

A photograph of a forest with a stream, used as a background for the text. The forest is lush with green trees and foliage, and a small stream flows through the center of the scene. The text is overlaid on the image in a bold, black font.

# Nature as a Resource for Promoting Self-Regulation

Dr. Julia Torquati  
Buffett Community Chair in Infant Mental Health  
UNL Department of Child, Youth and Family Studies  
[jtorquati1@unl.edu](mailto:jtorquati1@unl.edu)  
@jtorquati1

# Overview

- How does nature influence executive functions?
- How does nature affect self-regulation?
- General practices supporting self-regulation
- Dramatic play and representation
- Coaching attention, inhibitory control, self-regulation
- Time in unstructured activity

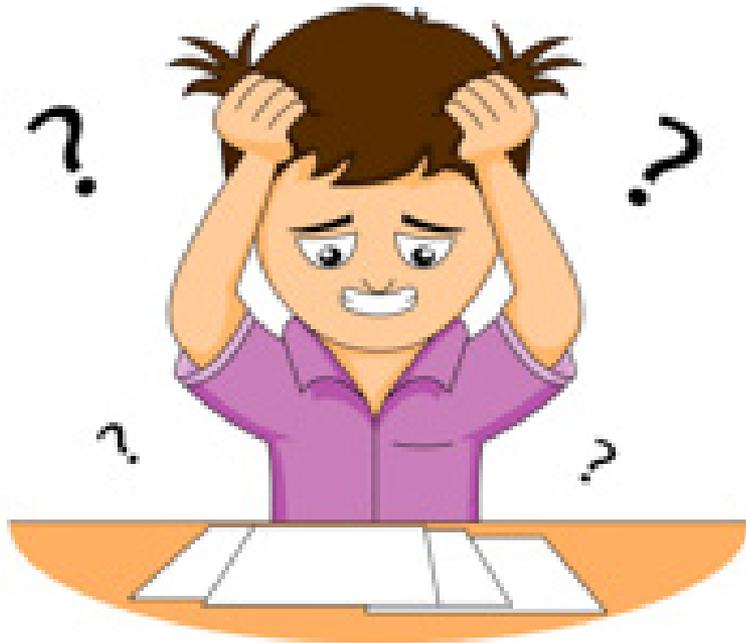
# How does nature promote human well-being?

- Stress Reduction Theory – Mental Health
- Immune function pathways – Physical Health
- Behavioral pathways – Physical Activity
- Social pathways – Social cohesion & support
- Attention Restoration Theory



