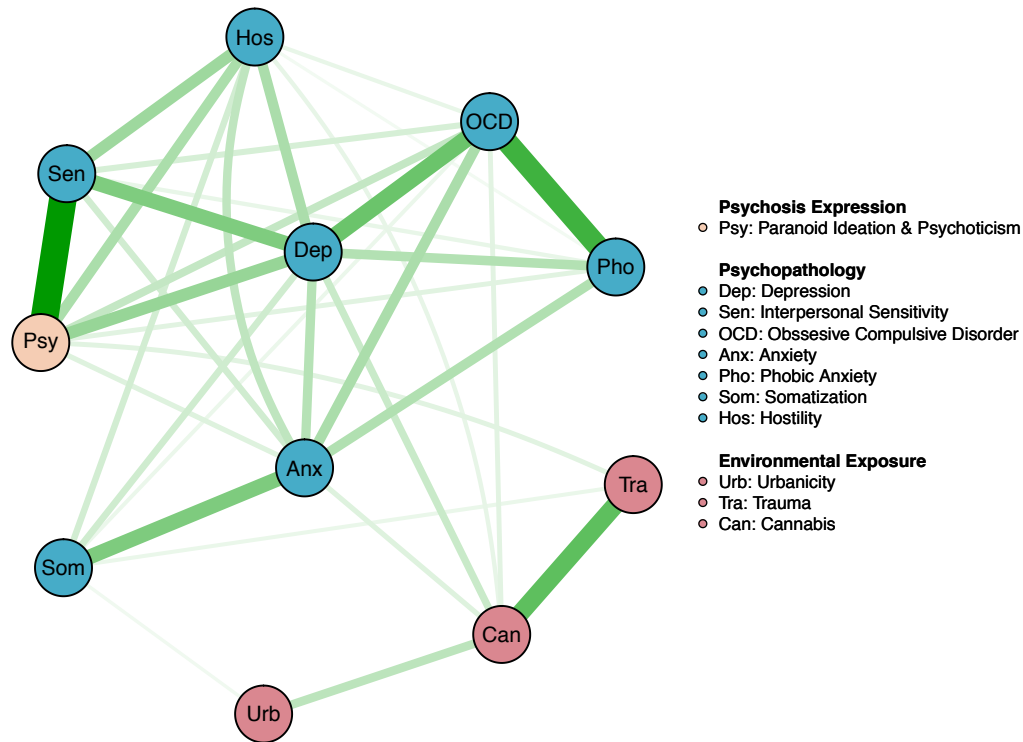
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Environmental Impact in Psychotic Disorders

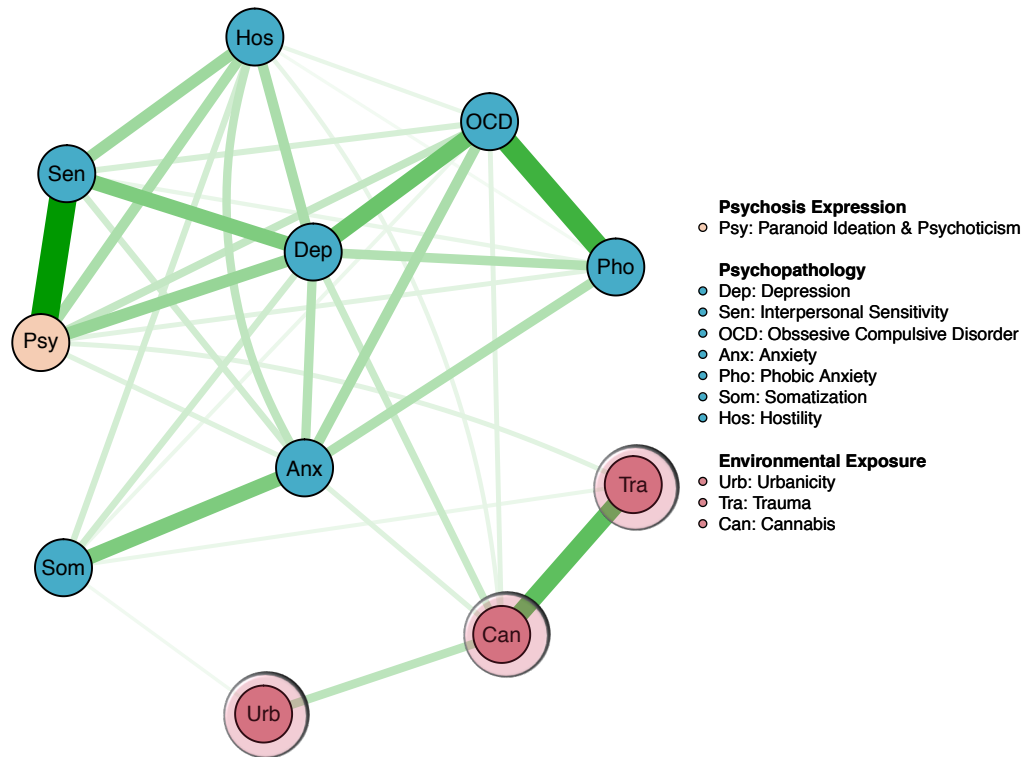
(a) Interrelations Environmental Exposure & Symptomatology



Isvoranu, A. M., Borsboom, D., van Os, J. & Guloksuz, S. (2016). A Network Approach to Environmental Impact in Psychotic Disorder: Brief Theoretical Framework. *Schizophrenia Bulletin*, 42(4), 870-873.

