

DEVICE A CLEMENT OF CHERREN CHEREN CHERREN CHERREN CHERREN CHERREN CHERREN CHERREN CHERREN CHE

EXERCISE is like taking

a little Prozac & a little Adderall



Neurotransmitters

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

Neurotransmitters cross gaps, or synapses, between neurons, and attach to receptors. Drugs can alter mood or behavior by blocking these receptors.

neurotransmitter

0

0

receptors

reuptake receptor

2005 Duplication not permittee

synapse



NOREPINEPHRINE

- Aerobic exercise increases brain Norepinephrine
- Also known as noradrenalin, neurotransmitter found in sympathetic nervous system which stimulates the heart, bloods vessels, sweat glands, large internal organs and adrenal medulla in the brain.
- **Norepinephrine :** Has a stimulating effect, fosters alertness, plays an important regulatory role in long-term memory and learning. Protects endorphins from being broken down prematurely.

Optimal levels stimulate a sense of wellbeing or even create a euphoric effect in stressful situations.

- Improved Attention, Arousal, Energy, Drive and Vigilance
- Improved Emotions and Mood
- Sleep and Dreaming
- Improved Self- Esteem
- Improved Perception
- Improved Cellular Learning

NOREPINEPHRINE



Norepinephrine, along with dopamine, plays a large role in attention and focus. Psychostimulants medications Ritalin/Concerta, Dexedrine and Adderall prescribed to help increase levels of norepnephrine and dopamine. Strattera affects only norepinephrine.

DEPRESSION

Differences in the norepinephrine system implicated in depression Serotonin-norephephrine reuptake inhibitors are antidepressants treat by increasing the amount of serotonin and norephinephrine available to postsysnapic cells in brain.

Exercise & Dopamine

• **Exercise** DA Synthesis, Release, and Reuptake Increased Dopamine activity during motor behavior The greater the exercise intensity the greater the increase of dopamine

Regular Exercise

Increases amount of enzymes that make DA Alters the action of DA at the postsynaptic site





Serotonin & Well-Being

Serotonin, a monamine neurotransmitter - biosynthesized in the body from the amino acid tryptophan.

Serotonin can also be consumed orally, is present in foods such as

meat, fruit, nuts, and a variety of vegetables.

However, serotonin taken into the body through dietary sources remains solely in the bloodstream, never entering into the serotonin pathways of the brain.

Within the brain, serotonin is associated with a variety of important centers, including those that control appetite, memory, sleep, and learning.

Serotonin is also closely associated with feelings of well being, acting in conjunction with endorphins, GABA, and dopamine to generate the biological process known as the reward cascade.

In fact, many pharmaceuticals designed to fight depression, bipolar disorder, and a number of other mood-related conditions function by stimulating serotonin production or inhibiting its uptake.



Acute and chronic exercise increases brain 5-HT

Serotonin linked to: Mood Regulation Impulse Control Self Esteem Combats toxic effects of high levels of stress hormone Improved cellular learning



ENDORPHINS

Candace Pert of Johns Hopkins University

Discovered Opiate Receptors : The body's built-in way of killing pain with molecules that work like morphine. Endorphins :

Dull pain in the body Produce euphoria in the mind. Exercise fills the brain with the morphine-like substance which parallels the good feelings known as 'runners high.'

- Endorphins are Stress Hormones Forty types of them, Receptors in brain and body, Calm the brain and Relieve muscle pain during strenuous exercise.
- Elixir of Heroism; Enables one to ignore pain when physically overextended
- Pain is related to Depression
- Endorphins produced by the body 'runners high' does not cross brain barrier
- Endorphins from the brain Produces the well-being that come from exercise.

