A New Prescription:

Exercise and the Groundbreaking Techniques for the Treatment of ADHD, Aggression, and Autism Spectrum Disorder.

***Beta-blockers Today***


- Bodner KE, Beversdorf DQ, Saklayen SS, Christ SE. J Int Neuropsychol Soc. 2012 May;18(3):556-64. Individuals with ASD performed more poorly than non-ASD individuals in the working memory condition. Importantly, administration of propranolol attenuated this impairment, with the ASD group performing significantly better in the propranolol condition than the placebo condition.

- Beversdorf DQ, Carpenter AL, Miller RF, Cios JS, Hillier A. Effect of propranolol on verbal problem solving in autism spectrum disorder. Neurocase. 2008;14(4):378-83. **ASD subjects benefited from propranolol on simple anagrams, whereas control subjects were impaired by propranolol.**

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**Muscle Spindles Activated by B-receptor**

- Epinephrine causes an increase in muscle tension; readying the person to react to a threat.
- B-blockers block the receptor to decrease the body’s arousal peripherally.
Phenomenon

- Woodland Elementary School
  2005 Fall
  PE one day per week / 50 minutes.
  2006 Jan - June
  PE4life Program
  Five days a week / 45 minutes.

- Inner city school with
  80% of kids on free lunch program

- PE4Life added
  Cardiac monitored watches,
  Dance Dance Revolution,
  A few exercise bicycles/fitness
  machines.

AND A NEW ATTITUDE

PE4life Programs help Reduce Disciplinary Incidents!

Major reduction of disciplinary issues in Woodland Elementary, (KCMO) site of a PE4life program

Out of School Suspension Days

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referrals</td>
<td>392</td>
<td>1177</td>
</tr>
<tr>
<td>Suspension Days</td>
<td>94</td>
<td>228</td>
</tr>
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</table>

66% reduction

59% reduction

After 1 YR of PE4life Program  Pre PE4life

PE4life has had a tremendous influence on the lives of our students. Students are also more motivated throughout the day, their enthusiasm is way up, and the discipline issues are way down.  - Craig Rupert, Principal, Woodland Elementary School

CHARLESTON PROGRESSIVE ACADEMY
EXERCISE IMPACTS SELF-CONTROL

Public Magnet School  Grades 4-8  Approximately 120 children
All on school breakfast and lunch programs.
Program: Added 40 minutes of exercise in the morning
  Exercise was performed in gym in station format.

Activities included:
  Basketball  Dance  Dance Revolution
  Double Dutch’ jump roping  Pogo stick jumping

1st Semester 2006 - 2007 Outcomes: Disciplinary Referrals

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<th>Year</th>
<th>2006</th>
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<tbody>
<tr>
<td>Referrals</td>
<td>661</td>
<td>353</td>
</tr>
<tr>
<td>Suspensions</td>
<td>71</td>
<td>24</td>
</tr>
</tbody>
</table>

Teachers reported:
  Students are more focused. Students are more focused during the MAP
  (Measure of Academic Progress) testing as well.

Teachers observed:
  Students testing immediately after morning activities did better — meeting or exceeding
  individual growth targets — than middle scholars taking the test late morning or in the afternoon.

BRAIN GAINS
City Park Collegiate, Saskatoon, Saskatchewan

20 minutes/daily, 65-75% MHR, 4 months
All students ran after teacher began as well

Student 1- life changing— reading comprehension 400%
Student 2- Controlled anger, ODD, improved 25% in all.

Grade 8

GO TO
WWW.JOHNRATEY.COM
Press PRESS- then Video-
first one
Time In versus Time Out

The Power of PLAY

Play evolved – to promote survival. Play makes the brain smarter - more adaptable - higher animals.

Play is the basis of social contact and group interaction - fostering empathy – The core of creativity and innovation.

Play gives us the ability to become smarter and more creative, to learn more about the world than the genes could ever teach, to adapt to a changing world.

In a world of continuously presenting unique challenges and ambiguities. Play Prepares the Player to cope with the evolving planet.