# Two Attentional Systems

**Directed Attention**

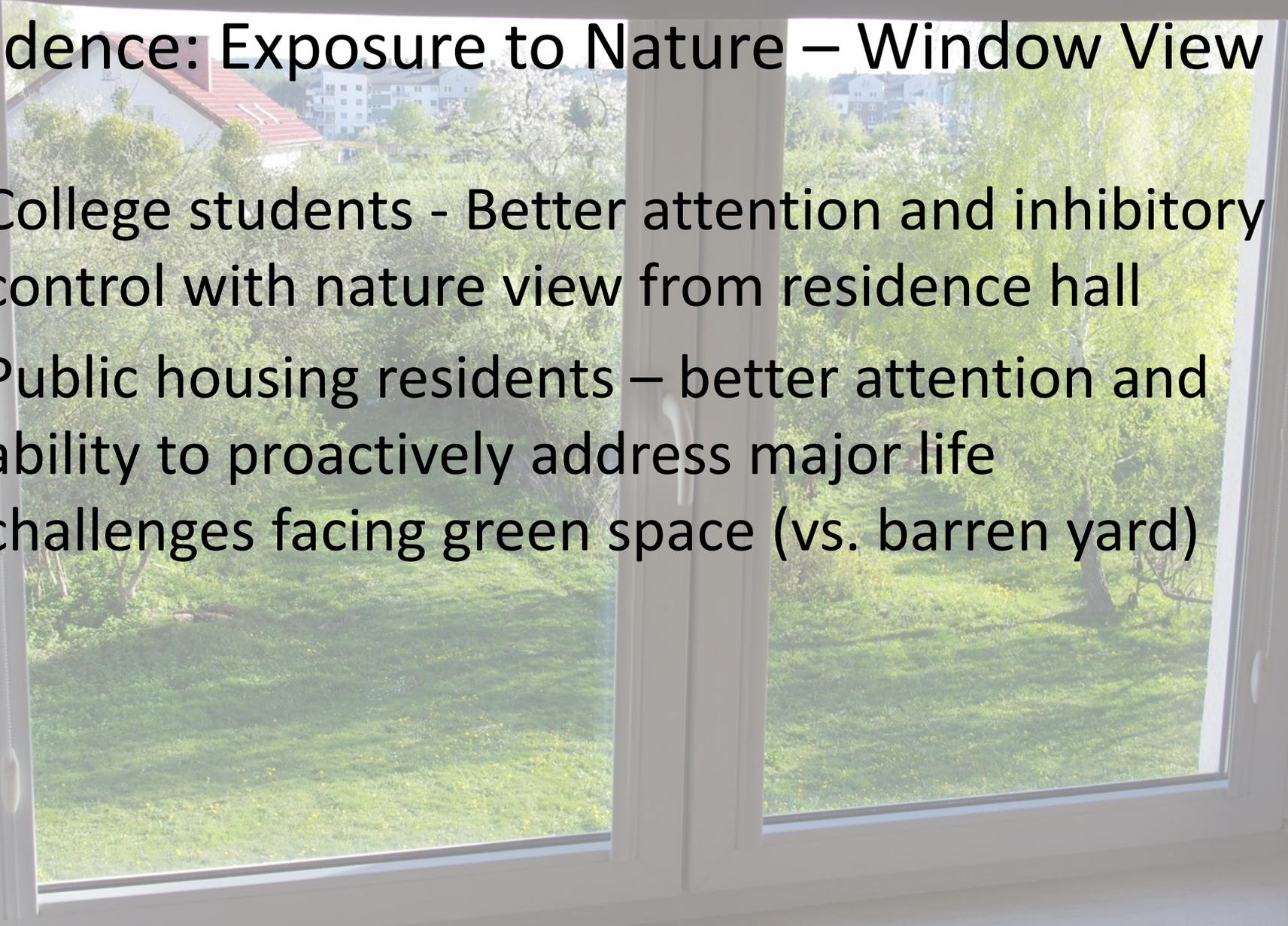


**Fascination**



## Evidence: Exposure to Nature – Window View

- College students - Better attention and inhibitory control with nature view from residence hall
- Public housing residents – better attention and ability to proactively address major life challenges facing green space (vs. barren yard)



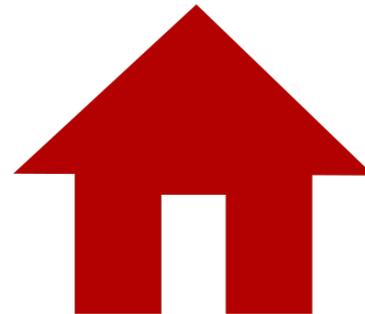
# Children's Views of Nature from Home

Girls ages 7-12 with a natural view had better concentration, impulse control, and delay of gratification than girls without a natural view (Faber Taylor, Kuo, & Sullivan, 2002)



# Children's Views of Nature from Home

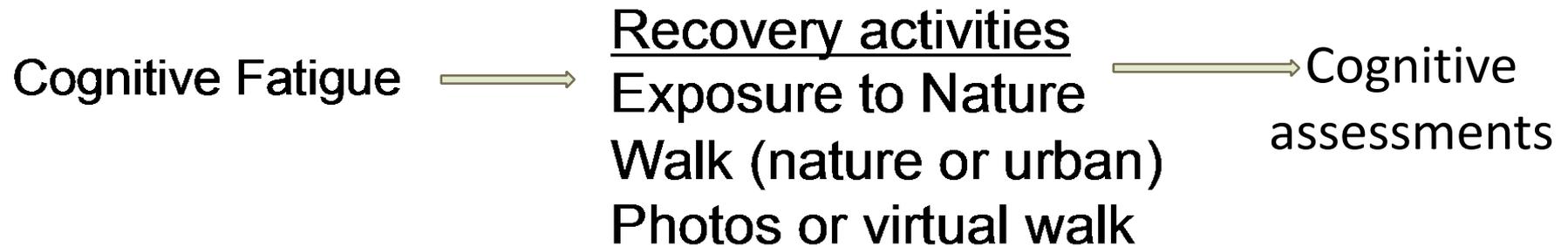
Parents of children who moved from homes with “less green” to “more green” surroundings reported fewer ADHD symptoms post-move (Wells, 2000).



