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

June 25, 2020



CSS-SMI INITIATIVE



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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



First Episode Psychosis – RAISE



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

Neurocognitive Functioning is Related to Daily Functioning



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

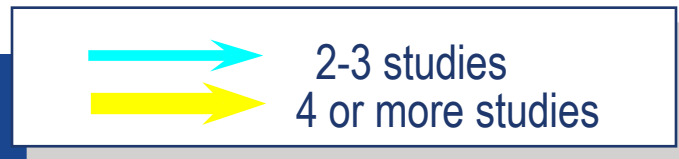
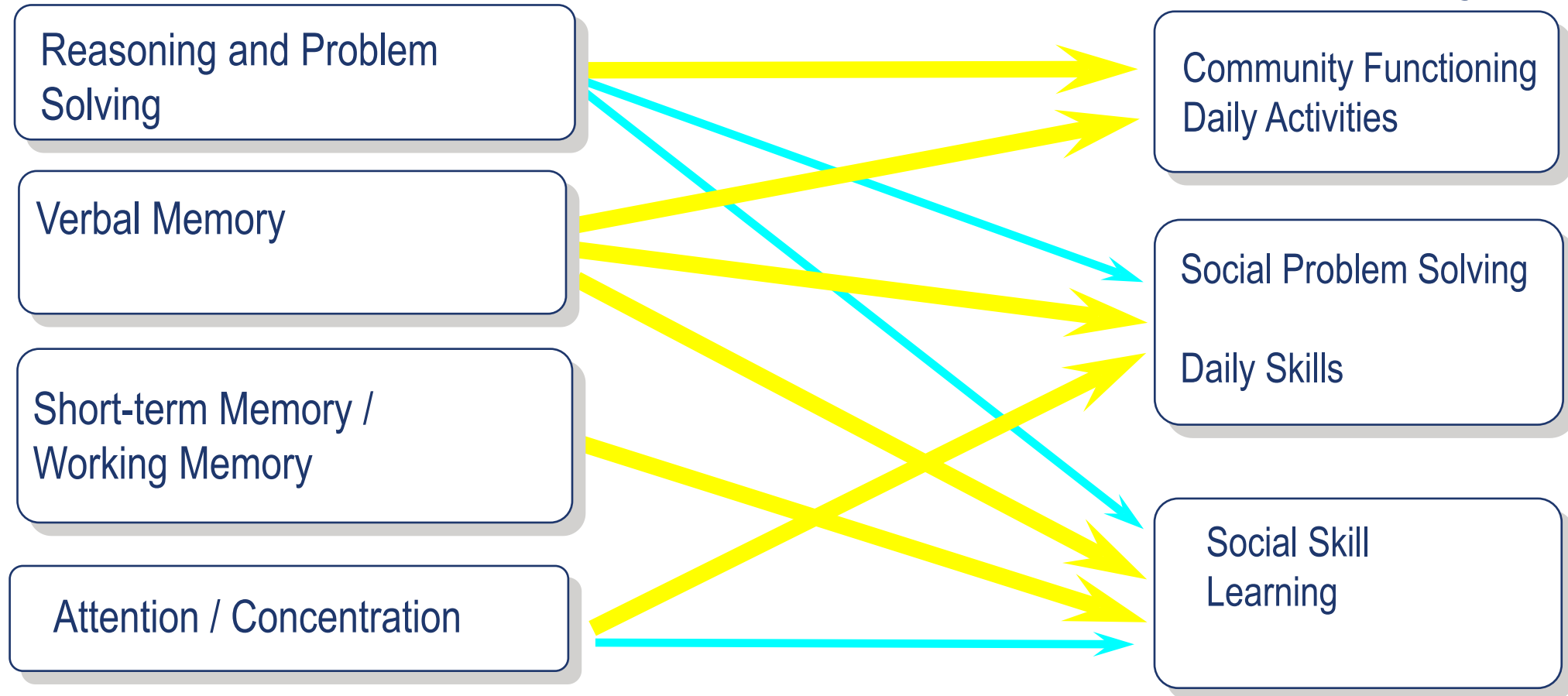
Speed of Processing

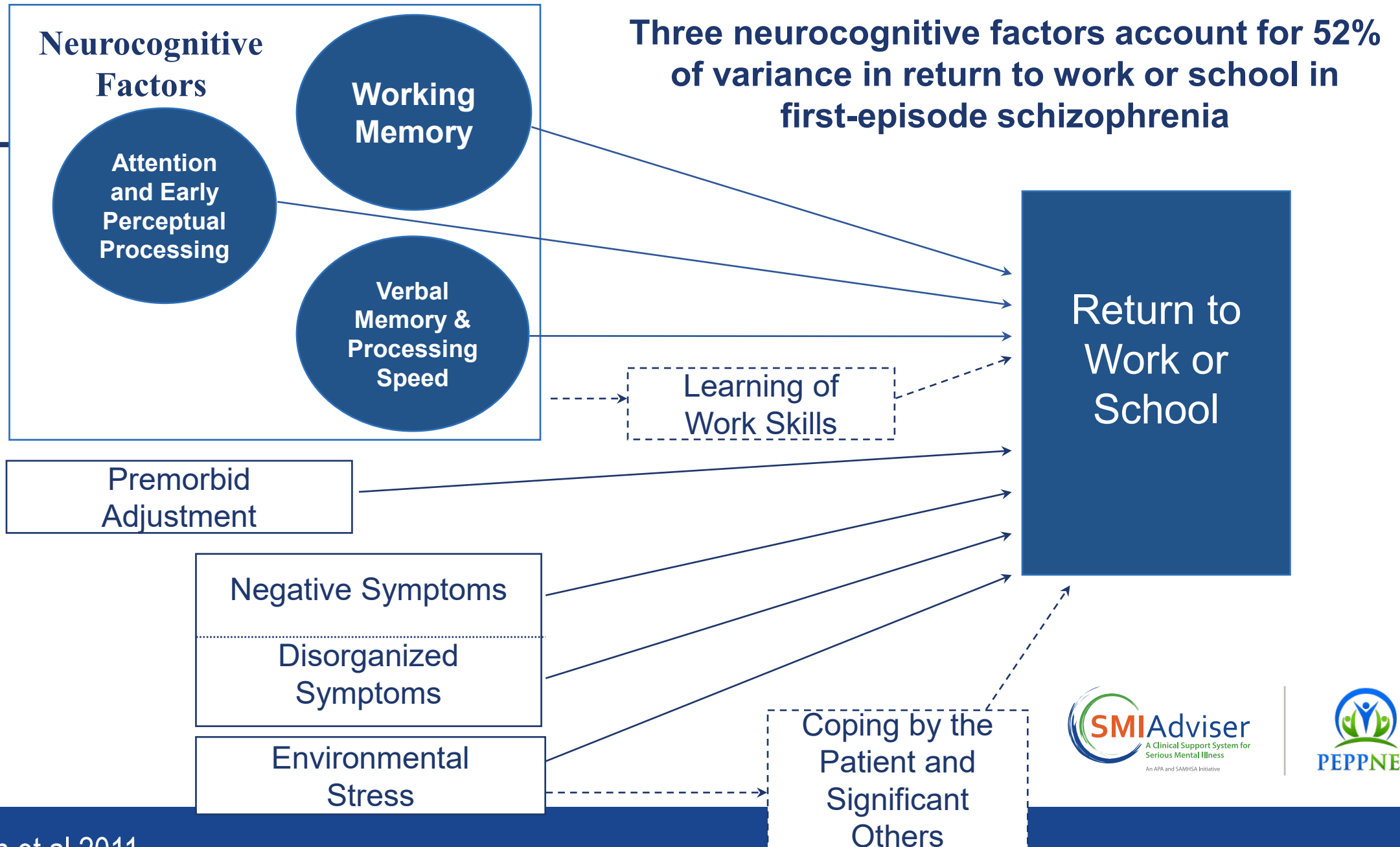
A cognitive ability defined as the time needed by a person to complete a mental or physical task