Environmental Impact in Psychotic Disorders

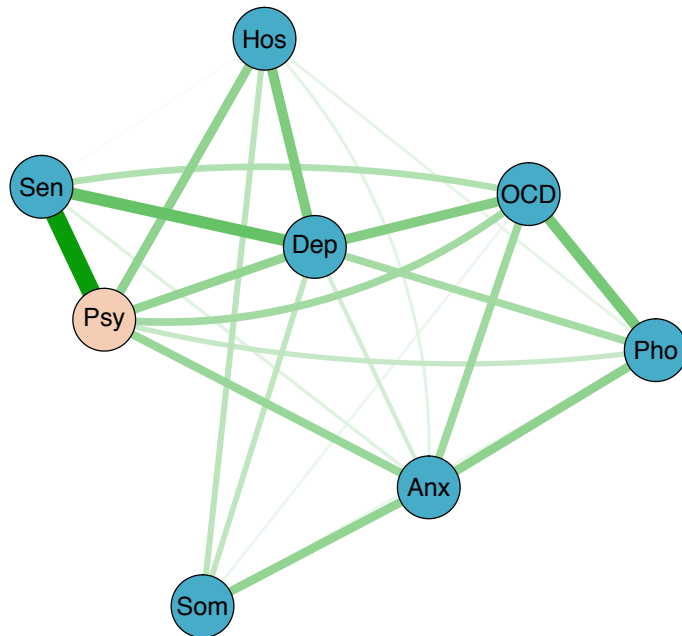
(a) Interrelations Environmental Exposure & Symptomatology



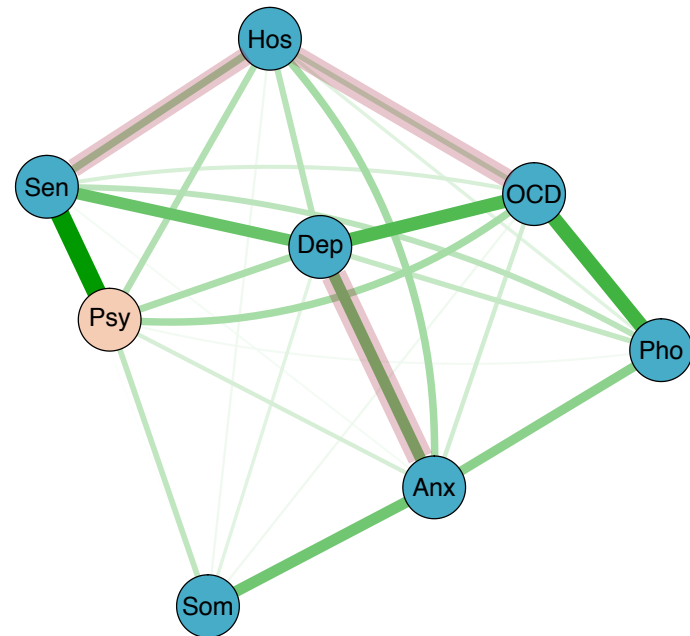
Isvoranu, A. M., Borsboom, D., van Os, J. & Guloksuz, S. (2016). A Network Approach to Environmental Impact in Psychotic Disorder: Brief Theoretical Framework. *Schizophrenia Bulletin*, 42(4), 870-873.

Environmental Impact in Psychotic Disorders

(b) No Environmental Exposure



(c) Environmental Exposure Cannabis



Isvoranu, A. M., Borsboom, D., van Os, J. & Guloksuz, S. (2016). A Network Approach to Environmental Impact in Psychotic Disorder: Brief Theoretical Framework. *Schizophrenia Bulletin*, 42(4), 870-873.

Network Models

❑ Methodological Notes

- ❑ Debate on the specificity of EBICglasso: issue for some lines of research focused on discovering small edges (e.g., bridge symptoms or environmental edges)
- ❑ The effects between variables from the *external field* of a symptom (such as an environmental variable or a genetic risk score) will likely almost always be smaller than the effects between e.g., the symptoms themselves; *qgraph* fading
- ❑ Methodology to account for these issues; current alternative: *unregularized model search* (*ggmModSelect*)

Overview

- ❑ Network Psychometrics: Brief Overview
- ❑ Clinical Applications
 - ❑ Psychotic Disorders
 - ❑ Towards Incorporating Environmental and Genetic Risk Scores into Network Models
- ❑ **Future outlook**

Future Outlook

- ❑ Direct implications on how to conceptualize treatment
- ❑ Three types of interventions from a network perspective:
 - ❑ nodes in the network (henceforth: node-interventions)
 - ❑ connections in the network (henceforth: edge-interventions)
 - ❑ the external field of factors outside of the network that influence it (henceforth field-interventions).

Isvoranu, A. M., Boyette, L.L., Guloksuz, S., Borsboom, D. (2019). Network Models of Psychosis. *Submitted in Psychotic Disorders: Comprehensive Conceptualization and Treatments*. Oxford, United Kingdom: Oxford University Press.

<https://psyarxiv.com/nk8yv>

Future Outlook

- ❑ Further methodological developments aimed towards integrating environmental and genetic risk scores into network models
- ❑ Adaptive assessment and confirmatory network analysis
- ❑ Integrative treatment approaches: combining subjective assessments with more complex and objective behavioral and physical data

Thank you for your attention!



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Slides at:

www.adelaisvoranu.com/presentations