# Research in School Contexts

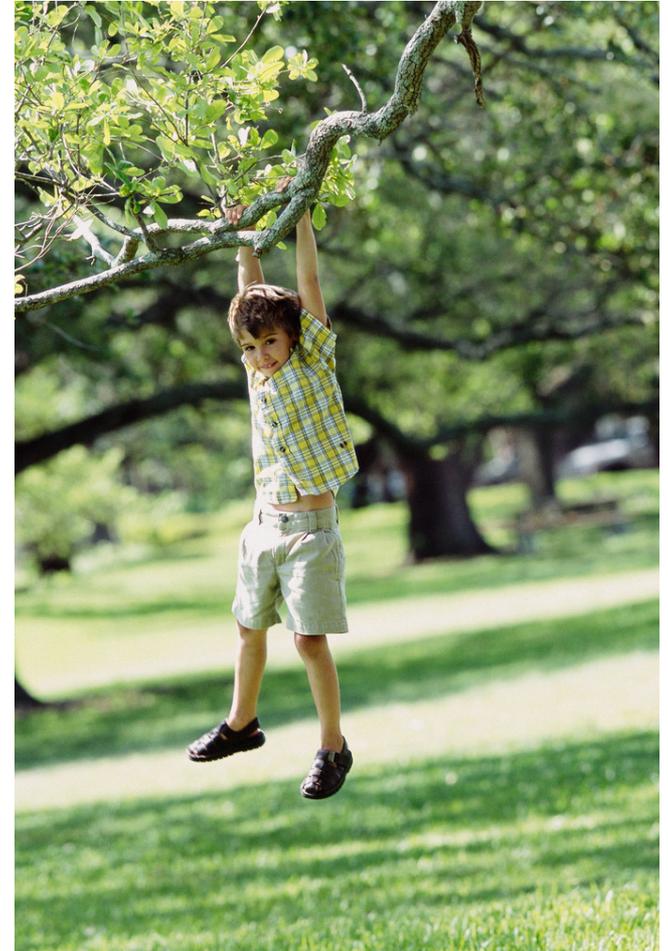
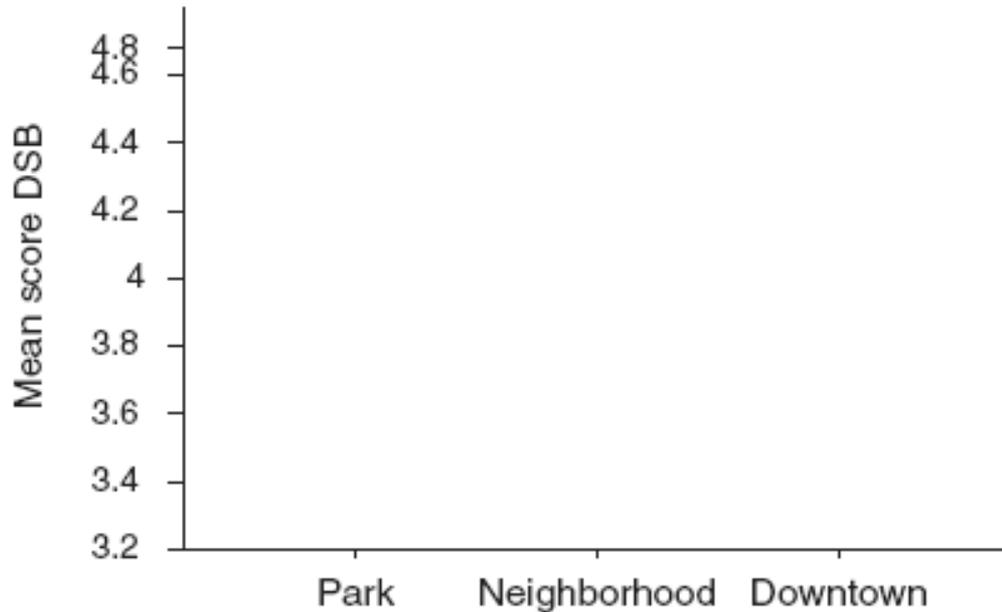
- High school students' window view
  - Better performance on attention tasks
- Comparison of 56 Canadian schoolyards before & after “greening”
  - More physical activity
  - More prosocial behavior, less hierarchical play
- 3 Middle schools in Austria before & after “greening”
  - Decreased physiological stress and increased psychological well-being
- Boston schoolyard initiative
  - Significantly improved standardized test scores