Cognitive Domains and Daily Functioning in Schizophrenia

Neurocognition

Functioning





Assessment of Cognitive Functioning

**Underlying Construct
Cognition**

**Objective Cognitive
Ability**

**Interview-based
Measure of Cognition:
CAI**

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

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

Cognitive Assessment Interview (CAI)



Three sources of information

Individual

Informant

Rater

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?

Patient Examples:

Informant Examples:

Patient

N/A 1 2 3 4 5 6 7

Informant

N/A 1 2 3 4 5 6 7

Composite

N/A 1 2 3 4 5 6 7

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?

Patient Examples:

Informant Examples:

Patient

N/A 1 2 3 4 5 6 7

Informant

N/A 1 2 3 4 5 6 7

Composite

N/A 1 2 3 4 5 6 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?

Patient Examples:

Informant Examples:

Patient								Informant								Composite							
N/A	1	2	3	4	5	6	7	N/A	1	2	3	4	5	6	7	N/A	1	2	3	4	5	6	7

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?

Patient Examples:

Informant Examples:

Patient								Informant								Composite							
N/A	1	2	3	4	5	6	7	N/A	1	2	3	4	5	6	7	N/A	1	2	3	4	5	6	7

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

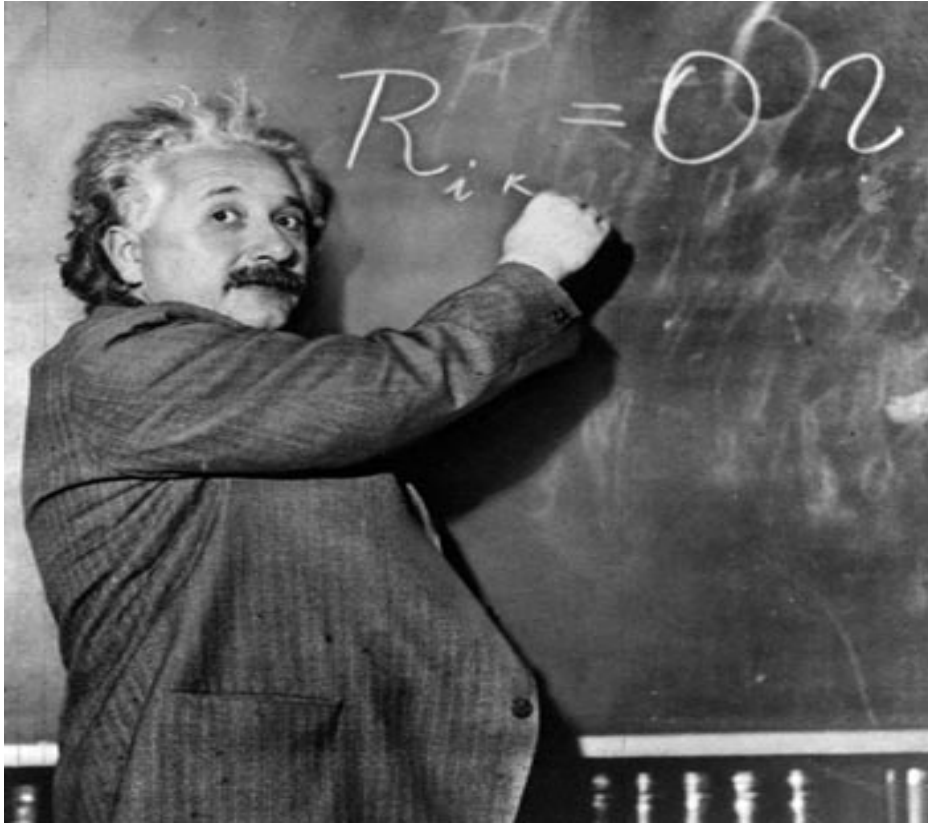
Medication Has Limitations

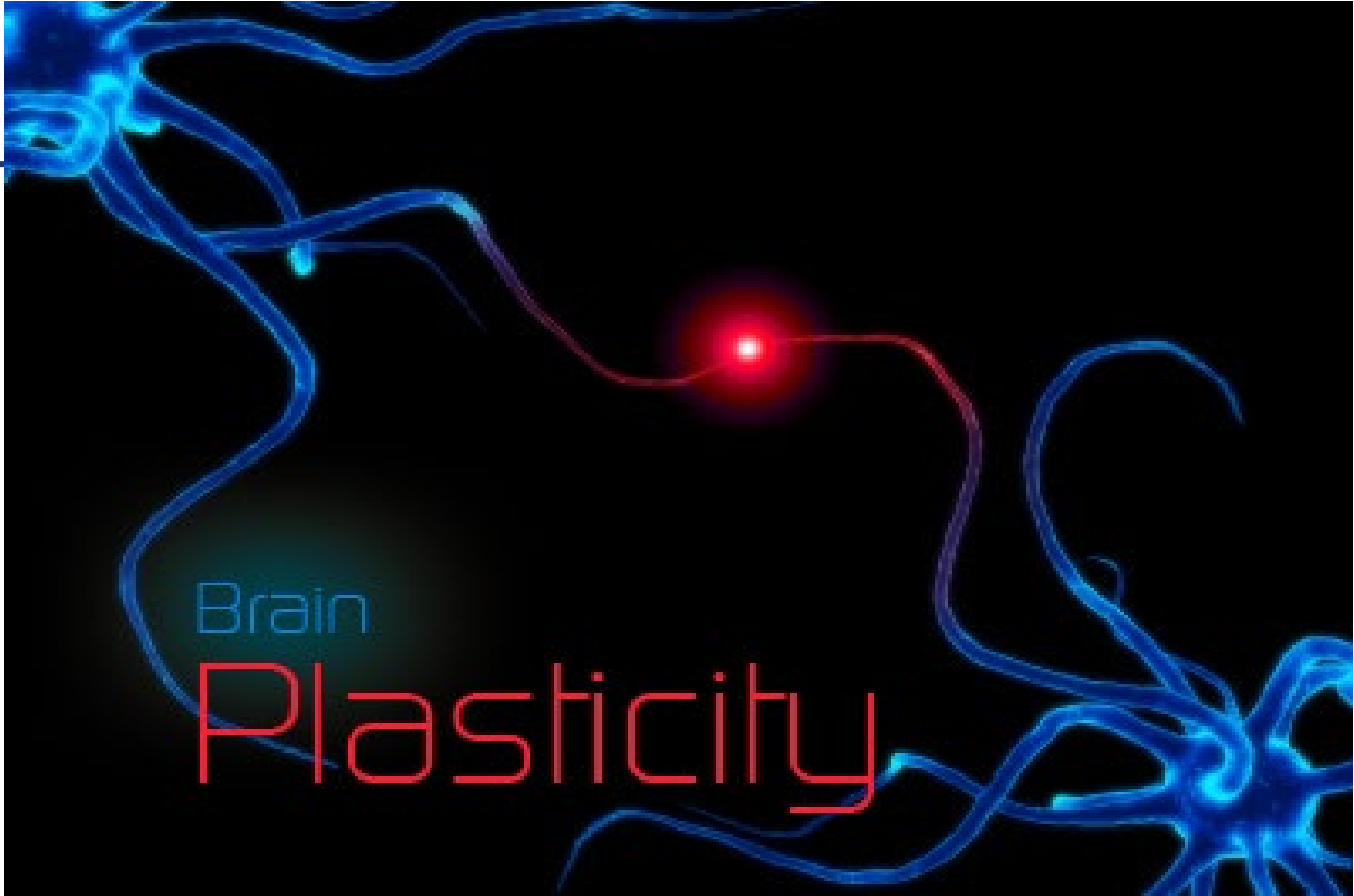


Medications cannot teach a person skills or how to function better at work, in social relationships, or independent living



Can Exercising the Brain Make You Smarter?





Brain

Plasticity

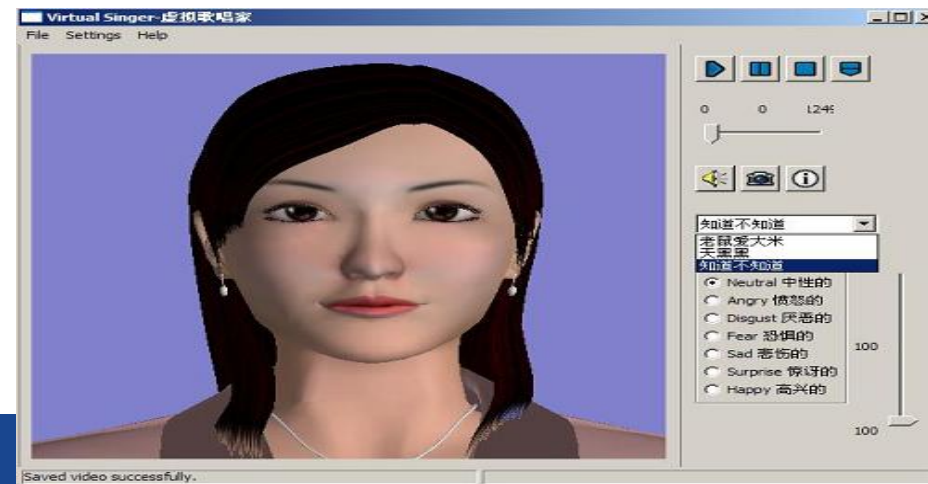
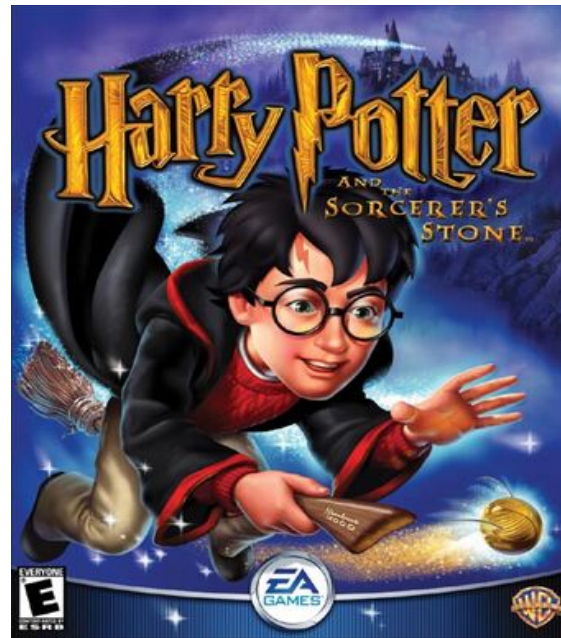


Neuroplasticity

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)