Beta-Endorphins ENERCISE

- Endorphins increase during and after exercise in the body for sure, the brain's increase not so much!
- Runners high– after 45 minutes of full speed running
- Endorphins are the bodies morphine and are linked to:
 - Mood Regulation
 - Self Esteem
 - Improves pain threshold- valuable in the body
 - Reward, motivation, satisfaction hormone





- Increases levels of Dopamine and Norepinephrine Impacts Attention and Motivation:
- Increases levels of Dopamine and Serotonin
 Which activates frontal inhibitory structures that stop random, divergent thoughts and actions, and help control rapid-fire reactions - Impulsivity
- Increases levels of Serotonin and Norepinephrine Mood is more positive, Vigor is higher, Anxiety is lower, Self-esteem is higher
- Learned Helplessness is overcome somewhat: Improved resilience, better able to withstand stress and frustration, Improved self-confidence

Exercise as Treatment Exercise As Treatment

- Physically Active More Psychologically Stable and Healthier Than the Inactive
- Form of treatment for depression and anxiety
- Regular walking is prescribed some weight training has been used effectively.



Personal preference & enjoyment of modality appear to be important predictors of psychological outcomes.

Exercise is a 'healthy behavior' and counteracts depressive or anxious tendencies (Lethargy, Worrying, etc)

Exercise may help beat 'addictions'

Possible Pathways;

- Endorphin pathway
- Monoamine hypothesis
- Thermogenic Hypothesis
- Distraction Hypothesis
- Opponent Processes Hypothesis

Human Population Laboratory in Berkeley8,023 people fortwenty-six yearsAlameda Country Study - Life Style Habits and Healthiness"Changing your exercise habits changes your risk

Dutch Study 2006 of 19,288 twins Exercisers are Less Anxious. Less Depressed, Less Neurotic, And more Socially Outgoing"

Finnish Study 1999; 3,403 people ...Found Exercise at least two or three times a week and experience less Depression, Anger, Stress, and 'Cynical Distrust'

Columbia University : Department of Epidemiology; 2003 8,098 Subjects Studied Outcome: Inverse Relationship Between Exercise and Depression



3 supervised exercise sessions per week **for 16** consecutive weeks. Training ranges equivalent to 70% to 85% of heart rate reserve. **30 minutes of continuous cycle or brisk walking/jogging at 70-85% intensity**. Subjects were: Exercise (N = 25), Medication (N = 29), and Combination (N = 29) Observed mean depression scores before and after treatment. All changes from pretreatment to posttreatment were statistically significant (P<.001 for all). The treatment groups did not differ on baseline or posttreatment levels of depression. Error bars represent SEs. HAM-D indicates Hamilton Rating Scale for Depression; BDI, Beck Depression Inventory.

From: Blumenthal: Arch Intern Med, Volume 159(19).October 25, 1999.2349-2356

Zoloft versus Exercise at 6 months



Clinical status at 10 months (6 months after treatment) among patients who were remitted (N = 83) after 4 months of treatment in Exercise (N = 25), Medication (N = 29), and Combination (N = 29) groups. Compared with participants in the other conditions, those in the Exercise condition were more likely to be partially or fully recovered and were less likely to have relapsed.

Facts from duke study

- **Medication.** Subjects in this group received sertraline (Zoloft). Medication management was provided by a staff psychiatrist, who met with each patient at the beginning of the study and during weeks 2, 6, 10, 14, and 16. At these meetings, the psychiatrist evaluated treatment response and side effects and titrated the dosage accordingly. Treatment was initiated with 50 mg and titrated until a well-tolerated therapeutic dosage was achieved up to 200 mg.
- **Combined Exercise and Medication.** Subjects in the combination group received concurrently the same medication and exercise regimens described above.
- **Depression at 10 Months.** When all participants available at follow-up(133 (85.6%) of the original 156 enrolled patients) were considered self-reported depressive symptoms did not vary among persons initially assigned to the exercise (mean \pm SE = 8.9 \pm 0.77), medication (11.0 \pm 0.81), or combined exercise and medication (10.6 \pm 0.75) groups (p = .13). However, when interviewer ratings in which the presence of Major Depressive Disorder as defined as the presence of DSM-IV diagnosis or an Hamilton Rating Scale for Depression score >7 were used, it was found that participants in the exercise group exhibited lower rates of depression (30%) than participants in the medication (52%) and combined groups (55%) (p = .028).

Long Term Effects of Too Much



1 or J. Indicates direction of metabolic abnormality relative to control

Red arrows indicate volume changes caused by depression

DEPRESSION CAN BE THOUGHT DESTRESSION CAN BE THOUGHT OUT; NO MOVEMENT POSSIBLE AWAY FROM THE GLOOM AND DESPAIR. NO EXIT. GIVE UP.