# Attention Restoration: Three-Phase Research Paradigm



# Nature Walk Study: Children diagnosed with ADHD

Mean Postwalk Scores on Digit Span Backwards for  
Park, Neighborhood, and Downtown Conditions



Taylor & Kuo, 2009, Figure 1

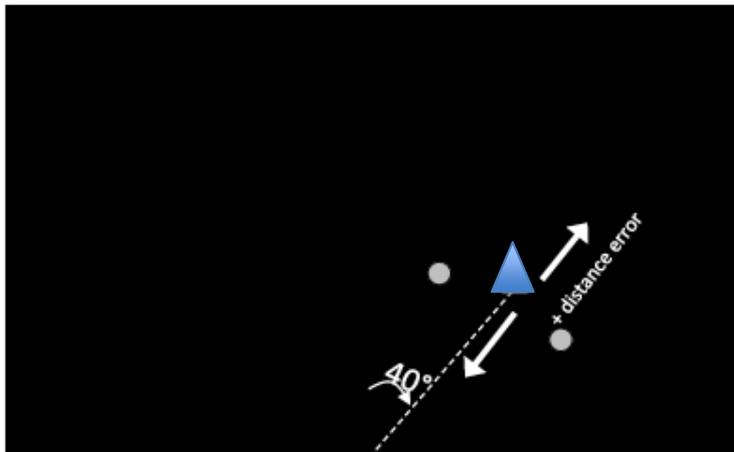
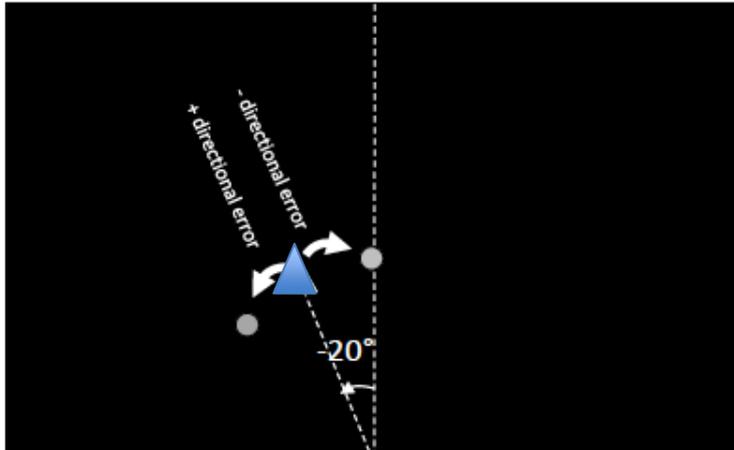
# Two studies examining executive functions

1. Comparison of cognitive performance after nature & urban walks
  - Do benefits of nature extend to children **NOT diagnosed with ADHD?**
  - Do benefits extend to **other executive functions?**
  - Working memory, spatial working memory, inhibitory control
  - Do benefits extend to **preschool-aged children?**
2. Comparison of cognitive performance **while** indoors & outdoors

