CLINICAL SKILLS – LEVEL 1

Sept 19-20, 2019——Day 2

Enhancing Neurological Recovery Through Vision Rehabilitation

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QUESTIONS FROM YESTERDAY?

Enhancing Neurological Recovery Through Vision Rehabilitation

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Plan for Day 2

- Concussion & Post Concussion Syndrome
- Return to Activity
- Symptom Management
- Pacing and Planning
- Neuroplasticity
- Treatment – vision, vestibular, proprioception, balance
- Case Studies

Enhancing Neurological Recovery Through Vision Rehabilitation

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Concussion & Mild Traumatic Brain Injury

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Why the concern with concussions?

(CDC Website)

- An estimated 3.8 million sports and recreation related head trauma annually in the United States
- US emergency departments treat an estimated 135,000 sports- and recreation-related head trauma annually
- Concussion from falls in the elderly and the workforce occur at a much higher incidence than in sports-related activities
- It's estimated that >50% of adolescents athletes will sustain a concussion by the time they graduate from high school

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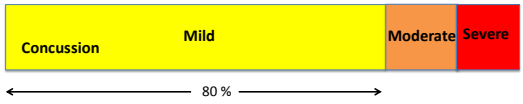
mTBI vs Concussion

Traumatic Brain Injury Continuum



All concussions are a mTBI but not all mTBI's are a concussion

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Consensus Statement on Concussion in Sport

Berlin Oct 2016

Published in:
***British Journal of Sports Medicine* 51(11) 2017**

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Concussion Defined *(Berlin Consensus Guidelines 2016)*

- **Sport Related Concussion:** *is a traumatic brain injury induced by biomechanical forces.*
- The clincial signs and symptoms cannot be explained by drug, alcohol or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc) or other comorbities (eg. Psychological factors or coexisting medical conditions)

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- 1. may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an 'impulsive' force transmitted to the head

- 2. typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. In some cases, symptoms & signs may evolve over a number of **minutes to hours**

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- 3. it may result in neuropathological changes, but the acute clinical symptoms largely reflect a *functional* disturbance rather than *structural* so no abnormality is seen on ***standard structural neuroimaging*** studies.

- 4. results in a graded set of clinical symptoms that ***may or may not*** involve the loss of consciousness. Resolution of the symptoms typically follows a sequential course. However, in some cases symptoms may be prolonged.

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Diagnosis: Berlin Guidelines 2016

- Suspected concussion with 1 or more of the following:
  1) ***Symptoms*** – somatic (eg. headache), cognitive (eg. in a fog), and/or emotional (eg. Lability)
  2) ***Physical signs*** (eg. LOC, amnesia, neuro deficit)
  3) ***Balance Impairment*** – (eg. Gait unsteadiness)
  4) ***Behavioural Changes*** (eg. Irritability)
  5) ***Cognitive impairment*** (eg. Slowed reaction time)
  6) ***Sleep disturbance*** (eg. Somnolence, drowsiness)

- Need a detailed concussion history
- Clinical Assessment – SCAT5 and Child SCAT5

****Serial monitoring for deterioration over the first few hours is necessary***

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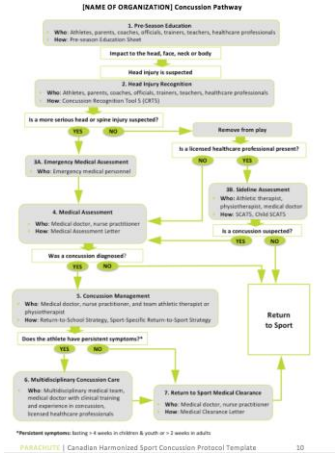
Parachute
PREVENTING INJURIES. SAVING LIVES.

1. Pre-Season Education
2. Head Injury Recognition
3. Assessment
4. Management



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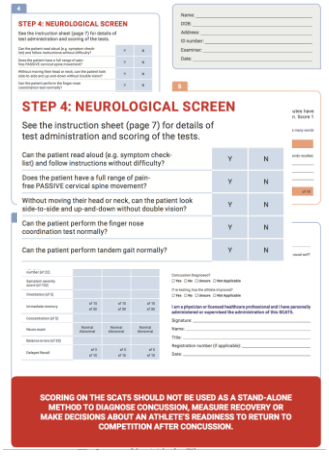
Useful immediately post injury in differentiating concussed from non-concussed but utility decreases 3-5 days post injury

Symptom checklist is clinically useful for tracking recovery



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Symptom Assessment

- Since many of the problems post concussion are self reported symptoms need to try to track this over time
- ***Suggested Tools***: SCAT5, **Rivermead Post Concussion Symptoms Questionnaire (RPQ-3, RPQ-10)**, Post Concussion Symptom Scale (PCSS), Neurobehavioural Symptom Inventory (NSI)
- ***Other tools:*** **Headache Impact Test (HIT-6), Brain Injury Vision Symptom Survey (BIVSS)**, Dizziness Handicap Inventory

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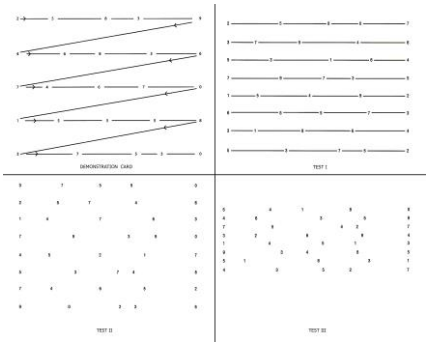
King Devick Test



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King Devick Test

(Galetta et al 2011 & 2013, King et al 2012)

- Can be administered in 2 minutes
- Assesses eye movement, attention, language
- > 5 sec difference from **baseline** is predictive of concussive event
- Not useful in ER setting for diagnosis *(Silverberg 2014)*
- Worse scores on K-D test associated with reductions in Immediate Memory portion of SCAT2
- Can be used for post game screening to help identify unrecognized concussions
- Research done with K-D test on NHL hockey players, New Zealand rugby players, MMA competitors

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Vestibular Ocular Motor Screen (VOMS) (*Mucha et al 2014) (pg 7)*

- Developed as a screening tool by UPMC
- Ages 9-40
- Equipment: Tape measure, metronome, target with 14 pt font (eg letter on a tongue depressor/popsicle stick)
- Take baseline of: Headache, Dizziness, Nausea, Fogginess – scale of 0-10

UPMC
University of Pittsburgh Medical Center

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VOMS Scoring

Vestibular/ Ocular Motor Test:	Not Tested	Headache 0-10	Dizziness 0-10	Nausea 0-10	Fogginess 0-10	Comments:
BASELINE SYMPTOMS						
Smooth Pursuits						
Saccades-Horizontal						
Saccades-Vertical						
Convergence (Near point)						Near point in cm: Measure 1: Measure 2: Measure 3:
VOR-Horizontal						
VOR- Vertical						
Visual Motion Sensitivity Test (VOR Cancellation)						

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VOMS

(Mucha et al 2014)

- 60% of patients report at least 1 provoked sx
- Concussed patients score higher on all VOMS items than controls (n=85)
- Symptom score >2 & NPC distance ≥ 5cm increased diagnostic accuracy 34% & 46% respectively
- Females report more symptoms & higher NPC
- VOR, VMS & NPC distance items on the VOMS resulted in a 90% +ve prediction rate for mTBI
- Related to symptoms scores on PCSS
- Independent of balance testing on BESS

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IF IN DOUBT, SIT THEM OUT.

