How Are Neurocognitive and Social Cognitive Factors Related to Daily Functioning in First Episode Schizophrenia?

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DISCLOSURE

No relationships or conflicts of interest related to the subject matter of this presentation.
LEARNING OBJECTIVES

• Identify domains of neurocognition and social cognition that are related to community functioning

• Describe brief neurocognitive and social cognitive assessment tools

• List empirically-based treatment approaches used to improve neurocognitive and social cognitive skills
Outline of the Presentation

• Definition of Neurocognitive Domains and Social Cognitive Domains and their Relationship to Functioning

• Methods of Assessing Cognitive Functioning

• Approaches to Cognitive Remediation
Early Course of Schizophrenia

• Promote hope, optimism, and recovery. However, being realistic is important

• Comprehensive Coordinated Care delivered by a dedicated team of trained and peer professionals

• One of the most important factors is to stick with the treatment

• Leading a healthy life is a realistic goal
Many individuals in the early course of schizophrenia want to return to school or work
Focusing on recovery goals improves motivation through Individual Resiliency Training (IRT)

Exposure to 4 or more sessions of (IRT) was associated with greater improvements in motivation

**Findings:** Focus on recovery goal setting and support in psychosocial intervention had an impact on motivation
Some individuals with a first episode of schizophrenia face a challenge…

Neurocognitive functioning is related to daily functioning

Understanding neurocognition and social cognition is part of a recovery-oriented approach
Are Cognitive Difficulties Central to Schizophrenia?
Cognitive Difficulties are Considered an Important Feature of Schizophrenia

- They are present before the diagnosis – clinical high risk, children at risk for schizophrenia, and unaffected twins
- Present in first episode patients (in some individuals)
- Relatively stable over time even during periods of remission
- Neurocognitive difficulties predict work and social outcome

Neurocognition and symptoms are correlated
Cognitive Domains Selected by Factor Analysis

- Short-term Memory / Working Memory
- Attention / Concentration
- Verbal Learning and Memory / Long-term Memory
- Visual Learning and Memory
- Reasoning and Problem Solving
- Speed of Processing

Neurocognitive Domains

Short-term Memory / Working Memory
Taking information learned and using that information a few moments later, e.g., learning names, remembering phone numbers

Attention / Concentration
The action or power of focusing one's attention or mental effort
Attention span refers to the length of time one can focus attention

Verbal Learning and Memory / Long-term Memory
The storage of information over a long period of time, e.g., learning information in school later tested on an exam
Neurocognitive Domains

Visual Learning and Memory

Ability to remember or recall information such as activities, pictures, or words that have been viewed in the past

Reasoning and Problem Solving

The ability to analyze information, detect patterns and relationships, and solve problems on an abstract level

Speed of Processing

A cognitive ability defined as the time needed by a person to complete a mental or physical task
Three neurocognitive factors account for 52% of variance in return to work or school in first-episode schizophrenia.

Nuechterlein et al, 2011
Assessment of Cognitive Functioning
Brief Cognitive Assessment Tool for Schizophrenia (B-CATS)

10-minute objective measure of global cognition

Use as a screening instrument or to measure change

Correlates highly (0.76, p < 0.01) with longer neurocognitive test battery and with daily functioning

Informs treatment and rehabilitation planning

Monitors the effectiveness of pharmacological and non-pharmacological treatments

Hurford et al 2018
Brief Cognitive Assessment Tool for Schizophrenia (B-CATS)

**Digit Symbol Substitution** - A sheet with a 9 item key pairing digit 1–9 with a unique symbol; below are rows of numbers with blank squares beneath. The subject pairs as many numbers with their unique symbols as possible in 120 seconds - Number of correct -

**Trail Making**
Test part A -A sheet with scattered circles containing numbers. Subjects draw a “trail” from number to number (1-2-3, etc.) to number 25, without lifting the pencil from the paper - Time to completion
Test part B - A sheet with scattered circles containing letters or numbers. Subjects draw a “trail” from number to letter (1-A-2-B, etc.) to number 13, without lifting the pencil from the paper - Time to completion

**Animal Fluency** – Subjects orally list as many animals as they can in 60 seconds - Administrator tracks responses
Cognitive Assessment Interview (CAI)

15 minute interview-based measure of cognition
For use by trained clinicians
Useful for screening and to assess change in cognitive difficulties
Correlates highly with objective neurocognition and daily functioning
Informs treatment and rehabilitation planning
Monitors the effectiveness of pharmacological and non-pharmacological treatments

Ventura et al 2016
Cognitive Assessment Interview (CAI)

Three sources of information

Individual

Informant

Rater

Ventura et al 2016
# Assessment of Short-Term Memory

## DOMAIN: Working Memory

### 1. Difficulty maintaining newly learned verbal information in mind for brief periods (long enough to use)?

Do you forget names of people you just met? Do you have trouble recalling telephone numbers you hear? Do you have trouble remembering what your Dr. just said during visits? Do you find you need to write down information to remember?