The more recess… the better behaved and attentive the student or worker.

IN THE MOMENT

The species with the biggest brain size play the most. Humans should never stop!

Play: How it Shapes the Brain, Opens Imagination, and Invigorates the Soul (2009)

Play prepares the player, to cope with the unique challenges and ambiguities of a world that is continuously changing. Play is necessary to keep our major brain systems synchronize.

The period when maximum play occurs - Ages 3-7 yrs is also the period of the most rapid growth of the cerebellum.
Stuart Brown describes the pictures of a wild starving, male, polar bear entering the area where a group of huskies were waiting. The photographer was sure that he was going to see the end of his huskies as this 1200 lb polar bear had not eaten in 4 months., BUT

Shortly, before the Husky was in a crouched bow with tail wagging ready to play

**Animals at Play**

**The Prefrontal Cortex**

**Major Role in Executive Function**

- EXERCISE particularly affects our Executive Function
  - Planning
  - Organization
  - Initiate or delay a response
  - Consequence evaluation
  - Learning from mistakes
  - Maintain the focus
  - Working Memory

- Dysfunction in these areas leads to disruption in the organization and control of behavior

Electronic Media:

Schools with the highest usage of electronic media – TVs, movies, computers – scored the highest on “non promoting of physical activity.

In schools with more fixed playground equipment, children were less active.
In schools with more portable equipment, i.e. balls and tricycles, children were more active.


The Polar Bears returned every night that week to play with the dogs.

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http://www.driesen.com/prefrontal_cortex.htm
Cerebellum: mood, schiz, autism

Vermis: a midline region of the cerebellum.
In a recent study, 33% of children with ADHD had Coordination Problems.

**Motor Problems Predict Severity**

- 159 ASD kids (14-33 months) relationship of fine and gross motor skills and social communicative skills. Fine motor and gross motor skills significantly predicted autism severity ($p < .05$).
- Children with weaker motor skills have greater social communicative skill deficits.
- Working on motor skill with balance training and many different types of exercise has positive effect and outcome.
Dance

- 16 higher functioning ASD students had an hour once a week for 7 weeks and used a comparison group with no change in their treatment.
- Dance Therapy with mirroring movements
- Improved
- Self-esteem
- Body Awareness
- Social Skills


Positive Exercise engagement

- Prior exercise- in 2 cases- reduced stereotypic behaviors
- The duration of the exercise was based on the pre-assigned criteria for satiation in consultation with the child’s therapist.
- This leads to the possibility of testing to see how much exercise is useful
- Led to increased on-task behavior and task completion as well as a decrease in stereotypic behavior
- Jumping on a trampoline until satiated- mean time was 9 minutes for the 11yr old and 6 min for the 7 yr old


Exercise has an effect to increase life forces in 4 ways:
1. Synaptic plasticity
2. Neurogenesis
3. Collateral circulation,
4. Also improves HBP, diabetes, obesity, other risk factors

BDNF

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EXERCISE PILLS

EXERCISE!
BDNF and Anxiety, 2017

• Mechanistic studies in adult animals have demonstrated a link between anxiety, 5-HT, and brain-derived neurotrophic factor (BDNF), a major neurotrophic factor that undergoes elevated expression during the periadolescent period.

• For example, SSRI administration increases the expression of BDNF in cortical and limbic brain regions, and BDNF is required for the anxiolytic and antidepressant actions of these agents.

• BDNF is also a critical neurotrophic factor for the development and function of the 5-HT neurotransmitter system, and mutant rodent models with reduced BDNF signaling display increased anxiety behaviors.

• May have life long anxiolytic effects on the 5-HT system.

Norepinephrine

DOPAMINE

SEROTONIN

Neurotransmitters
Neurons are specialized cells in the brain that receive and transmit messages through biochemicals called neurotransmitters.

Build More NTs and Receptors
The brain is a muscle.
More GABA puts the breaks on!

Exercise increased prepro-galanin mRNA expression in the locus coeruleus.