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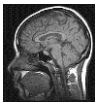
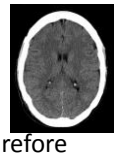


Role of Imaging in mTBI



- CT and MRI imaging usually normal therefore not indicated acutely
- More evidence of structural neurological disruption on newer imaging technology:
  - Functional MRI, Diffuse Tensor Imaging, Qualitative EEG (QEEG), Magnetic Resonance Spectroscopy (MRS) magnetoencephalography (MEG)
  - ***Better for group differences than individual diagnosis***

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Task based fMRI Summary *(Yue 2014)*

- (1) increased activation in task- related areas of the brain without significantly worse performance, suggesting that some mTBI patients need to "***work harder***" to perform a simple task at a satisfactory level
- (2) abnormalities in ***frontal lobe function***, with a few studies reporting alterations specifically within the middle frontal gyrus

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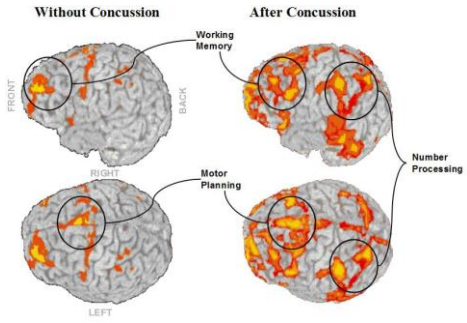
mTBI & Mental Subtraction



http://www.ccs.fau.edu/section_links/HBBLv2/Research/MTBI.html

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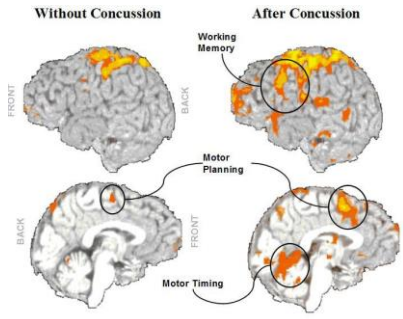
mTBI & Rt finger sequencing task



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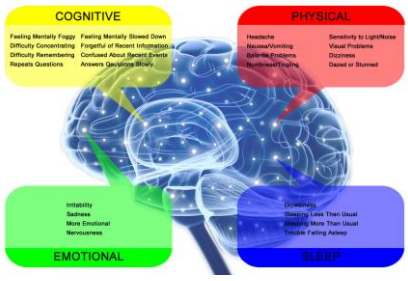
Early Management



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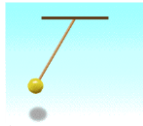
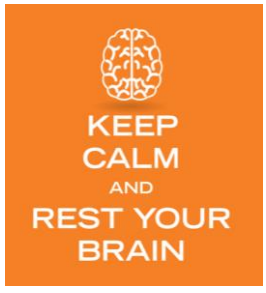
Rest?



- Evolving recommendations
- Indicated for 48 hours
- Cognitive, physical and environmental as needed
- Then need to start activity as tolerated
- Treat individually



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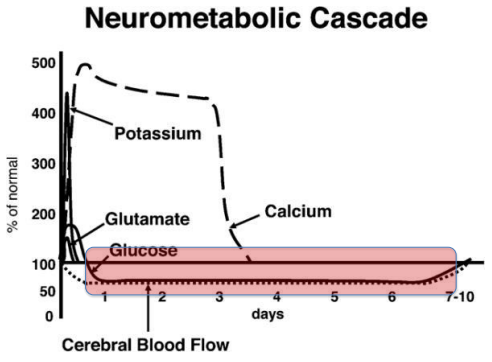

FIGURE 1 . Time course of the neurometabolic cascade of concussion.

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How do you get out of rest?

- **Graduated** return to cognitive and physical activity
- Don't leave your patients in REST
- Need to educate about how and when to introduce activity and monitor symptoms
- Otherwise – depression and non-compliance
- ***Remember!*** They are brain injured therefore their judgment and decision making is impaired

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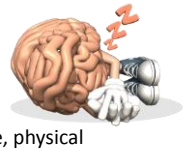
Rest Recommendations



- Educate patient and family:
  - **Limit:** TV, computer, reading, cell phone, physical activity, school, sports, socializing
  - **Allow:** increased sleep, hydrate and eat well
- Activities should be symptom limited
- Alternate between types of activity – cognitive/physical
- Give examples and guidelines for what to do and what not to do
- Use caution giving timelines for recovery

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What should you recommend for Restful Activities?

- Listening tasks – audiobooks, quiet music, radio/podcasts
- Meditation or relaxation activities
- Anything leisure that 'relaxes' (i.e. knitting**); but ensure use of a timer
- Colouring
- Light household tasks
- Short walk indoors or out

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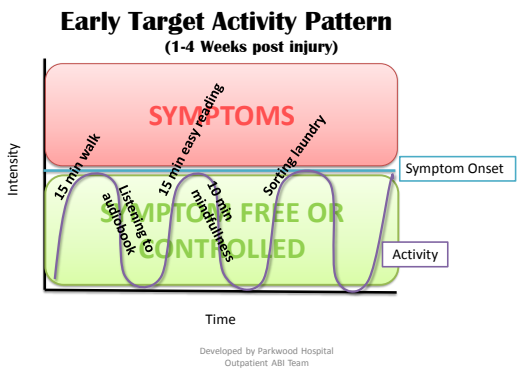

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Domains of Activity

- Need to gradual increase activity in different areas

Cardiovascular/ Physical	Environmental	Cognitive	Rest Ideas
-Increased heart rate – walking, cycling, jogging -Walking/running while talking -Household management tasks – cleaning - Beginner/gentle yoga or tai chi	-Light exposure -Noise Exposure -Social interaction -Busier envts -Fluorescent lighting -Talking in a small group	-Reading tasks -Computer tasks -Memory tasks -Problem solving activities -Planning activities -Cooking -Meal planning -Add noise/distraction	-Mindfulness -Podcasts -Audiobooks -Listening to music -Bath -Colouring -Cuddling pets

*Work on increasing stamina and complexity of activities while monitoring symptoms

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Berlin 2016 – Graduated Return to Sport

1. Symptom Limited Activity	• Daily activities that do not provoke symptoms • Goal: Gradual reintroduction of work/school activities
2. Light Aerobic Exercise	• Walking or stationary cycling at slow to medium pace. No resistance training • Goal: Increase Heart Rate
3. Sport Specific Exercise	• Running or skating drills. No head impact activities • Goal: Add movement
4. Non-Contact training drills	• Harder training drills. May start progressive resistance training • Goal: Exercise, coordination & increased thinking
5. Full contact practice	• Following medical clearance, participate in normal training activities • Goal: Restore confidence & assess functional skill by coaching staff
6. Return to sport	• Normal game play