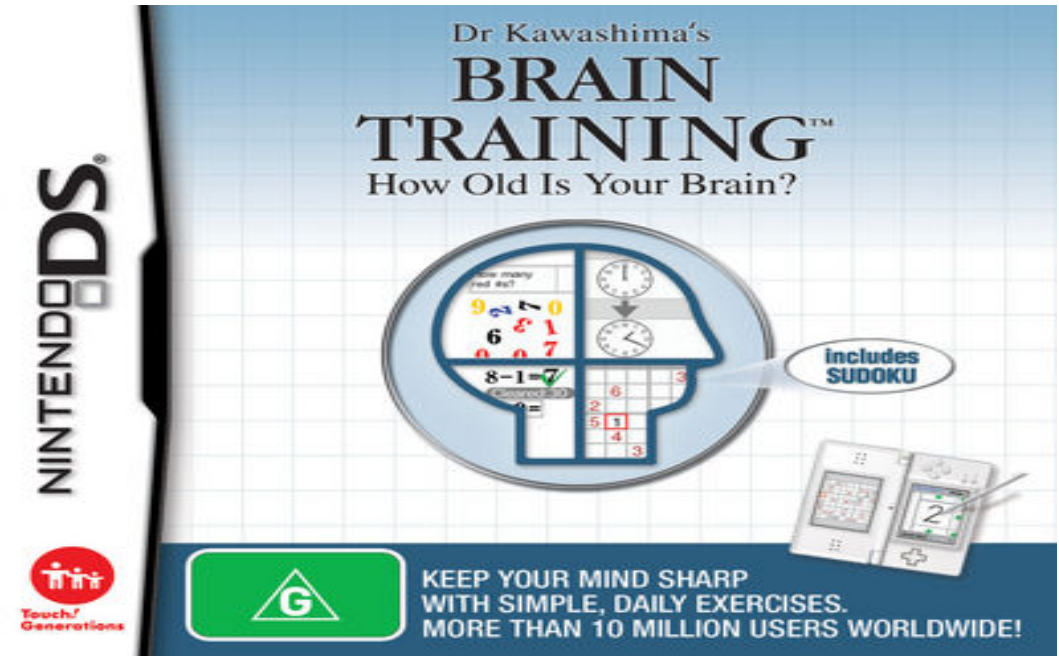
- Posit Science – BrainHQ.com - Originally developed for aging adults, now being used for individuals with schizophrenia and other mental health conditions
- CogSMART.com – Fully manualized approach developed for clinicians



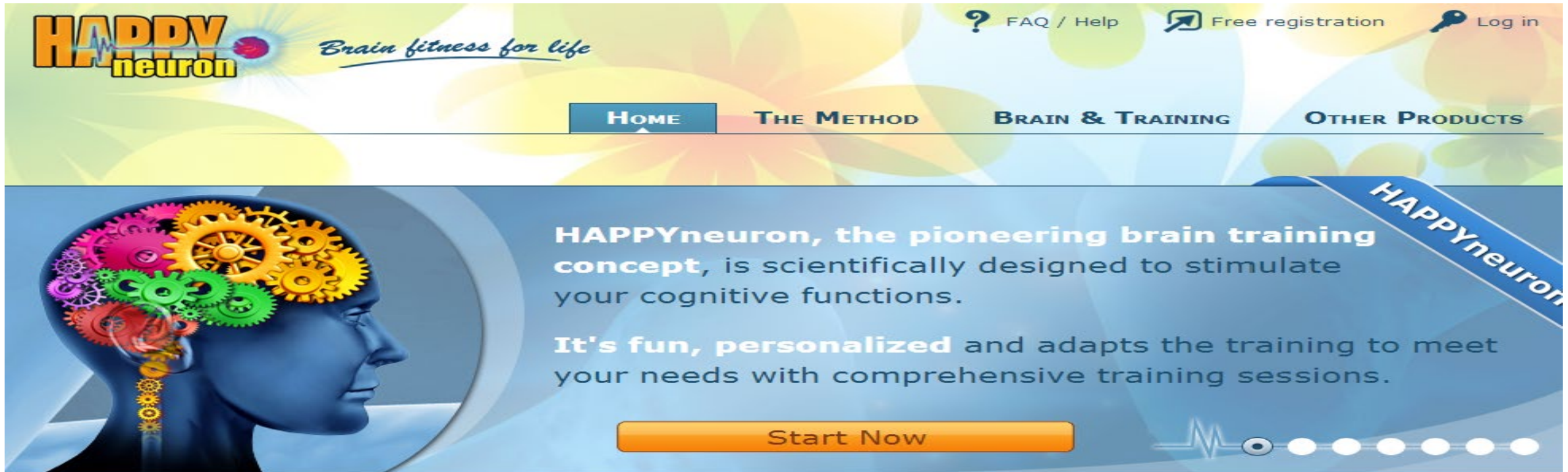
Commercially Available Programs



- PositScience -- BrainHQ
- Lumosity
- HappyNeuron
- Brain Safari
- NintendoDS
- Wii



Commercially Available Programs



HAPPYneuron *Brain fitness for life*

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— Memory — Attention — Language — Reasoning — Visual-Spatial —



[PLAY!](#)

The Squeaking Mouse

KunCha

Available on AppStore

Apps



Commercially Available Programs



“Speed Trap” focuses on Speed of Information Processing

Auditory-based

Difficulty adapts to the user in “real-time”

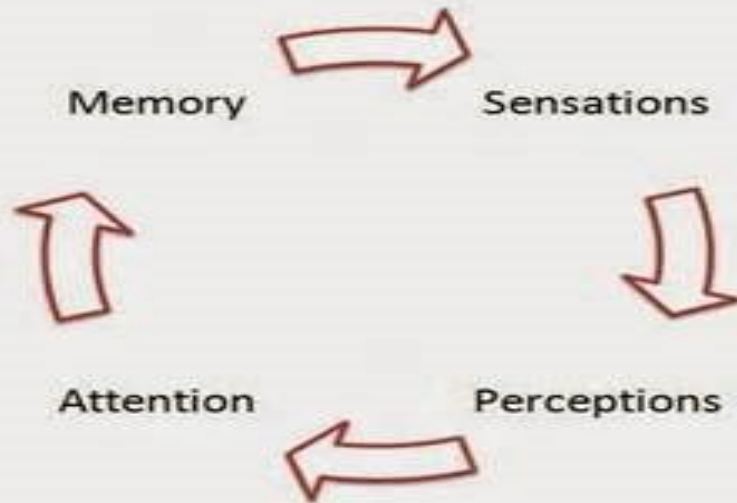
Multiple levels and configurations



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

Basic Cognitive Processes



HIGHER ORDER THINKING SKILLS

- ❖ **Cognitive skills:**
 - analysis, synthesis, evaluation, problem solving, decision making.
- ❖ **Personal skills:**
 - creativity, initiative, entrepreneurship, perseverance, ingenuity, acting safely with respect to oneself and others, co-operation, leadership,
- ❖ **Communicative skills:**
 - written, graphical, tabular, symbolic presentation, oral responses to larger groups,
- ❖ **Social value:**
 - decision making in a social, environmental, economic or political context with a sound justification,
- ❖ **Self-evaluation, assessment.**

Meta-analysis: Effect Sizes (d and g)