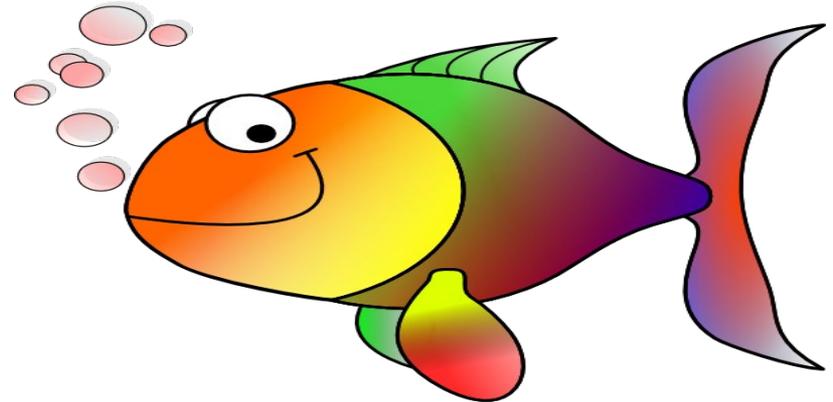
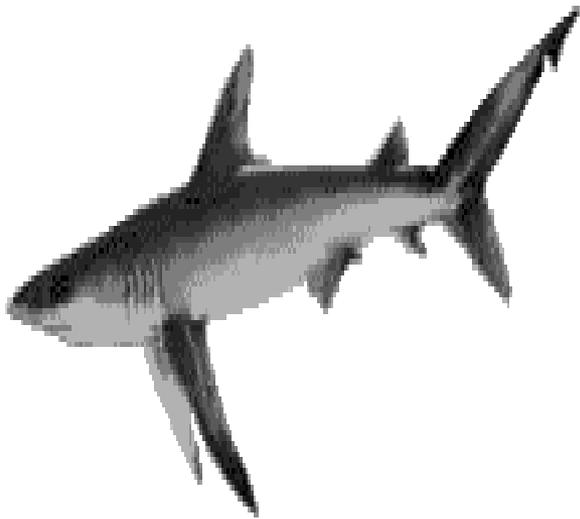
# Common Measures for Both Studies

- Spatial working memory
- Verbal working memory
- Inhibitory control
- Sustained attention

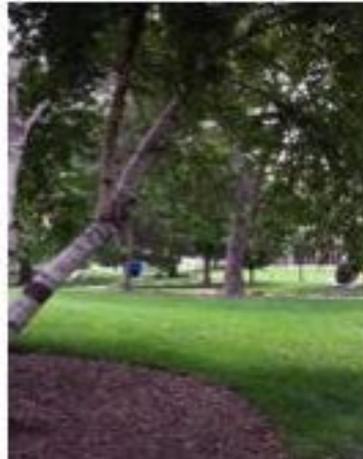
# Spatial Working Memory



# Inhibitory Control: Go/No-go (GNG) Sustained Attention: Continuous Performance Task (CPT)



# Impact of Urban Nature on Executive Functioning in Early and Middle Childhood (Schutte, Torquati, & Beattie, 2015)



- Typically developing 4-5 and 7-8 year old children
- Preschoolers' spatial working memory more accurate after nature walk
- Attention measure – shorter reaction time after nature walk

# **Attentional Demands of Executive Function Tasks in Indoor and Outdoor Settings: Behavioral and Neurological Evidence**

(Torquati, Schutte, & Kiat, 2017)

- 10 Children ages 6-11 years (M=9.3; SD=1.5)
- 2 sessions, counterbalanced: indoors, outdoors
- Spatial working memory, working memory, CPT, GNG
- Continuous EEG; analyzed Event-Related Potentials (ERPs)
- Salivary Cortisol