BECOMES ALL ENCOMPASSING AND CAN OVERWHELM THE NATURAL REPAIR AND PROTECTIVE MECHANISM AND ERODE THE NERVE CELLS CONNECTIONOS AND BRANSHES, PREVENT REGROWTH AND SHUT DOWN THE PLASTICITY.

MIMICS AGING IN MANY WAYS IF ACTION IS NOT TAKEN.

Drop in Hamilton Depression Score After 16 Weeks



I. A. BLUMENTHAL et al.

Figure 4. Hamilton Depression Rating Scale (HAM-D) scores after 16 weeks of treatment using intention-to-treat analysis (left panel) and limited to patients who did not exhibit an early response (n = 183) (right panel). Probability estimates are for a patient with the most typical profile in the study: age 52 years, female, Caucasian, one prior major depressive episode, and a baseline HAM-D score of 17. Error bars represent 95% confidence limits. Planned contrasts for the HAM-D using intention-to-treat analysis yielded the following test results: all active treatment versus placebo, p = .231; all exercise versus medication, p = .574; supervised exercise versus home exercise, p = .624. After removing early responders, the contrast results were: all active treatment versus placebo, p = .123; all exercise versus medication, p = .514; supervised exercise versus home exercise, p = .510. Sup = supervised exercise; Med = medication; Plac = placebo.

Four Groups in Depression Study

a. Home based exercise program with instructions and check in

- **b. Supervised Exercised**
- c. Zoloft to 200 mg
- d. Placebo.

In the current study, both exercise and medication achieved higher remission rates compared with placebo; 45% of MDD patients undergoing supervised exercise, 40% undergoing home-based exercise, and 47% receiving medication were in remission after 16 weeks of treatment, compared with only 31% receiving placebo.

Blumenthal JA, Babyak MA, et al. Exercise and pharmacotherapy in the treatment of major depressive disorder. Psychosom Med. 2007 Sep-Oct;69(7):587-96.



Figure 1. Pre- to postexercise changes in tension by duration of exercise. Negative scores indicate a decrease. The vertical lines represent ± 1 SE.

Figure 4. Pre- to postexercise changes in vigor by duration of exercise. Negative scores indicate a decrease. The vertical lines represent ± 1 SE.

21 COLLEGE STUDENTS: 4 WEEKS- 1st week. SITTING FOR 30 MINUTES 2nd week. 10 MINUTES ON BIKE TO 60% OF Vmax 3rd week. 20 MINUTES ON BIKE TO 60% OF Vmax 4th week. 30 MINUTES ON BIKE TO 60% OF Vmax.





Figure 5. Pre- to postexercise changes in fatigue by duration of exercise. Negative scores indicate a decrease. The vertical lines represent ± 1 SE.

Figure 7. Pre- to postexercise changes in total mood by duration of exercise. Negative scores indicate a decrease. The vertical lines represent

30 min continuous (LB) VS 3/10 min (SB)



Fig. 2. Changes in the POMS vigor-activity from pre- to mid- and posttraining for the long-bout, short-bout, and control groups. $*P \le 0.05$, values significantly different from values before training.

K.B. Osei-Tutu, P.D. Campagna / Preventive Medicine 40 (2005) 92–98

Fig. 3. Changes in total mood disturbance from pre- to mid- and posttraining for the long-bout, short-bout, and control groups. $*P \le 0.05$, values significantly different from values before training.

Eight weeks of regular, long bouts of walking significantly enhance feelings of vigor and activity and significantly reduce feelings of tension and anxiety compared to both short-bout intermittent walking and no exercise at all. Accumulating 30 min of walking in three 10-min bouts is not sufficient to produce sustained significant reductions in feelings of tension and anxiety over time. Importantly, regular long bouts of exercise had an impact on mood compared to those who remained sedentary. This was not true for short intermittent bouts of exercise





Figure 3. Weekly 17-item Hamilton Rating Scale for Depression by exercise frequency. All groups—control, 3 days/week, and 5 days/week—had reductions in symptoms during the 12 weeks of treatment. There was no independent effect of frequency on reduction of symptoms.