Exercise sessions that were not injected (bradykinin) exhibit increased (a) cortical density of prepro-galanin mRNA in the locus coeruleus compared to sedentary controls. Supporting the long duration of exposure required to increase cortical density of prepro-galanin mRNA in the locus coeruleus was positively correlated with distance run at 4 weeks. (b) Cortical density for prepro-galanin mRNA in the locus coeruleus was not significant between groups.

522 papers mostly in last 10 years on the effect of exercise on GABA levels to act as a regulator on the brain getting too overwhelmed.

Brings about equilibrium and protection of cells and circuits.

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Yoga increases GABA

There is a low level of GABA activity in both Anxiety and Depression. As well as Chronic Stress and PTSD. Exercise and Yoga both increase the level of GABA in the Hippocampus.

There was an acute increase in thalamic GABA levels immediately after the 60-min yoga session. These increases in thalamic GABA levels in the yoga group were positively correlated with improved mood and decreased anxiety. There were no significant changes in GABA levels in the walking group.

Yoga and ASD

- Twenty-four (24) children aged 3–16 years
- Intervention: The efficacy of an 8-week multimodal yoga, dance, and music therapy program based on the relaxation response (RR) was developed and examined.
  - Many positive changes on scales measuring general behavior, including aggression, attention, and adaptive skills.
ENDORPHINS

ENDOCANNABINOIDs

Diagrams and images showing the relationship between endorphins, endocannabinoids, and neurotransmitters like dopamine (DA), glutamate (GLU), GABA, and oxytocin. The text reads:

Did you know that a twenty-second hug releases the bonding hormone and neurotransmitter oxytocin, which is nature’s antidepressant and antianxiety.
Exercise treats panic by Atrial Natriuretic Peptide (ANP)

2 days – 10 pts tested
30 min exercise or “30 min “rest”

• Given CCK4, (Cholecystokinin-tetrapeptide) to induce panic, 10 minutes after exercise or rest
• In exercise panic scores (API) were reduced and correlated with rise in ANP

Kynurenine and Depression

Depression is no longer just one or two factors, but a chaotic complex system change that needs a reset. It is not just a problem with neurotransmitters, but dysregulation of the stress system (dysregulation of the HPA), change in the immune-inflammatory pathways, mitochondrial changes, growth factor changes, and increased oxidative changes. A simple way to look at it as the forces of erosion in the brain have gained an upper hand on the forces of growth. Neuroplasticity is stopped.

Panel B shows that exercise prevents crossing of Kynurenine into the brain

Neuropeptide Y=NPY

Memory  Mood  Anxiety  Addictions  Aging

Seizure inhibition  Neuroprotection  Antinociceptive effects
How Far Do I have to Run Today?

Exercise & Learning

The JACK Effect

DOPAMINE
ENDORPHINS
ENDOCANNABINOIDS
BDNF
GABA
SEROTONIN
MICHAEL PHELPS OFF RITALIN

At age 9, Michael was put on Ritalin, a stimulant used to treat hyperactivity. His mother thinks it helped a little. He seemed to be able to focus longer, he could get through homework without moving around so much. She said he was still a middling student. It might have raised some C’s to B’s, she said. But if a homework assignment had to be at least four sentences, she said, He’d just do four sentences. After two years, Michael asked to get off the meds. He had to go to the school nurse’s office to take a pill at lunch, she said, and felt stigmatized. Just out of the blue, he said to me: I don’t want to do this anymore, Mom. After consulting with the Dr., Michael stopped medication. In the meantime, Michael the swimmer had appeared. By 10, he was ranked nationally in his age group. Ms. Phelps watched the boy who couldn’t sit still at school sit for four hours at a meet waiting to swim his five minutes’ worth of races.

At age 12 Michael needed an algebra tutor, and was so antsy in school that his mother suggested the teacher sit him at a table in the back. And yet he willingly got up at 6:30 daily for 90-minute morning practices and swam 2 to 3 hours every afternoon.

Chongqing 28 million people

When the Dog walker did not show up