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### 2. Difficulty performing "on the spot" mental manipulations or computations?

Do you have difficulty knowing how much change to expect when shopping? Do you have trouble keeping figures in mind while paying bills or balancing your checkbook?

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| 7                | 7                   |
### Assessment of Concentration / Attention

#### DOMAIN: Attention/Vigilance

#### 3. Problems sustaining concentration over time (without distraction)?

*Do you have trouble concentrating? Do you take breaks frequently? Do you have trouble paying attention while reading, listening to the radio or watching television, long enough to read/listen/see a whole article/chapter/program?*

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#### 4. Difficulty focusing on select information (if there is not obvious distraction)?

*Do you have trouble finding what you need at the supermarket? Is it difficult for you to pick out the correct route on a bus map?*

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#### SEVERITY ANCHOR POINTS

- **N/A** = Rating not applicable, or insufficient information
- 1. Normal, not at all impaired
- 2. Minimal cognitive deficits but functioning is generally effective
- 3. Mild cognitive deficits with some consistent effect on functioning
- 4. Moderate cognitive deficits with clear effects on functioning
- 5. Serious cognitive deficits which interfere with day-to-day functioning
- 6. Severe cognitive deficits that jeopardize independent living
- 7. Cognitive deficits are so severe as to present danger to self/others
Medication Has Limitations

Medications cannot teach a person skills or how to function better at work, in social relationships, or independent living.
Can Exercising the Brain Make You Smarter?
Neuroplasticity

Cognitive Remediation is based on the concept of neuroplasticity which refers to the brain’s ability to alter both physical structure and functional organization in response to learning.
Computer Games
What is Cognitive Remediation?

Cognitive remediation approaches involve computer-assisted or skills based training of cognitive functions

Two types – Restorative and Compensatory

- Restore lost cognitive functioning due to illness or injury or accelerate cognitive functioning that is delayed

- Compensate for cognitive difficulties through environmental modifications and behavioral strategies
Cognitive Remediation (CR)

- Posit Science – BrainHQ.com - Originally developed for aging adults, now being used for individuals with schizophrenia and other mental health conditions

- CogSMART.com – Fully manualized approach developed for clinicians
Commercially Available Programs

- PositScience -- BrainHQ
- Lumosity
- HappyNeuron
- Brain Safari
- NintendoDS
- Wii
Commercially Available Programs

“Speed Trap” focuses on Speed of Information Processing

Auditory-based

Difficulty adapts to the user in “real-time”

Multiple levels and configurations
Cognitive Rehabilitation Programs Target

• Basic cognitive processes such as memory, attention, and processing speed
• Higher order cognitive processes such as decision making, organization, perspective taking, context appraisal, and flexibility
Meta-analysis: Effect Sizes ($d$ and $g$)

Cognitive Remediation

Wykes et al 2011
- Cognition $d = .45$
- Symptoms $d = -.18$
- Functioning $d = .42$

Revell et al 2015
- Symptoms ES = -.19
- Functioning ES = .18

Cella et al 2017
- Negative Symptoms $g = -.30$
Neurocognitive Composite Score - Individuals with a First Episode of Schizophrenia (n = 43)

Group X Time interaction, p < .05

Nuechterlein et al 2020
Working Memory Score - Individuals with First Episode of Schizophrenia (n = 43)

Group X Time interaction, p < .05
Cognitive Training Leads to Greater Work/School Role Functioning in First 6 Months of Treatment (N = 53)

Group X Time interaction, p < .04

Nuechterlein et al 2020
Cognitive Training Leads to Greater Work/School Role Functioning in 12 Months of Treatment (n = 32)

Increased Role Functioning

Change in Work/School Functioning

Cognitive Training

Healthy Behavior Trng

Group X Time interaction, p < .02
Is Cognitive Gain Predictive of Role Functioning Gain? – Yes!

…in First Episode Schizophrenia

Overall neurocognitive composite gain in 3 months predicts 3-month role functioning gain (r=.39, p<.02) and also tends to predict 6-month role functioning gain (r=.33, p<.07)
Exercise Enhances the Impact of Cognitive Training on Cognition in First Episode Schizophrenia within 3 Months (N = 47)

\[ F(1,37.6) = 7.19, \ p = .01, \ \text{effect size} \ \text{Cohen’s} \ f = 0.42 \ (d=0.84) \]

Nuechterlein et al 2016
Exercise Enhances the Impact of Cognitive Training on Role Functioning in First Episode Schizophrenia within 3 Months (N = 47)

\[ F(1,28.9)=16.01, p<.01, \text{ effect size Cohen’s } f = .49 \]
Black Americans Compared to Caucasians
First Episode Psychosis – RAISE

No differences

- Duration of Untreated Psychosis
- Number of prior hospitalizations
- Age at first diagnosis
- Most symptoms – including negative symptoms
- Substance use

Negendra et al 2018  NIMH - Recovery After an Initial Schizophrenia Episode (RAISE)
Black Americans Compared to Caucasians
First Episode Psychosis – RAISE