Cognitive Remediation

Wykes et al 2011

- Cognition $d = .45$
- Symptoms $d = -.18$
- Functioning $d = .42$

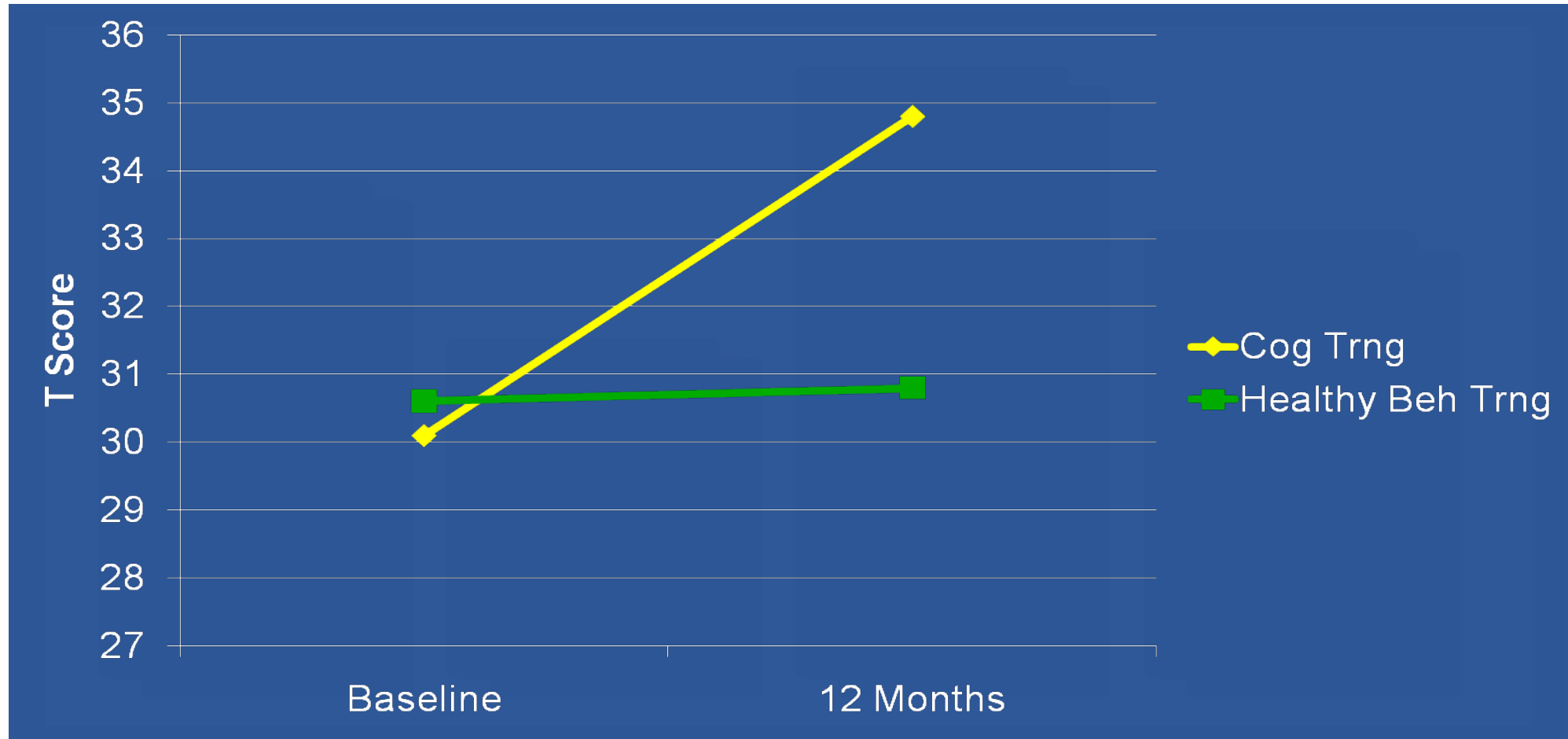
Revell et al 2015

- Symptoms ES = $-.19$
- Functioning ES = $.18$

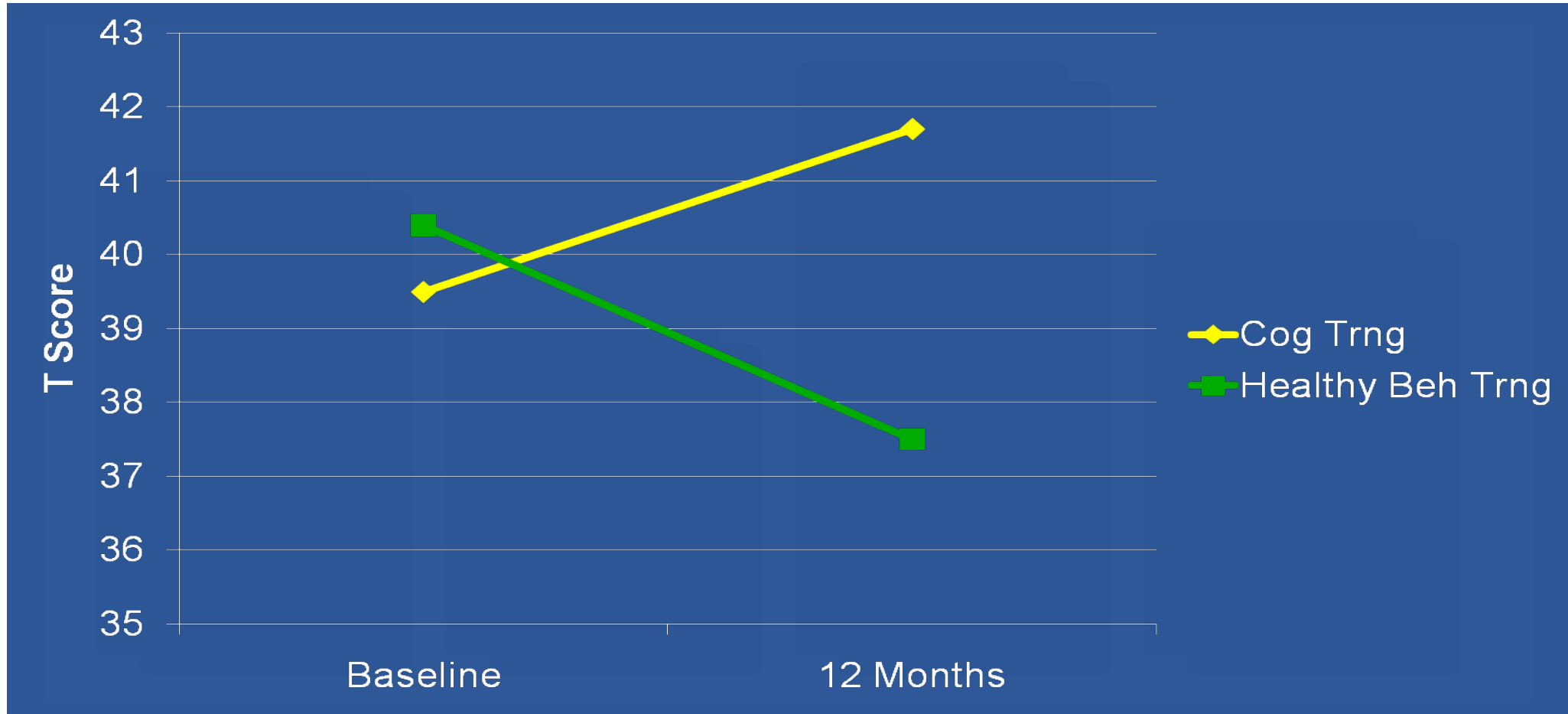
Cella et al 2017