# Results: Indoors vs. Outdoors

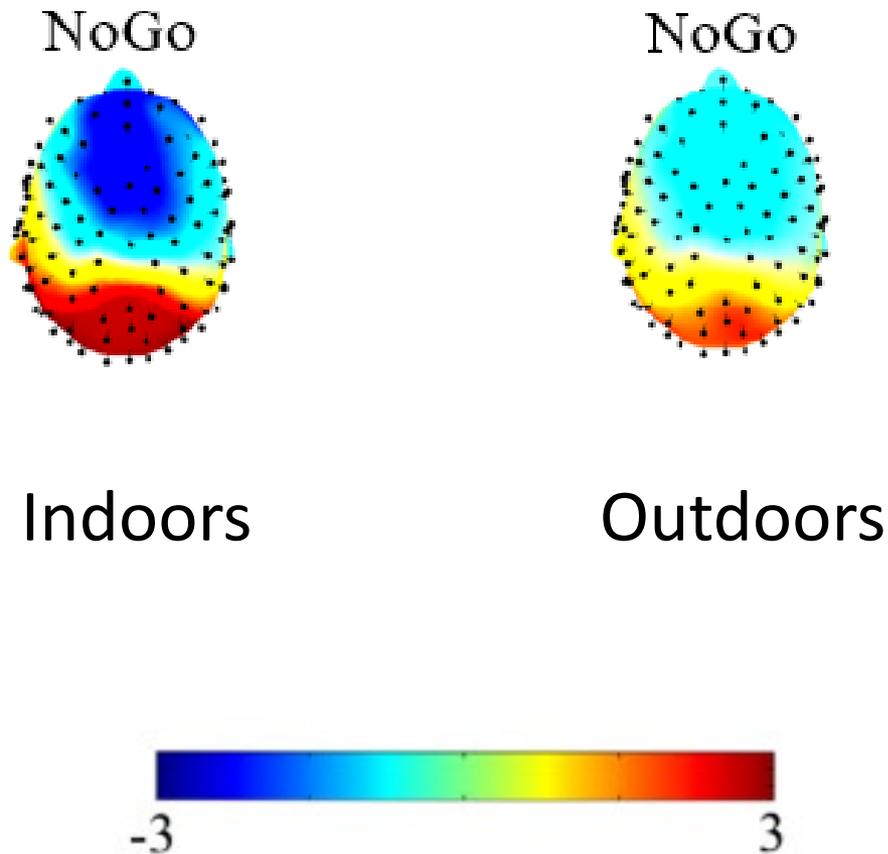
- No significant differences in working memory (Digit Span Backwards)
- No significant differences in cortisol concentration
- Better performance on spatial working memory outdoors

# Results: Attention & Inhibitory Control

- No significant differences in attention (CPT) or inhibitory control (GNG)
- Differences in neurological activity indoors vs. outdoors on measures of attention & inhibitory control
  - N100 ERP: Early perceptual response
  - P300 ERP: Later cognitive processing, comparing stimulus to representation in memory (same? Different? Response needed?)



# Comparison of **CPT N100** ERP Indoors & Outdoors



# Summary of Cognitive Benefits of Nature – Study 2

- Some benefits to attention and spatial working memory for children **NOT diagnosed with ADHD**
- Better spatial working memory **while outdoors**
- No differences in performance on tasks assessing inhibitory control or sustained attention
- However, ERP analysis indicated that **less effort was required outdoors** (smaller amplitude) to achieve the same level of performance

# Self-Regulation

- Is Holistic!
  - Managing emotions, cognitions, behaviors within context
  - Role of neurological maturation
- Requires practice, teaching, scaffolding
- Takes time to consolidate skills
- Proceeds from co-regulation to self-regulation

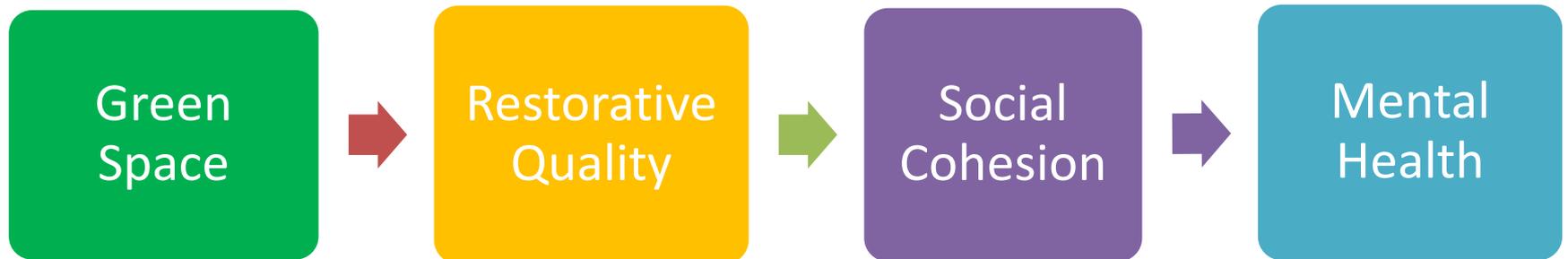
# Effects of Nature on Self-Regulation: Stress Recovery Theory