All exercise was performed in a supervised laboratory setting with adults (*n* 80) aged 20 to 45 years diagnosed with mild to moderate MDD using Hamilton Depression Scale

Participants were randomized to one of four aerobic exercise treatment groups that varied total energy expenditure (7.0 kcal/kg/week or 17.5 kcal/kg/week) and frequency (3 days/week or 5 days/week) or to exercise placebo control (3 days/week flexibility exercise). The 17.5-kcal/kg/week dose is consistent with public health recommendations for physical activity (PHD). The 7.0-kcal/kg/week dose was termed "low dose" (LD).

The main effect of energy expenditure in reducing Hamiltton scores at 12 weeks was significant. Adjusted mean scores at 12 weeks were reduced 47% from baseline for PHD, compared with 30% for LD and 29% for control.

Aerobic Exercise Can Work Faster than Drugs to Lift Depression

Twelve people with severe depression, that had lasted an average of nine months, exercised daily for 10 days.

Their average age was 49; seven of them were women. In 10 patients drugs had failed to substantially improve symptoms.

The exercise entailed walking on a treadmill for 30 minutes every day.

Three minutes of intense activity were alternated with walking at half speed for three minutes. The intensity was increased as heart rate adapted to the training program.



British Journal of Sports Medicine. 2001; 35:114



Effects of a Single Bout of Exercise on Mood and Well-Being in Patients with Major Depressive Disorder

<i>e</i> dscape®	www.medscape.com							
LE 1. Affective measures means and standard deviations.								
POMS	Baseline		Postexercise: 5 min		Postexercise: 30 min		Postexercise: 60 min	
	М	SD	м	SD	M	SD	м	SD
Tension								
Exercise	7.95*	4.37	5.75 ^{*,b}	4.72	5.25 ^p	4.53	3.65°	4.58
Quiet rest	8.25*	4.84	5.55*	4.68	5.65°	4.86	5.55 ^{a,b}	5.24
Depression								
Exercise	11.00*	4.19	6.80°	5.29	6.70 ^p	5.38	6.55*	5.86
Quiet rest	9.95*	5.12	8.30*.0	5.81	7.65 ^b	6.33	6.60**	5.74
Anger								
Exercise	6.25*	5.22	3.55°	5.10	3.05*	5.01	2.95*	5.31
Quiet rest	7.40*	5.02	4.10°	4.54	3.65°	4.92	3.20"	4.94
Vigor								
Exercise	4.20*	2.54	7.75*	4.84	6.10 ^{b, c}	3.46	5.15**	3.45
Quiet rest	4.85*	3.57	4.60*	4.11	4.40*	4.21	5.00*	4.41
Fatigue								
Exercise	11.11*	5.11	8.35°	4.91	7.95 ^b	5.61	7.65 ^{a,b}	5.50
Quiet rest	11.15*	5.19	8.75**	5.80	9.20**	5.96	8.35*	6.11
Confusion								
Exercise	8.85*	3.17	6.30*	4.27	7.05 ^p	4.31	6.70*	4.62
Quiet rest	9.20*	3.71	7.954.0	3.68	7.45 ^{a,b}	3.69	6.80*	3.82
(SEES)								
Well-being								
Exercise	11.05*	2.54	15.50°	4.51	14.65 ^p	4.88	13.85 ^{a,b}	4.88
Quiet rest	13.40"	5.14	12.70*	4.03	12.60°	5.21	12.60*	4.64
Distress								
Exercise	12.80*	6.12	9.05*	5.28	8.80 ^p	5.83	6.90°	4.80
Quiet rest	14.55*	6.60	13.20*	6.82	11.20 ^{*,0}	6.47	8.40°	5.21
Fatigue								
Exercise	14.00*	6.84	13.90*	5.86	12.00*	5.93	12.20*	5.92
Quiet rest	16.85*	6.01	15.90*	7.33	15.50*	7.45	14.30*	8.09

40 pts within 2 weeks of diagnosis walked for 30 minutes at an intensity equal to 60–70% of their age-predicted maximal heart rate.