- Negative Symptoms $g = -.30$

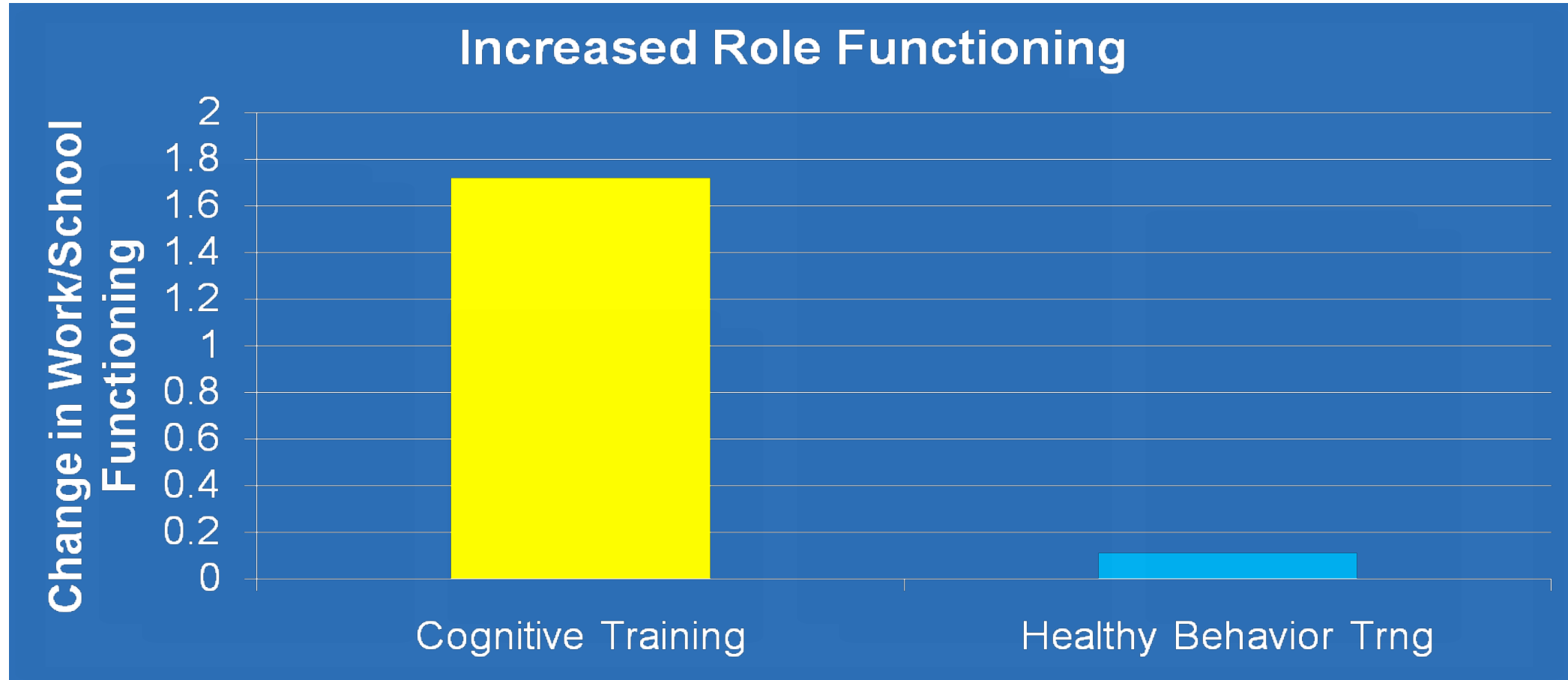
Neurocognitive Composite Score - Individuals with a First Episode of Schizophrenia (n = 43)



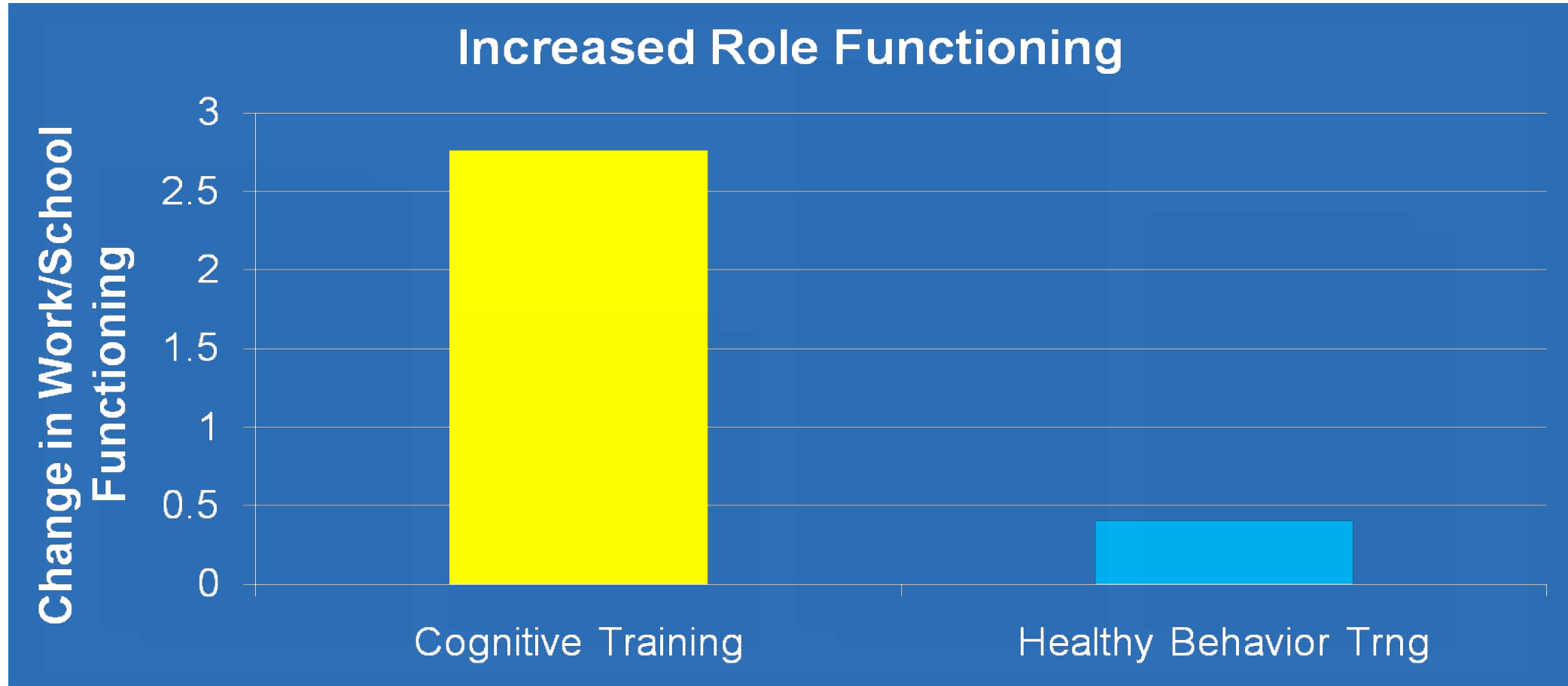
Working Memory Score - Individuals with First Episode of Schizophrenia (n = 43)