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Clearance for Return to Learn/ Work/Play

Role of Exertion

- Vision & vestibular tasks in space with hand/eye coordination
- Sport specific visual tasks – need to be fast & multidirectional
- Should include multiple systems: balance, vestibular, cognitive & vision
- Need to get heart rate up while doing tasks

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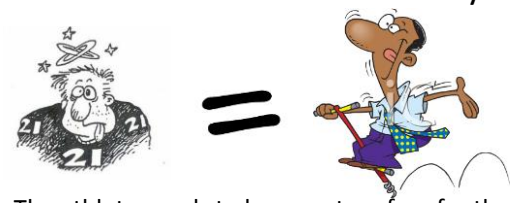
General Rule of Return to Play



- The athlete needs to be symptom free for the same amount of time they have symptoms prior to returning to **contact** sports
- ***especially youth & adolescent***

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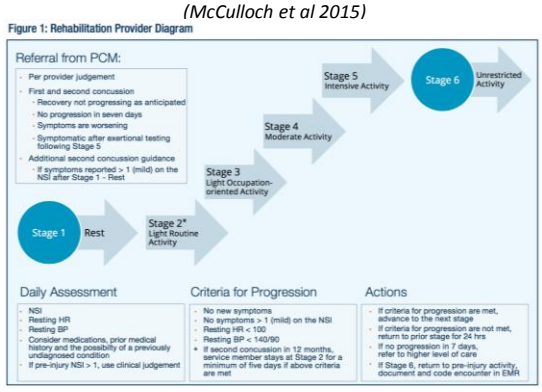
Military Return to Activity Guidelines

(McCulloch et al 2015)



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Military Guidelines – Stage 1

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 1 Rest	Rest, limit activity to promote recovery No same day return to duty/play Provide and review with patient Stage 1 education sheet	**DEMANDS** Extremely light physical activity, primarily rest although total bed rest not recommended Sleep as desired Abstain from alcohol Avoid caffeine and nicotine Avoid breath holding RPE Scale rating — extremely light; 6-8 Heart rate not to exceed 40% of age adjusted theoretical maximum heart rate; resting HR not greater than 100 Document resting HR and BP (baseline)	Extremely light cognitive activity, primarily rest Quiet environment with low lighting Ensure service member has corrective lenses and if photophobia is a problem, low light and sunglasses are advised	Slow and limited range of head and body movement when changing positions to limit symptoms Limit positions where head is below the heart
Initiate Stage 2 the next day after Stage 1, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		**ACTIVITY EXAMPLES** Basic activities of daily living Wear comfortable clothes Remain seated as needed (such as for hygiene, showering, dressing, meals) Walking as required — limited to easy pace, even terrain, minimal grade (such as to latrines and dining) **No** exercise	Extremely light, leisure activity (such as television with rest breaks each hour, short leisure reading, casual conversation) **No** video games **No** studying **No** driving	Movement as required for daily routine at tolerated pace Put on shoes while bringing foot to knee, use slip on shoes **No** bending with head below heart

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Military Guidelines – Stage 3

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 3 Light Occupation-oriented Activity	Full body, complicated coordinated movements Provide and review with patient Stage 3 education sheet	**DEMANDS** Occupation-oriented activities for a maximum of 60 minute periods followed by four hours of rest (1:4) RPE Scale rating — light; 10-12 Heart rate not to exceed 65% of age adjusted theoretical maximum heart rate Resting HR not greater than 100; resting BP not to exceed 140/90 Avoid repetitive lifting Encourage healthy sleep habits	Maximum 30 minutes of light cognitive activity followed by minimum 60 minutes rest between cognitive activities Simple, unfamiliar tasks ***or*** complex familiar tasks (more steps, distractions in environment) Activities that require one or more of the following: • Using written technical instructions • Visually scanning the environment while moving Increase exposure to light and noise distractions	Increase balance challenges in different light and terrain conditions Increase activities that require one or more of the following: • Clear vision during movement • Faster eye, head and body movements • Stooping, stretching and aiming • Motion in the surrounding environment
Initiate Stage 4 the next day after Stage 3, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		**ACTIVITY EXAMPLES** Functional tasks requiring occasional lift and carry; lifting not to exceed 20 pounds May wear helmet and/or load bearing equipment (ammunition belt, suspenders, first aid kit, etc.) Light military tasks (cleaning equipment, organizing personal space) Brisk walk Elliptical or stair climber SR-ups, pull-ups, pushups — no more than 25% of repetitions on most recent fitness test Plank **No** valsalva **No** combatives or collision sports	Shopping for one item Narrated walk (service member identifies and verbally reports landmarks while walking on smooth terrain) Preventive maintenance check on vehicles Tabletop construction tasks that involve written/diagram instructions **No** video games **No** driving	Carrying objects indoors that block view of feet Walking on uneven terrain, steps, different lighting conditions Passenger in vehicle as tolerated, switch focus from near to distant landmarks Walking in narrow aisle or hallway Hand-to-hand ball toss overhead Stand on one foot with eyes open, then closed Swimming (avoid flip turns) Squat bender, windmill

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Children & Youth Return to Activity

- 30% at 1 mos *(Zemek et at 2016)* & 11.8% at 3 mos of children with mTBI remained symptomatic *(Barlow et al 2015)*
- More conservative, **successful return to school must come before return to sport (game)**
- can start return to physical activity in parallel with return to school

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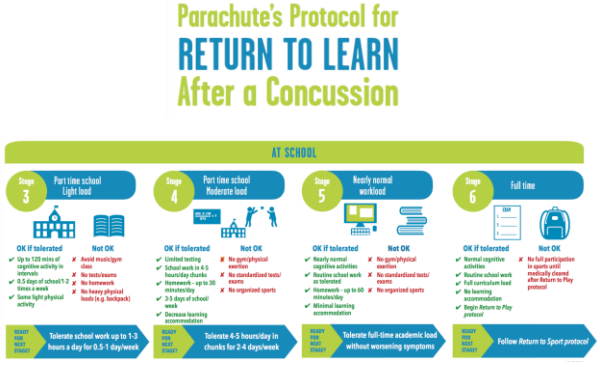

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(www.concussionsontario.org)

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Natural Course of Recovery

- 80%-90% of people who experience mTBI will recover fully

- Remaining 10%-20% develop Post Concussion Syndrome (PCS) or Persistent Symptoms Post Concussion
- Timing? Berlin Guidelines Adult 2 weeks, Peds 4 weeks

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Adult Guidelines Available

- Ontario Neurotrauma Foundation released the 3rd Edition of:

Guidelines for Concussion/Mild Traumatic Brain Injury & Persistent Symptoms

(July 2018)

(www.braininjuryguidelings.org)

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Multiple Factors Play a Role