POMS, profile of mood states; SEES, subjective exercise experiences scale; M, mean; SD, standard deviation.

Note: Differences in superscripts within each group represent mean differences between time points with P < 0.01.

Source: Med Sci Sports Exerc @ 2005 American College of Sports Medicine

BARTHOLOMEW J. Med. Sci. Sports Exerc., Vol. 37, No. 12, pp.

2032-2037, 2005.

Exercise Efficacious Treatment for MDD

Mild to Moderate Major Depressive Disorder Dunn, Trivedi, Kampert, Clark, Chambliss



Global Burden of Disease Study

Disease Ranking - # years of life lost to premature death or disability

- #1 Ischemic Heart Disease#2 MDD
- Only 23% with MDD seek treatment.
- Social Stigma Associated with Treatment
- Exercise Viable Treatment -Recommended for Most Adults

Compared exercise, antidepressant, and combination in older adults - All treatments were effective.

Treatments





MAD ABOUT FOOTBALL

"Mental health sufferers are often locked inside themselves, and football allows them to open up," said film-maker Volfango di Biasi, who wants to de-stigmatise illnesses such as schizophrenia in the film. A 90-minute film called "Matti per il Calcio" ("Mad about Football") documents the efforts of an Italian psychiatrist to treat people with schizophrenia and depression by recruiting them for a competitive football team. (Italian football resembles what Americans call soccer rather than American football.) According to a British newspaper, The Guardian, Mauro Raffaeli coaches the players – many of whom take psychiatric medication and have not been able to work – twice a week on the outskirts of Rome. Of the 80 players whom Raffaeli has worked with since the team was created in 1993, more than half have been able to reduce their use of medication and more than half have returned to work. The team has inspired the creation of 50 similar teams involving people with mental illnesses around Italy.

RATEY'S WELLNESS **R**



Exercise for optimum physical and mental health



Exercise for muscle strength, increased endurance, stamina and agility



Exercise to strengthen heart and lungs to work more efficiently.



Exercise to increase bone density, prevent osteoporosis, improve balance lowering the risks of falls and fractures



Exercise to prevent high blood pressure, high cholesterol, heart disease, type 2 diabetes, strokes and to reduce the risk of cancer



Exercise to shed extra pounds, tone muscle, increase metabolism that regulates calories burned when resting, and aid in hunger reduction.



Promotes Wellness and Mental Health



Lower Sadness, Tension, and Anger + Improve Resistance to Disease



Boosts confidence and Self-esteem



Reduces Anxiety and Stress



Exercise releases endorphins – body's natural pain killer increase feelings of happiness



Exercise yields an increase in energy – better sleeping patterns,



Exercise increases vital neurotransmitters and factors that act as "miracle grow" for the brain



Exercise helps to overcome "learned helplessness" or that giving up feeling



Exercise boosts the resilience of the body and the brain- improving their ability to deal with stress.

Stress

An evolving new hypotheses

 In the path of physiology and treatment of depression, involves adaptation or plasticity of neural systems. Depression could result from an inability to make the appropriate adaptive responses to stress or aversive stimuli.

Synaptic Plasticity

The synaptic connection is the key element for the flow of signals and information in brain circuits.



It is, therefore, easy to understand why the neural basis of complex brain activities, like learning and remembering, as well as of individual intellectual ability, are studied starting from the level of the synaptic function. These complex brain functions are explained by the property of synaptic connections to strengthen or weaken their activity in relation to the previous activation state. They can also be eliminated or formed de novo. This property is called synaptic plasticity. The ability of the brain to continuously modify the activity of its circuits, based on previous and ongoing activity, and therefore on experience, was proposed for the first time on a theoretical level by Donald Hebb in 1949 (from whom the term of Hebbian synapse derives, to indicate a synapse that is able to modify its function on the basis of activity).