Cognitive Training Leads to Greater Work/School Role Functioning in First 6 Months of Treatment (N = 53)



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



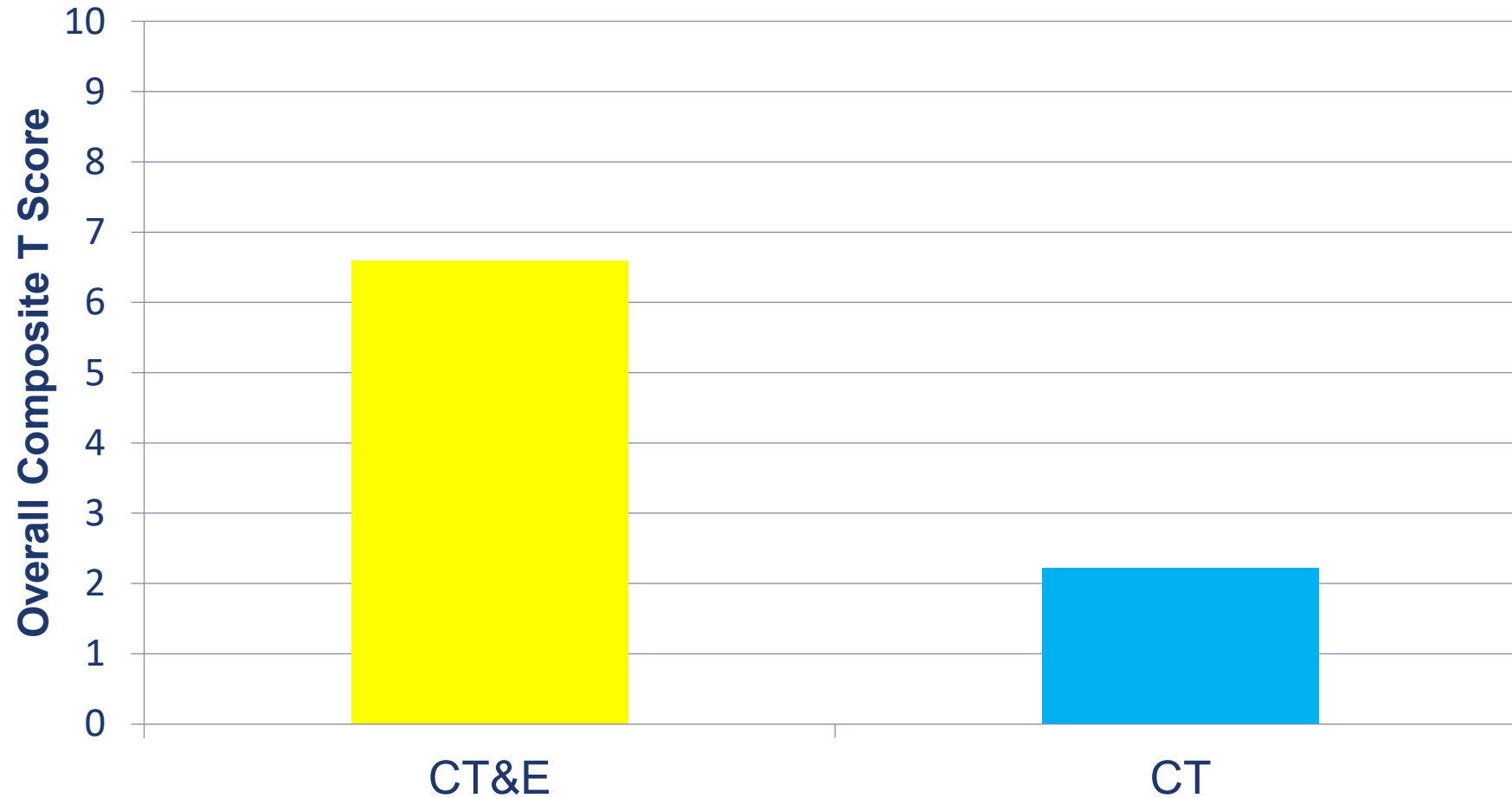
Is Cognitive Gain Predictive of Role Functioning Gain? – Yes!



...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 ($r=.33$, $p<.07$)