More likely to lack permanent housing

Less likely to have private insurance

Report a poorer quality of life

More severe disorganization – no differences in other symptoms

Lower level of neurocognitive functioning

Less likely to abuse alcohol

Recommendations: Case management to improve housing situation
Cognitive remediation to improve cognition

Negendra et al 2018
NIMH - Recovery After an Initial Schizophrenia Episode (RAISE)
Black Americans Compared to Caucasians
First Episode Psychosis – RAISE
Treatment Outcome Disparities

Community-Based Care Condition

- Higher positive symptoms
- Higher levels of disability
- Less likely to use Evidence-based Care – Family Therapy
- Less likely to recovery

NAVIGATE – eliminated all of these trends

Oluwoye et al 2018  NIMH - Recovery After an Initial Schizophrenia Episode (RAISE)
Although social interaction is complex, scientists believe that it is vital to human health, both mentally and physically.
What is Social Cognition?

Cognitive processes that underlie human relationships which includes perceiving others' beliefs, thoughts, intentions, and emotions (Dulau, 2015)

Mental operations underlying social interactions, which include the human ability and capacity to perceive the intentions and dispositions of others (Brothers, 1990)

The ability to construct representations of the relationship between oneself and others and to use those representations flexibly to guide social behavior (Adolphs, 2001)
Social Cognition in First Episode Schizophrenia

- Difficulties are present in first episode schizophrenia. Magnitude is similar to established illness (Healey et al 2016; McCleery et al 2016)
- Difficulties are stable over time (Horan et al 2012; McCleery et al 2016)
- Might be more correlated with symptoms early rather than later in the course (Healey et al 2016)
Social Cognition in Schizophrenia

- Perception of Social Cues
  - Facial Perception
  - Voice Perception
- Experience Sharing
  - Mirroring
  - Affect sharing
- Mentalizing
- Emotional Experience and Regulation
- Empathy
Social Cognition

• Facial / Emotion Perception
  Facial perception is an individual's understanding and interpretation of the human face. Facial features carry a wealth of social information. Emotion perception refers to the capacities and abilities to recognize and identify emotions in others.

• Voice Perception
  The acoustic properties of speech (for example, pitch, intonation and rhythm; also called prosody), including emphasis and emotional tone, provide critical information beyond the meaning of words.
Basic Emotions

- Happy
- Angry
- Fear
- Sad
- Surprised
- Ashamed
Individuals with schizophrenia had difficulties in overall emotion recognition, particularly fear and did not benefit from increased emotional intensity. Error patterns indicate that individuals with schizophrenia misidentified neutral cues as negative.
Social Cognition in Schizophrenia

• Mirroring
  Motor resonance refers to a functional correspondence between the state in the motor system of an observer and that in the motor system of the person making the action.

• Affect Sharing
  The correspondence between the observation of a person who is displaying an emotional expression and the activation of emotion-related brain regions of the observer is also a component of experience sharing.
A newborn baby imitates opening the mouth

Mirroring
Mentalizing

Why do we need a theory of mind?
To make sense of (or predict) behavior

The ability to attribute mental states to ourselves and others to explain and predict behavior (Baron-Cohen, Leslie, and Firth, 1985)
Mentalizing a way of thinking abstractly about self and others…

- How to intuitively know how to get along with others
- How to wisely negotiate relationships with family, friends, co-workers, neighbors, etc.
- How to understand the main point when dealing with other people or resolving social problems
- How to understand unwritten social norms and adapt one’s behavior accordingly
- Related to insight into one’s condition (Subotnik et al 2020, meta-analysis)
Social Cognition and Daily Functioning

There are clear and consistent relationships between social cognition and community functioning

- Kee et al 2003
- Couture et al 2006 – review
- Sergi et al 2007
- Fett et al 2010 – meta-analysis
- Horan et al 2012
Interaction of Social Cognition and Social Functioning – Attribution Theory

Social stimulus

Conclusion: “My co-worker is angry.”

Attribution: “My co-worker is angry with me.”

Behavior: Acting unfriendly toward co-worker.

Emotion perception
Social perception

Attributional style

Deficits in theory of mind may prevent the client from countering attributional style biases

Javed & Charles 2018
### DOMAIN: Social Cognition

10. Difficulty appreciating another person's intentions/point of view?

*Do you have trouble understanding other people's point of view (if you disagree with them; even if they don't say it outwardly)? If you are talking and someone looks at their watch, what do you think they may be feeling?*

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Computer-based Social Cognition Training is Available
He lives in Portland.

His name is Donald.

He is going to Canada with his family this summer.
Summary

Neurocognitive and social cognitive difficulties are an important feature of first episode schizophrenia and are related to daily functioning.

Two relatively brief methods of cognitive assessment:
   a) screening / determining severity level
   b) useful in treatment planning
   c) brief methods of social cognition assessment – under development

Cognitive Remediation
   a) Restorative approach
   b) Compensatory approach
   c) SocialVille
THANK YOU

for your attention, working memory, speed of processing, and social cognition!