Depression and stress shrink brains

- Decreases dendritic structure and complexity
- Decrease the volume in hippocampus
- Impairs making new nerve cells
- Running increases cortisol (stress hormone)
- Running doubles new hippocampal cells
- Overwhelming production of Growth Factors to combat stress hormone
- IGF-1 insulin-like growth factor; FGF-2 fibroblast growth factor; VEGF vascular endothelial factor all come in from the muscles acting and together with BDNF, GDNF, NMDA, Serotonin - all drive neurogenesis

Cell Survival

- As with neurogenesis in development, cell survival is not guaranteed
 - Many die shortly after they proliferate but before they mature
 - Dying neurons in picture are surrounded by microglia



Long Term Effects of Depression



Red arrows indicate volume changes caused by depression

• Summary of neuro-imaging abnormalities in early-onset, primary, major depressive disorder (MDD).

• The regions where neuro-physiological imaging abnormalities have been consistently reported in unmedicated MDD samples are listed and approximately shown on this midsagittal brain diagram in which subcortical structures are highlighted onto the medial surface.

- The arrows in front of each region name indicate the direction of resting state abnormalities in glucose metabolism in unmedicated, depressed MDD samples relative to healthy control samples.
- In some cases, abnormalities in both directions have been reported which may depend either on the specific region involved or on the clinical state (eg, treatment responsive vs nonresponsive; see text).

• The red arrows indicate histopathological and/or gray matter volumetric abnormalities in postmortem studies of primary mood disorders.

Normal

Normal Hippocampus in unstressed Male Monkey

Loss of Neurons and atrophy of Dendrites In Stressed Male Monkey The Number of Neurons in the Hippocampus area CA4 in Monkey









Tianeptine

- A new antidepressant without any effect on the neurotransmitters-- just on central plasticity. Positive effects of tianeptine on neuronal excitability, neuroprotection, anxiety, and memory. McEwen B Molecular Psychiatry (2005) 10, 525–537. doi:10.1038/sj.mp.4001648
- No effect on serotonin, norepinephrine, dopamine, just on plasticity and mood, anxiety. Weighs in on the new theory of depression being a problem with the brain shutting down its learning and adapting capacity and instead of growth it begins to shrink.
- So depression is an unhealthy situation for the brain. Catabolic forces rather than growth and adaptability. Not just one area or one neurotransmitter but the total package is compromised. CBT (top down effect) treats the cortex and antidepressants (bottom up) works on the limbic system, both lead to alleviating depression. But all roads lead to a return to plasticity, adaptability, neruogenesis, improved mood and decreased anxiety.



How the Brain Changes

Research suggests exercise spurs growth in a brain structure associated with memory, possibly leading to improved function. An overview:

BLOOD VOLUME IN THE BRAIN: NEUTRAL

INCREASED





THE EVIDENCE: When new nerve cells form in the brain, their growth is accompanied by the creation of blood vessels.

Researchers found that exercise increased blood volume in the dentate gyrus (a region of the hippocampus, which is used in memory), implying new cells were forming in the area.

SOURCES: NATIONAL ACADEMY OF SCIENCES OF THE U.S.A., COLUMBIA UNIVERSITY





Eleven healthy subjects (mean age 33, ranging from 21–45 years; two males and nine females) participated in the study, completing a 3-month aerobic exercise regimen.

Cognitively, individuals performed significantly better on trial 1 learning (F7.0, P 0.027) after exercise, with a trend toward improvement on all-trial learning (F 5.0, P 0.053) and delayed recall (F 5.0, P 0.057). There was no effect on delayed recognition (F 0.19, P 0.67) or source memory (F 0.15, P 0.25) (Fig. 4*a*). To test that cognitive improvement was related to exercise *per se*, we found that individual changes in trial 1 learning were correlated with individual changes inVO2max (0.660, P0.037)

Pereira AC, Huddleston DE, Brickman AM, Sosunov AA, Hen R, McKhann GM, Sloan R, Gage FH, Brown TR, Small SA. An in vivo correlate of exerciseinduced neurogenesis in the adult dentate gyrus. Proc Natl Acad Sci U S A. 2007 Mar 27;104(13):5638-43.

THE BRAIN IS A MUSCLE AND TO ADD NEW CELLS STRESS MUST OCCUR



Angiogenesis is the process of formation of new blood vessels; It is generally a rare occurrence in the adult, although it is a common adaptive response to exercise training in skeletal muscle. This kind of Collateral Circulation happens in the muscles, the heart, and the brain.