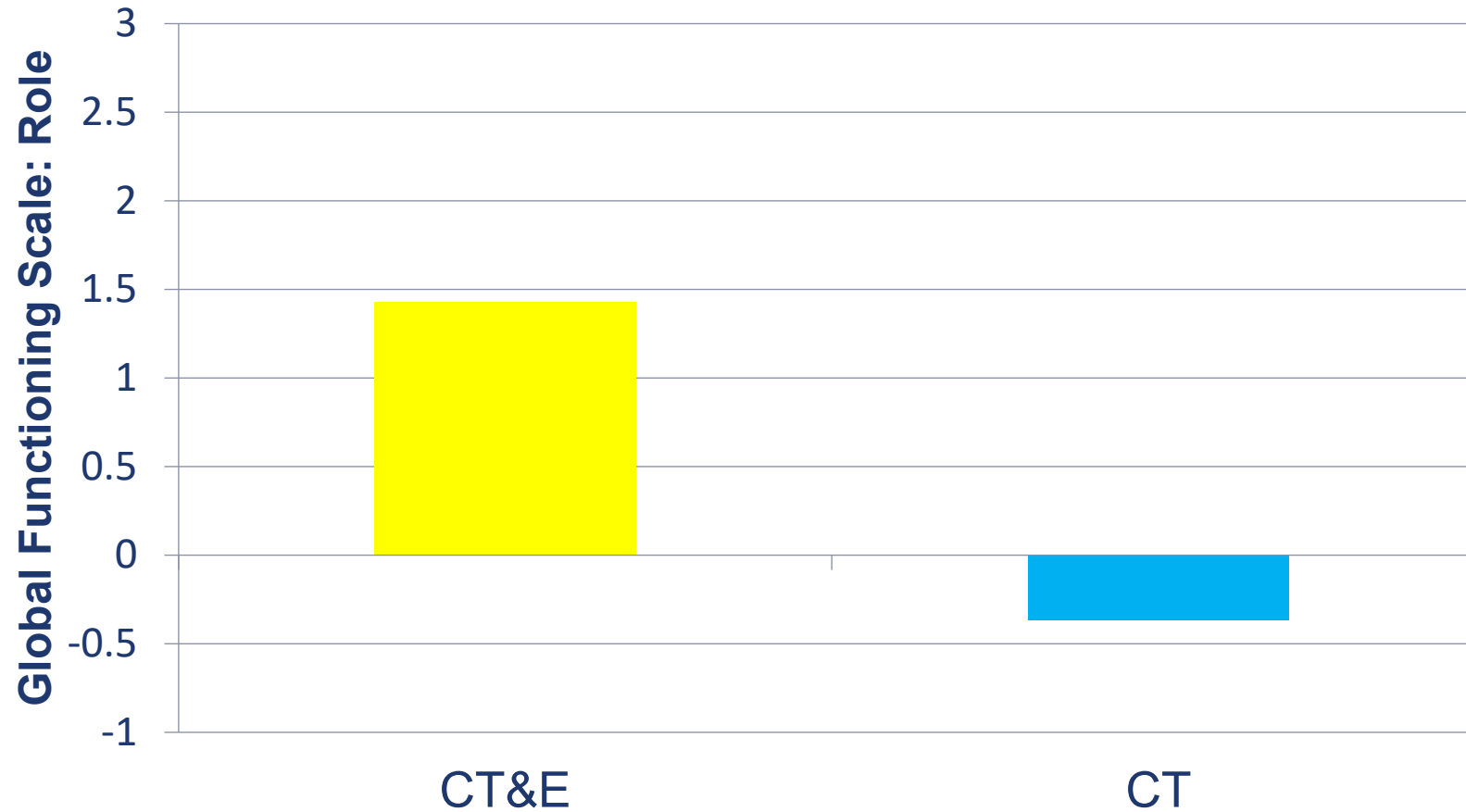
Exercise Enhances the Impact of Cognitive Training on Cognition in First Episode Schizophrenia within 3 Months (N = 47)



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

Nuechterlein et al 2016

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



$F(1,28.9)=16.01, p<.01, \text{effect size Cohen's } f =.49$

Nuechterlein et al 2020

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

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

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

Social Interaction



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)

- 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

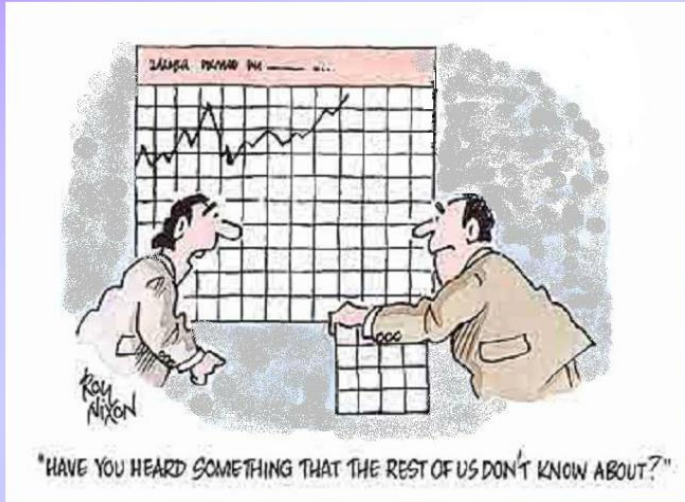
Mirroring



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)

Social Cognition



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

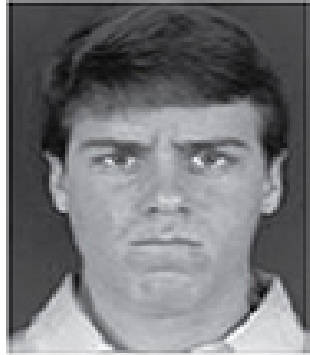


There are clear and consistent relationships between social cognition and community functioning

- 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



Emotion perception
Social perception

Conclusion:
"My co-worker is
angry."

Attribution:
"My co-worker is
angry with me."

Behavior:
Acting unfriendly
toward co-worker.

Attributional style

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

Social Cognition



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?

Patient Examples:	Informant Examples:
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Patient								Informant								Composite							
N/A	1	2	3	4	5	6	7	N/A	1	2	3	4	5	6	7	N/A	1	2	3	4	5	6	7

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Computer-based Social Cognition Training is Available



SocialVille



brainHQ | help

TRAINING

PROGRESS

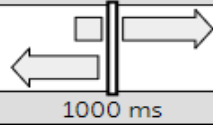
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2



Read facial expressions faster >>



SocialVille



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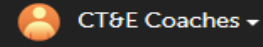
help

TRAINING

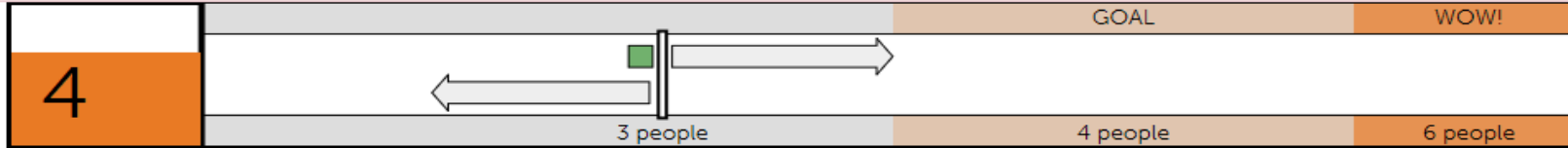
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He lives in Portland.

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



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THANK YOU

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