Pre Injury	Injury	Post Injury
• History of TBI • Female • Age • Anxiety • Depression • Migraines • Genetics	• Symptom Burden • Sleep Issues • Neck Involvement • Vision Changes • Dizziness • Cognitive Changes • Mechanism of injury	• Initial Management • Employment • Lifestyle • Access to Care • Home & work supports

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Predicting risk in the pediatric ER

(Zemek et al JAMA 2016)

- >3000 pts included
- Analysis on >2500 pts
- Post Concussion Symptom Inventory
- Developed a risk score to help guide treatment

≤ 3 = low risk
4-8 = med risk
≥ 9 = high risk

- Higher risk:
  - Age 13-<18
  - Female
  - Prev mTBI Sx > 1 wk
  - MD diagnosed migraine hx
  - Answering questions slowly
  - BESS tandem ≥4
  - Headache
  - Sensitive to noise
  - Fatigue

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Table 5. Selected Predictor Variables for Multivariable Model of Persistent Postconcussive Symptoms (PPCS) at 28 Days in the Derivation Cohort[a]

	No. of Risk Points for PPCS	Odds Ratio (95%CI)	*P* Value
Age group, y			
5–7	0	1 [Reference]	<.001
8–12	1	1.54 (1.09-2.19)	
13-<18	2	2.31 (1.62-3.32)	
Sex			
Male	0	1 [Reference]	<.001
Female	2	2.24 (1.78-2.82)	
Prior concussion and symptom duration			
No prior concussion; symptom duration <1 wk	0	1 [Reference]	.01
Prior concussion; symptom duration ≥1 wk	1	1.53 (1.10-2.13)	
Physician-diagnosed migraine history			
No	0	1 [Reference]	.001
Yes	1	1.73 (1.24-2.43)	
Answering questions slowly			
No	0	1 [Reference]	.008
Yes	1	1.37 (1.08-1.74)	
Balance Error Scoring System tandem stance No. of errors			
0–3	0	1 [Reference]	.02
≥4 or Physically unable to undergo testing	1	1.31 (1.04-1.66)	
Headache			
No	0	1 [Reference]	.01
Yes	1	1.66 (1.11-2.48)	
Sensitivity to noise			
No	0	1 [Reference]	.002
Yes	1	1.47 (1.15-1.87)	
Fatigue			
No	0	1 [Reference]	<.001
Yes	2	1.84 (1.37-2.46)	

[a] There were 1701 patients in the derivation cohort included in the primary analysis.

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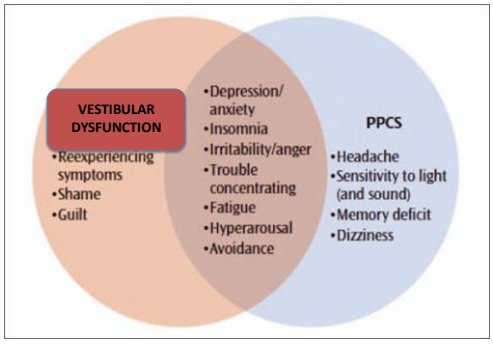
The problem with mTBI



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Identifying mTBI Subgroups

Using classification to guide treatment and improve outcomes

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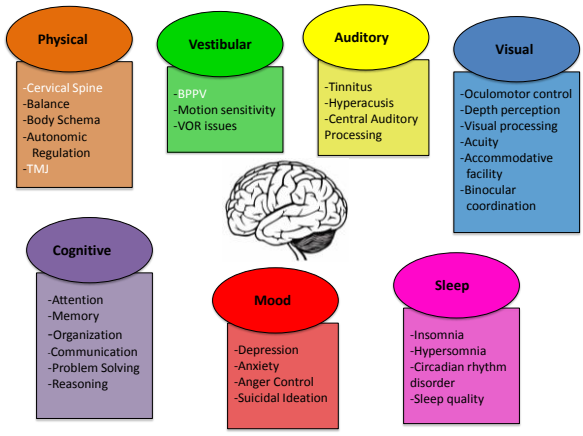

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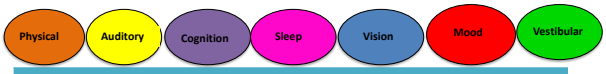

Symptom	Domain						
Headache	●	●	●	●	●	●	●
Fatigue	●	●	●	●	●	●	●
Dizziness	●	●		●	●		●
Sensory Sensitivity		●		●	●	●	●
Confusion		●	●	●	●	●	●
Exercise Intolerance	●			●	●	●	●
Brain Fog			●	●	●	●	●
Nausea	●				●		●
Trouble Reading			●	●	●		
Social Isolation	●	●	●	●	●	●	●
Screen Intolerance				●	●		
Trouble speaking		●	●	●	●		

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Post Concussion Symptom Survey – as a tool to help determine trajectory (Dr. DeAnn Fitzgerald)

Symptoms	Rating	Vision	Vestibular	Migraine	Cognitive	Cervical	Anxiety
Headache							
Nausea							
Vomiting							
Balance Problems							
Dizziness (spinning or movement sensation)							
Lightheadedness							
Fatigue							
Trouble falling asleep							
Sleeping more than usual							
Sleeping less than usual							
Drowsiness							
Sensitivity to light							
Sensitivity to noise							
Irritability							
Sadness/Hopelessness							
Nervous/Anxious							
Feeling more emotional							
Numbness or tingling							
Feeling slowed down							
Feeling like "in a fog"							
Difficulty concentrating							
Difficulty remembering							
Visual problems							
Slow wavy dizziness							
Ruminating thoughts							
Difficulty in Math, Science, Reading							
Symptoms worse at end of day							
Difficulty with attention							
Difficulty finding words							
Total							

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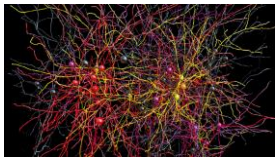
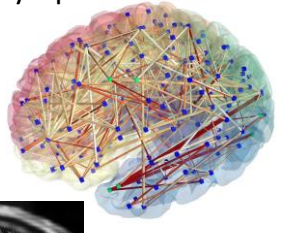
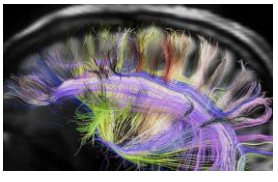
mTBI = Altered Network Connectivity = ***Inefficiency*** = Symptoms







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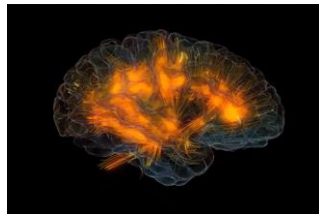
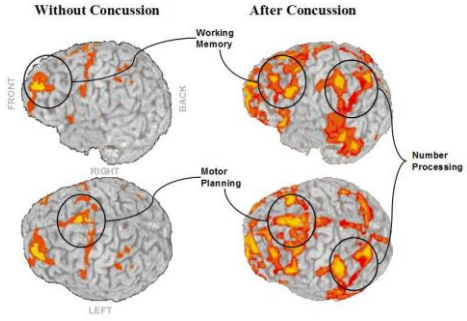
A noisy, inefficient brain means…