Repair and Recovery: Stress then Growth



Stress and Depression A Schematic Summary



The Battle Between Stress & Exercise



Jump Rope Therapy

Carteenpank.com



"I had an epiphany."

Making new nerve cells with exercise

Recent evidence has suggested that over 9000 new cells are produced in the hippocampal DG of adult laboratory animals every day (Cameron and McKay, 2001). This process can also be dramatically enhanced by exposing animals to environmental enrichment (Kempermann et al., 1997) or allowing them access to voluntary exercise (Eadie et al., 2005; Farmer et al., 2004; van Praag et al., 1999).

- Glutamate- NMDA
- Serotonin
- BDNF Brain-derived Neurotrophic Factor
- GDNF Glial-derived Neurotrophic Factor
- VEGF Vascular endothelial factor
- IGF-1 Insulin-like Growth Factor
- FGF-2 Fibroblast growth factor



FIGURE 1. Shift From Passive Fear to Active Coping in the Brain^a

Fear- start a constellation of fear responses in the brain to include freezing, activating sympathetic system and eventually a full blown stress response- neuroendocrine. The amygdala- the fear button -- is heavily involved with learning, called 'limbic tagging' basically makes the encoding process easy. The lateral nucleus integrates the outside stimuli to unconditioned response of the person. If lateral is allowed to go to the central nucleus of the amygdala - you get activation of brain stem areas -- that deal with catatonic freezing, response, and also 2. Start the sympathetic nervous system. 3. And hit the hypothalamus to start the stress response-releases of ACTH CRH - \rightarrow Cortisol. So you are left in the panic mode and sit and stew and traumatize the self again and again. This can be shifted basal nucleus or the activating centers for movement- this is a reciprocal process that goes from bottom up to top down- so by getting some movement going this draws the energy through the basal nucleus and away from the full blown fear catatonic panic-- just think of a person who just has heard some horrific news, they immediately get up and start to move- walk away from it or pacing aimlessly around and away from the news bearer. Not just NO-Don't tell me that -- rejecting it for a while to slowly incorporate it without turning into a bowl of jelly and moving to help deal with the news more successfully

Stress and depression Battle Exercise, Antidepressants



Fig. 1. A model demonstrating the opposing actions of stress/depression and antidepressants on hippocampal plasticity. The influence of aging, exercise and dietary restriction are also indicated. See text for further description and details.



R.S. Duman / Neurobiology of Aging 26S (2005) S88–S93





IGF-1 Insulin-like Growth Factor

VEGF Vascular endothelial factor

FGF-2 Fibroblast growth factor

ANP- Atrial Natriuretic Factor

ALL THESE COME FROM MUSCLE CONTRACTION AND TRAVEL TO THE BRAIN AND HAVE AN EFFECT ON LEARNING AND BRAIN CELL HEALTH AND GROWTH



BODY BRAIN MIND

The influence of different types of stress on disease susceptibility and longevity are mediated by reciprocal signaling between the CNS and periphery. Extrinsic stimuli and movements modulate serotonin (5HT), BDNF, CRH, insulin/IGF-1 and glucocorticoids (GC) levels in multiple regions of the CNS as indicated.

As well the actual movement of muscles sends IGF-1, FGF, VEGF off to the blood stream and up to the brain and these have a significant impact on neuroplasticity and in fact may be necessary for new cell growth and development.



"'GameBoy: A Memoir of Addiction,' by Ronald Markowitz."

When the Dog walker did not show up





ANOTHER EXAMPLE OF SHAMELESS SELF- PROMOTION

For more information and to join the blog go to:

www.JohnRatey.com





THE REVOLUTIONARY NEW SCIENCE OF EXERCISE AND THE BRAIN



Beat Stress, Sharpen Your Intellect, Lift Your Mood, Boost Your Memory, and Feel Better Than You Ever Have Before!

JOHN J. RATEY, M.D., COAUTHOR OF DRIFEN TO DISTRACTION WITH ERIC HAGERMAN

JACK SAYS BUY THE BOOK AND SOME FOR YOUR STAFF TOO

Physiological Stress