- Hospital patients facing window with brick wall or view of nature
  - Shorter post-op hospitalization, less pain med
- Lower blood pressure, less anxiety in dental office with aquarium
- Natural view from prison cell → fewer infirmary visits, fewer stress symptoms

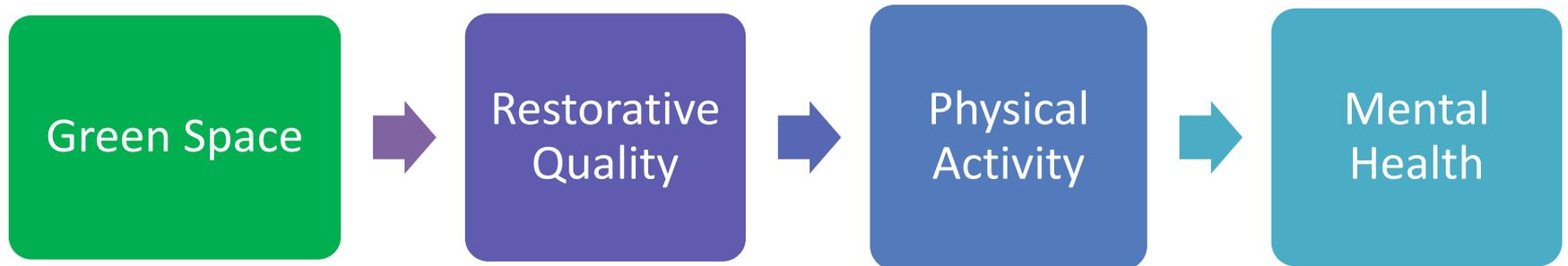
# Effects of Nature on Self-Regulation: Stress Recovery Theory

- Lower occupational stress for workers with a natural window view

# Urban Residential Green Space and Youth Mental Health



# Urban Residential Green Space and Youth Mental Health



# Nature effects on parasympathetic nervous system

## Urban Scene

Amygdala

Impulsivity  
Anxiety

## Nature Scene

Anterior cingulate  
Insula

Empathy  
Altruism

# Connection to Nature and Self-Regulation



# Comparison of Nature & Non Nature-Based Preschools

Children in nature-based preschools demonstrated greater:

- Curiosity
- Creative thinking
- Resilience
  - Initiative
  - Self-regulation

# General Practices Supporting Self-Regulation

- Predictability, routines
- Clear expectations
- Emotional & physical security
- Promoting autonomy (trust, choices, respect)
- Engagement in meaningful activities
- Positive direction

# Clear Expectations, Explanations, & Positive Direction

- Stay behind the backpack
- Feet on the trail
- Respect animals' homes

T: "we're going by the ravine today and where do our people feet need to be?"

Ch: "Trail!"

T: "You're stepping on our animal friends; we need to be respectful."

T: "If we keep our voices turned down, we may see some wildlife"

# Songs

- Keep your feet on the trail, on the trail! (if you're happy and you know it)
- Eyes on me, on me!
- Everybody find a hand to hold, hand to hold, hand to hold, everybody find a hand to hold so we can cross the street! (wheels on the bus)

# How does Dramatic Play Promote Self-Regulation?

Bodrova, Germeroth & Leong on Vygotsky and Elkonin:

“...children create an imaginary situation, take on and act out roles, and follow a set of rules determined by these specific roles.”

“Play requires that players observe and restrain themselves.”

# Dramatic Representation

- Be a sandwich

“You’re falling out of the sandwich! Come on up here and be the ham and the pickles!”