- You can't filter sensory stimulus
- You can't easily maintain your balance and move through your environment
- You can't use multiple systems at the same time
- You get easily fatigued

56

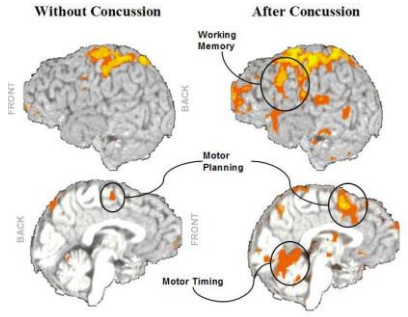
mTBI & Mental Subtraction



http://www.ccs.fau.edu/section_links/HBBLv2/Research/MTBI.html

57

mTBI & Rt finger sequencing task



http://www.ccs.fau.edu/section_links/HBBLv2/Research/MTBI.html

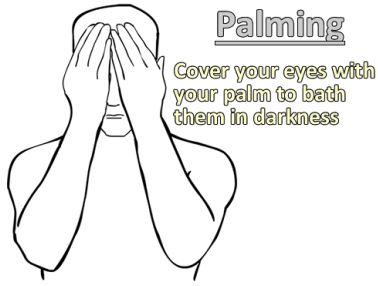
58

Symptom Reduction - Quiet the **NOISE!!!!!!**

- **Limit stimulating environments and use strategies to help tolerance**
  - Visual –sunglasses, binasal occlusion, blinders, screen modifications, hat with a brim
  - Auditory – musician's earplugs, gregorian chants, brown noise
- **Take breaks to recharge brain**
  - Planning & Pacing activities
  - Palming, mindfulness
  - Restful activities
- **Treat sleep disturbance**
  - Sleep hygiene, melatonin, amitriptylline, morning light

59

Try Palming *(Bates eye exercises)*



**from Chapter 6 - The Brain's Way of Healing – Norman Doige*

60

Mindfulness

- Mindfulness can help decrease depression scores post mTBI *(Bedard et al 2013)*
- Guided mediation or independent breathing exercises or body scan
- *(Patient Handout with mindfulness resources on USB)*

61

Address Sleep Issues

Sleep Hygiene

- Go to bed and wake up at the same time – have a bedtime ritual
- Make your bedroom a haven for sleep – dark, cool, quiet & comfortable
- Use bed for sleeping only – not work or TV
- Limit/restrict caffeine after 1:00
- Access morning sunlight
- Exercise but not right before bed
- Limit daytime napping to 30-45 min or not at all

62

Other Sleep Life Hacks

- Melatonin, Magnesium
- Apps - Sleep pillow, Calm Sleep Stories
- Sleep Sounds – youtube
- Short wave blue light therapy
- Amitriptyline – 10 mg daily
- Weighted blanket
- Dreampad Pillow
- Poor sleep can impact symptom validity performance on NC testing *(Mosti et al 2014)*

Sleep Story

One from the 80's

Sounds for Sleep

63

Noise Sensitivity – Coping Strategies

- Musicans earplugs (Pacato/Alpine)
- ***Bose Noise Cancelling headphones***
- Limit use of earplugs to noisy environments only (sporting events, concerts, busy restaurants)

64

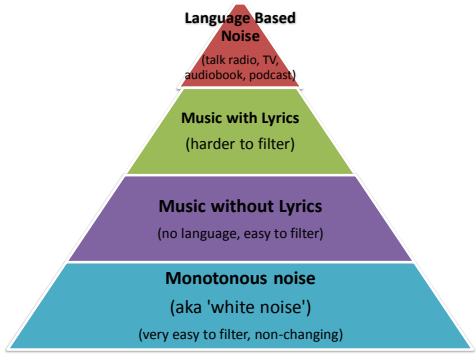
Noise Sensitivity - Treatment

- Graduated noise exposure to **build tolerance**
- It will get worse before it gets better
- Should be comfortable sounds and low level
  - In general environment or one ear bud
  - Gregorian chants (youtube)
  - Nature noises – Sleep pillow or Calm app
  - Binaural noise
  - Apps – Study, Coffitivity



65

Graduated Noise Exposure



66

Tinnitus

- Need to have noise in environment to drown out internal noise
- When sleeping try: fan, white noise machine, brown noise (youtube or app), sleep pillow app
- Sound generating hearing aids



67

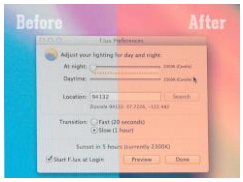
Reading Strategies

- Blinders –reduce visual input
- Coloured Overlays
- Timer
- Binasal Occlusion
- Larger font
- App – Glasses


68

Strategies for Screen Tolerance

- F.lux – blue light filter for computer
- Night Shift –iOS only, Android blue light filter
- Glasses with tint



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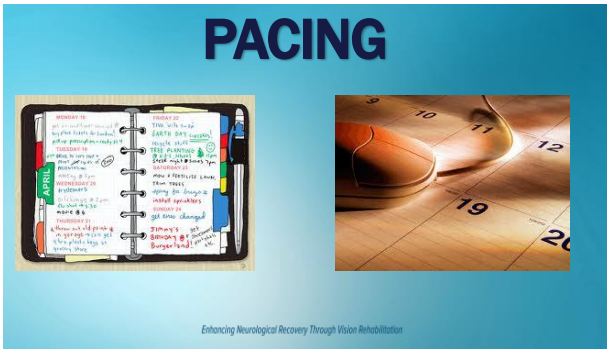
Other strategies for symptom reduction

- Syntonics
- PEMF – pulsed electronic magnetic force
- Acupuncture
- Cranial Sacral Therapy

70

PLANNING & PACING



71

Our patients…

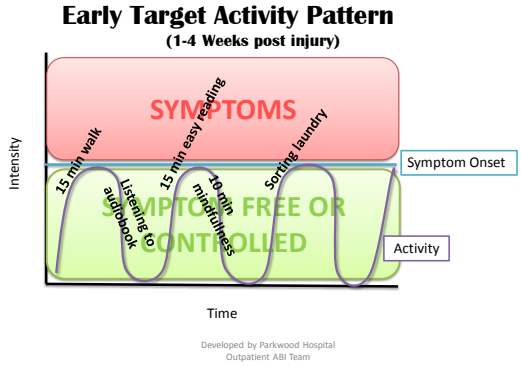
- Are highly functioning multi-taskers
- They are too busy to rest
- Want desperately to return to normal
- Are highly motivated and will usually do what you ask of them
- Need to scale back, and then gradually add tasks in again

72

At the opposite extreme….
Mushrooms

- Have been left in rest
- Light and noise sensitive
- Very symptomatic
- Nervous to increase activity level and bring on symptoms
- Avoid social interactions
- Need lots of guidance about introducing activity and stimulation

73



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Right level of activity – **Acute phase**