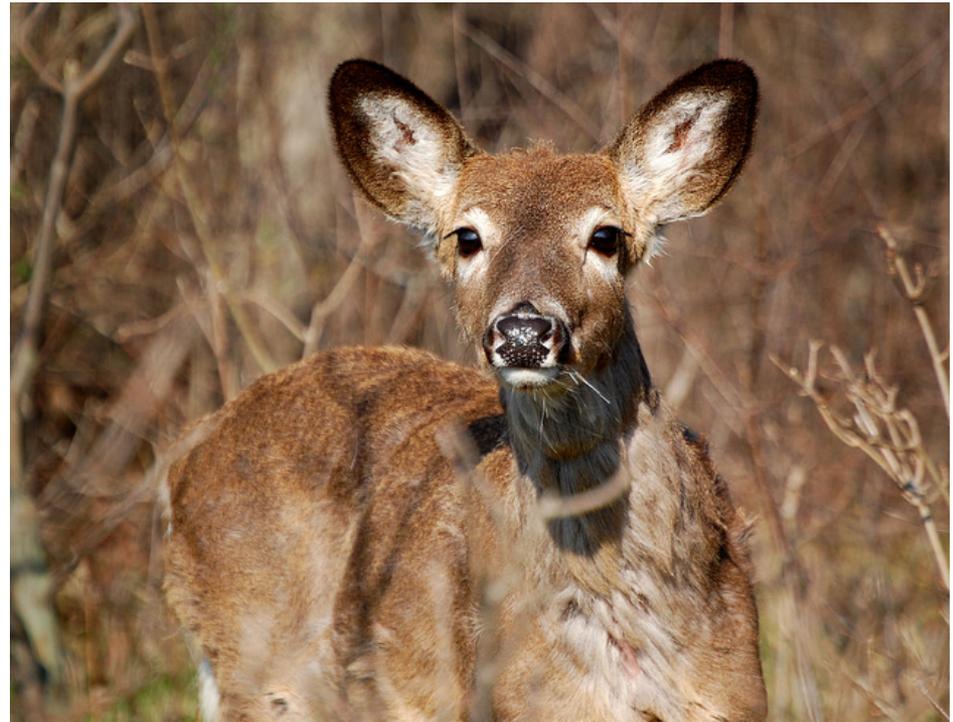
- Be a fox

“Why does a fox have big ears? Why is a fox quiet? Let’s be quiet foxes.” (quiet fox gesture)

# Dramatic Representation

- Be a deer

“Why is a deer quiet? Do you want to be a buck or a doe? Everyone go single file like deer, and put your right hand on the railing; everyone show me your right hand!”





“Put on your deer ears – listen to the lake. Does it sound like there are big waves today or little waves?”



“Be a tree – grow your roots! Down, down, feet stuck to the ground! Grow your branches! Opposite! Alternating! Opposite! Alternating!”



# Dramatic Representation

T: “What does the yellow bridge tell the drivers? It tells the drivers that this is a pedestrian crossing, and they have to go slowly and watch for people walking.”

T: “Open your eyes and ears; how many steps do you think it will take to get across the bridge?”

“Put on your science eyes, and your listening ears, and turn your voices off because guess what? Nature has a lot of things to tell us today.”



# Dramatic Representation in Transitions

“Move s-l-o-w-l-y to the tables; see how slow I’m moving? Slow, like the slowest turtle, and find your place.”



# Games:

## The Camouflage Game

- T1: you need to be able to see me, that's rule number one.
- T2: The bunny would want to know where the coyote is, because it wouldn't want to get surprised by the coyote.
- T1: The prey want to know where the predator is, so keep your eyes on me all the time. Even if I can't see you, you need to see me. Do you think the coyote would be able to see 10 bunnies all piled up?
- Ch: YES!

# Games

- Mrs. Robin
- Migrate, Hibernate, Activate



# The Chlorophyll Game



# Owl & Mice



# Coaching Attention and Inhibitory Control



“Close your eyes and listen carefully, then we’ll talk about what we heard. Let’s keep our voices quiet, open up your ears, and we’ll hear the waterfall today. Put your lips together, listen for a moment, we’ll hear some very special things. We can share our thoughts after.”

“If you hear the waterfall, put one finger up; if you hear a bird, put another finger up; if you hear children’s voices (from another group) put another finger up; if you hear the wind, put another finger up. When you have used all your fingers you can put them in your lap and just use your ears.”

“Use your eyes to tell your feet where to go. What do you see here?”

“Be sure you are aware of where your feet are going.”

“Put your walking feet on—walk don’t run. The hill makes our bodies go fast, so we need to walk, walk, walk.”

“Put your hand on something that has chlorophyll.”

# Unstructured time in nature supports executive function, self-regulation





























“If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement, and mystery of the world we live in.”

~ Rachel Carson