- We are aiming for patients to participate in ALL activities BELOW the level of symptoms
- Stop activities prior to symptom onset
- Re-introduce activities in a graded and gradual way

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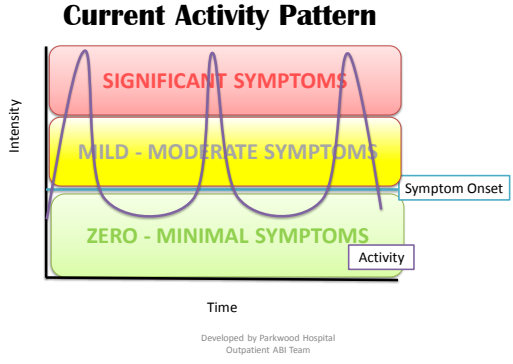

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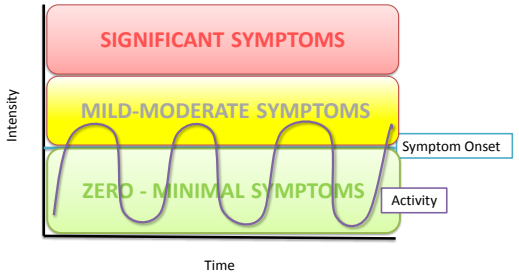
Persistent Symptom Target Activity Pattern



Developed by Parkwood Hospital Outpatient ABI Team

77

Right level of activity – Chronic phase

- Same principles of graded and gradual activity but messaging is slightly different
- Patient can have a bit more leeway to go into symptoms before stopping activity
- General guide: symptoms increase 2-3/10 on intensity scale and return to baseline in less than 1 hour
- Factors to consider:
  - time since injury
  - Symptom burden
  - Symptom irritability
  - Recovery time
  - Current level of activity
  - Personality

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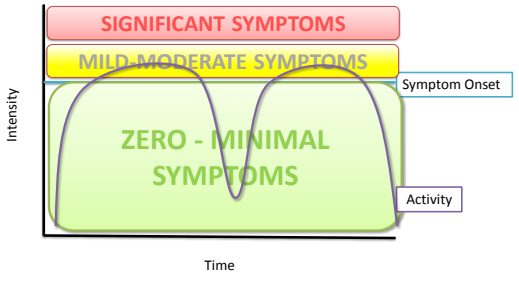
Long Term Activity Goal



Developed by Parkwood Hospital Outpatient ABI Team

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Energy Conservation

- Think of your brain like a car

- And your energy level as a gas tank

80

Biggest "Gas Guzzlers"

- **Talking**
  - Phone, crowded environment, while others are talking
- **Visually stimulating environments/activities**
  - Evil triad: bright, colourful, and moving (everything that you find at wal-mart!)
- **Driving**
  - Even as a passenger, when raining, on crowded streets
- **Any activity that requires 'filtering'**
  - Any noise in the background will be distracting, and it takes a lot of energy to put up a filter
- **Cognitive Tasks (increased attention and processing):**
  - Reading, Sudoku/cross words
- **Physical Activity**
  - You are not efficient with physical activity; so simple tasks in the past may be exhausting now
  - Need to make sure your heart rate doesn't go too high, or could bring on symptoms (HR monitor?)

81

Strategies

- Pace and plan activities, incorporating rest into the day
- Build breaks into the day
  - 15 minutes per hour

- Alternate types of activities
  - Thinking (banking) VS Doing (dusting)
- Reduce activities that cause symptoms (i.e. TV, computer, etc)
- Encourage routine, good sleep patterns, exercise and nutrition

82

The ultimate goal:

Live in the Green

Have a Green Day

Have a headache free day

83

#1 way to pace…

USE A TIMER!

84

In order to properly pace activities, there needs to be a plan

And therefore, a plan*ner*…

(paper or electronic)

85

86

Pacing and Planning Toolkit:

87

Planning

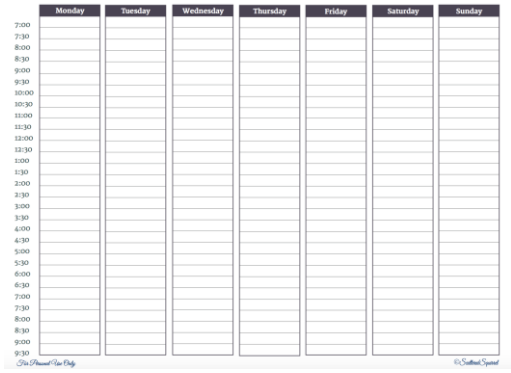
- Need to pace tasks to maximize usable energy
- Need to organize to ensure tasks are completed (i.e. agenda, lists, printables)
- Decision making needs to be minimal, recruit help when necessary
- Planning AHEAD, prior to panic (and to ensure success)
- Key: make life as EASY as possible and gradually increase difficulty to pre-injury level
- MOST patients who embrace the use of a planner/agenda begin to have less symptoms sooner

88

Begin by tracking Level of Activity & Symptoms - ***Journaling***

89

Then start planning ahead to minimize symptoms – ***Pacing & Planning!***



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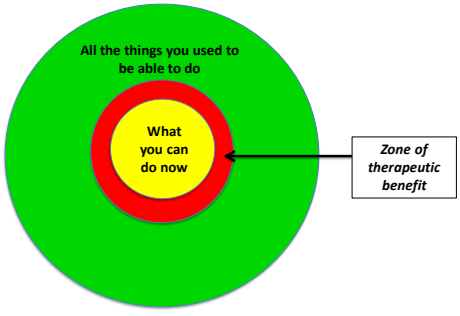
The right amount of challenge

Modelled after Vygotsky's theory of development



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Longer term goal

92

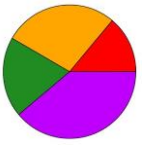
Around the house

- Delegate
- Prioritize
- Break tasks into bits
- Have a list of tasks
- Pick 1-2 tasks per day
- Plan Meals ahead of time
- Make tasks easier

93

The Myth of "ALL OR NONE"

- Most people will procrastinate or put off a task if they are unable to complete 100% of it.
- Many can have success with breaking tasks into smaller 'chunks' which are more managable.
- Doing 100% of a 'chunk' can be satisfying and gives your brain positive feedback



If your goal was to complete the red part, you have success

94

Resistance is Futile…

95

Some people started to understand…

While others continued to struggle with this concept…

96

SLIDE TITLE GOES HERE

- Text Goes here

97

The Inspiration…

A patient who had a significant head injury and continues to experience debilitating fatigue. On the inpatient unit, his activities were managed by the therapists, but now that he was at home, he could plan his own day… he wasn't very good at pacing, and he was not seeing a correlation between activity and fatigue symptoms.

98

We needed him to self-manage his schedule, and pace his tasks…

What we really need was to LIMIT what he did all day…

99

The Idea: An 'Activity Diet'

WeightWatchers PointsPlus

The Concept…

100

The Principle:

- Every activity has a points value based on
  - How difficult a task is
  - How much it takes out of you
  - How many symptoms you get
- You get a maximum number of points per day

101

Why it Works:

- Provides a simple, structured way of tracking activities within a limit
- Provides a framework for limiting tasks
- Provides concrete limits to activity, rather than 'guessing' if they have done too much

102

Who should try it?

1. People who are doing too much and having trouble managing their symptoms
2. People who are not doing enough and are afraid of having a setback who need to gradually reintroduce activity
3. People who have delayed onset of symptoms and have trouble deciding how much activity is too much

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How it works:

- Patients are given 15-20 points per day.
- Activities are given a point value, based on the level of difficulty (and symptoms that are caused)
- Patients are to plan the day to ensure they have enough points to do the tasks they want to do within their maximum

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Typical point values:

Activity	Point Value	Activity	Point Value
ADLs (bathing, dressing, grooming)	0.5-2	TV use	2pts per hour
Meal Preparation	2-3 (depending on complexity)	Computer use	2pts per hour
Dishes	1-2	Reading	2pts per 1/2-1hour
Grocery shopping	5	Talking on the phone	2pts per 15 minutes
Hockey game (watching)	5	Eating out at a restaurant (2 people)	5 (+1 for each additional person)
Working	1-2pts per hour	Attending an appointment	3-5
Childcare	1-2pts per hour	Attending Group sessions	3-5

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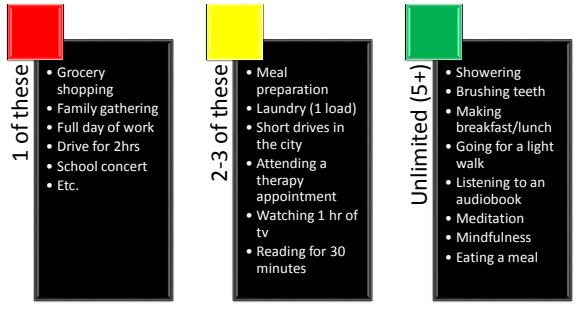
Menu of Options (or stoplight):



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The Change:

- As tasks are limited, symptoms will improve
- Like any food diet, this is not a temporary thing, but a lifestyle change (be prepared!). This is probably one of things that will linger after most of the rehabilitation is over.
- Once they start to recover, we can increase the total points in a day, and activities will be worth less points (kind of like the maintenance portion of a diet)

107

Bottom line…

Pacing activities below the level of symptoms can bring relief, and promote healing and recovery.

You cannot be successful with **pacing** without also using **planning** techniques.

108

Parkwood Institute Resources

- New website launched with lots of resources including 5 week interdisciplinary education series. ABI 101 – Steps to Success
- https://sjhc.london.on.ca/concussion-mtbi
- Survivor and Family Ed series – recorded and archived for several years
  - Document for how to access is on the USB, great for patients & family also on website above

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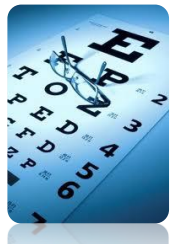
Rehabilitation



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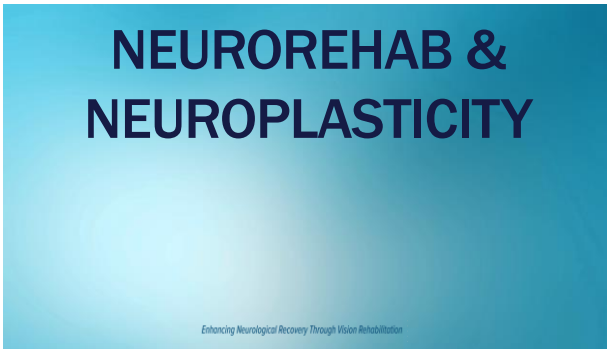

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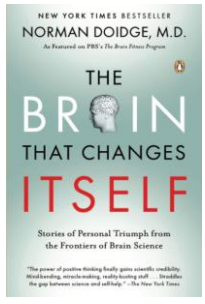
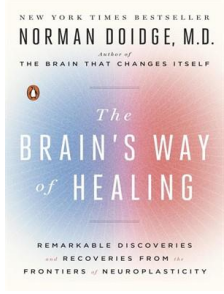
Recommended Reading





Documentary:
http://www.cbc.ca/natureofthings/episodes/the-brains-way-of-healing

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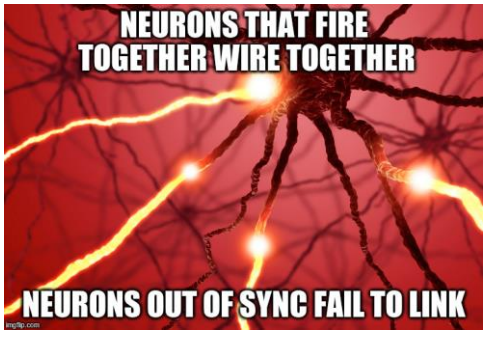
Neuroplasticity – Hebb's Law



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Other Principles of Neuroplasticity

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Neuroplasticity

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Neuroplasticity

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PRESCRIBING: A BRIEF OVERVIEW

DeAnn Fitzgerald, OD

Enhancing Neurological Recovery Through Vision Rehabilitation

118

Applications for Lenses

- Compensatory
- Therapeutic
- Performance
- Developmental
- Comfort
- Functional
- Behavioral

119

Possible Goals for a Prescription

- Influence visual thinking
- Influence visual motor to guide visual sensory
- Influence symmetrical posture
- Alter gait or movement
- Guide projection to equal perception
- Improve visual grasp, release and manipulation
- Speech and language
- Efficient visual processing
- Increase reading speed

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Possible Goals for a Prescription

- Gain awareness
- Improve comprehension
- Improve insight
- Improve understanding of the world
- Disrupt warped visual system
- Guide visual development
- Balance visual system at near

Possible Goals for a Prescription

- Make performance easier
- Sustain performance
- Increase ease and comfort
- Allow more efficient productive performance
- Heighten discernment over a larger viewing field
- Change behavior
- Improve function

Specific Optometric Lens Applications

- "Normal" refractive conditions
- Strabismus
- Amblyopia
- Anisometropia
- Vertical Deviations
- Asymmetrical Cylinder
- Centering Shift
- Myopia Control
- Visual Field Disorders
- Vision Therapy

Performance Testing

- Helps to determine the final prescription
- The opportunity to trial the prescription determined from the data collected during the analytical and near retinoscopy and observe how the lenses impact performance.
- Real world function of prescription

Tests to Determine Best Prescription

- Visual Motor Performance Tests
  - Dynamic Retinoscopy
  - Streff Ball and Cap
  - NPC
  - Pursuits
  - Reading

Performance Testing

- Observe changes in:
  - Visual Motor abilities
  - Reading
  - Walking
  - Paper and pencil tasks
  - Visual aliasing/grid
  - VO Star
  - Breathing, attitude, posture
  - Patient report of symptoms

Streff Ball and Cap

- Equipment needed:
  - Wand - gold or silver
    - Some people use a pen or other object
  - Cap
    - Highlighter cap, eye drop bottle cap, finger
- Patient fixates ball (Wolff Wand)
- Holds cap at waist level in preferred hand
- Put cap on ball quickly
- Do not look back and forth between cap and ball

Important Visual Spatial Perception Concepts

- SOLI vs. SILO
  - Small Out Large In (SOLI)
    - Real objects moving in real space
    - Objects appear larger when they are closer and smaller when they are farther away.
  - Small In Large Out (SILO)
    - Perceived movement of the target.
    - Target should appear smaller and closer with Base Out prism or minus, larger and farther for Base In prism or plus
  - NOTE: can often shift a patient's perception from SOLI to SILO by opening peripheral awareness (this shift can be instantaneous)
- Form Constancy
- Figure-Ground

What else?

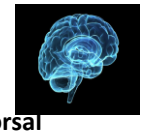
Yoked prism—used to modify environmental awareness—

- Base down—perception—further, bigger, uphill
- Base up---perception---closer, smaller, downhill
- Base right---perception---expands space right and contracts space left
- Base left---perception---expands space left and contracts space right
- Base down emphasizes the background
- Base down and Base In prism both cause the eyes to diverge

129

It's a brain thang!!

- When prescribing any lens, prism or tint—it is important to know the extent of the patient's ability to recover---anyone with low recoverability will not efficiently and quickly adapt to change
- Base up affects **parietal lobe**
- Base down affects **temporal lobe**
- Aiming and pointing—**peripheral/dorsal**
- Focusing—**central/ventral**



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Balance?

- Yoked prism not only affect environment they affect motor
- Base down—causes the eyes to look up and out—motor skills it will cause the person to lean back on the heels
- Base up---causes eyes down and inward---motor skill is affected so that they lean forward on their toes
- Base right—activated the right hemisphere---eyes left---rotates the body left
- Base left—activates the left hemisphere---eyes right—rotates the body right

131

Posture?

- **Yoked prism** will affect hips
- **Non yoked prism** will affect shoulders
- **Base In prism**---objects appear further and bigger—shoulders back
- **Base Out prism**---objects appear closer and smaller---shoulders forward

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Prisms

- Yoked prisms—change information at the brainstem level
- 15 diopter yoked prism walk---ask the patient to walk a straight line, is she aware of the changes in space—hypersensitive
- Yoked prisms can cause an unconscious shift in the body (the hips) and/or environment—uphill, down hill, slanted to the right or to the left
- Non-yoked prisms—do not cause an unconscious shift of the center of gravity or to the hips—they alter the apparent location of the targets

133

Yoked prism is different for Focal/Ambient

- Effective for treatment of visual-postural imbalance
- Two prisms positioned with the base end of the prism in the same direction
- Causes an image shift toward the apex – **Focal Visual Process**
- Causes a shift of the center of mass toward the base –**Ambient Vision Process**

134

Prescribing Tips

- When prescribing any lens, prism tints—it is important to know the extent of the patient's ability to recover---anyone with low recoverability will not efficiently and quickly adapt to change
- Base up affects parietal lobe
- Base down affects temporal lobe
- Aiming and pointing—peripheral/dorsal
- Focusing—central/ventral

135

Prescribing Prism Tips

- **Place the base of the prism in direction you want the patient to go**
- Always prescribe the least amount of yoked prism appropriate to cause the desired effect of improved postural orientation
  - Start at a moderate amount (2PD) then increase by 2 until you get the change you are looking for
- Start base left and don't finish with base up
- Used in therapy only (approx 15 -60 min)
- Reassess in 3-6 weeks – get feedback from PT/OT
- If don't get effective change you want at reassessment will do a prescription

136

Observation with Yoked Prism

- Observe postural position in static sitting, static standing and dynamic ambulation
- Look for position of the pelvis in relation to the shoulders
- Anterior-posterior shift should be evaluated by observing the relationship of the position of the head and neck to the position of the pelvis
- Look for an anterior or posterior tilt of the pelvis relative to the weight bearing on the feet
- Anterior pelvis tilt – pressure forward or on toes
- Posterior pelvis tilt – pressure posterior or on heels

137

Treatment for VMSS

- Yoked prism
- Desired outcome is to shift the real image to the perceived
- Might require 1 to 6 prism diopters
- CAREFULLY MONITOR

138

IMMEDIATE EFFECT OF YOKED PRISM

139

EFFECT AFTER 6 WEEKS

140

Power of Plus

- Low Plus Lenses—as "Dorsal—Ambient—Peripheral" optometrists, we can use plus (+0.12 or +0.25 or +0.50) This can help release "focal binding" which allows the patient to become "aware" of the background and helps "open up" the peripheral awareness—panoramic view; emphasizes background instead of the detail
- Low Plus Lenses affect the brain in occipital, temporal, parietal lobes and limbic system—neck muscles will loosen
- Low plus lenses shift posture from eso → exo, from flexion → extension, from central → peripheral, from sympathetic → parasympathetic

141

More?

Filters

- Occlusion—spot, binasal, bitemporal—alters retinal fiber input—so it will alter parietal or temporal input
- Tints—Blue—shorter wavelength—calming (increases parasympathetic and increases accommodation
- Yellow---longer wavelength—stimulating (increasing sympathetic and decreases accommodation)

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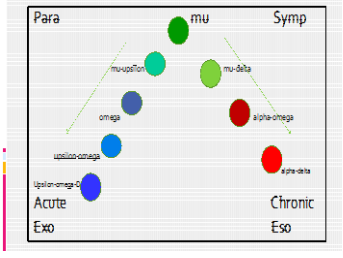
More?

- Syntonics
  - Using light to balance the Parasympathetic and Sympathetic systems



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Binasal Occlusion

- ***The best magic trick we have!***
- Width of tape depends on what is comfortable for the patient
- Can be used for tabletop activities, moving in the environment or both

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Uses for Bi-Nasal Occlusion

- TBI/PTVS
- Convergence Insufficiency
- Reduce Asthenopia, Photophobia, Headache, Vertigo
- Strabismus
- Amblyopia
- Disequilibrium
- Centering Shift
- Accommodative Problems
- Spatial Organization Problems
- Diplopia

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Indications to Trial Bi-Nasal Occlusion

- Headache
- Photophobia
- Convergence Insufficiency
- Suppression
- Hemianopsia with Midline Shift
- CN IV Palsy
- Constant Diplopia
- Esotropia “infantile/congenital”

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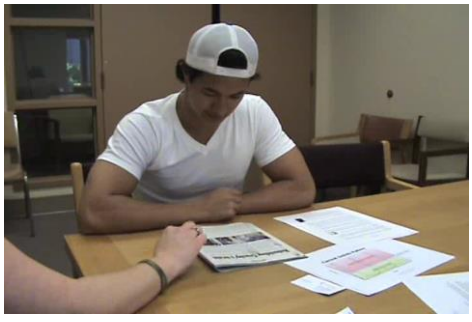
Immediate Effect of Binasal Occlusion



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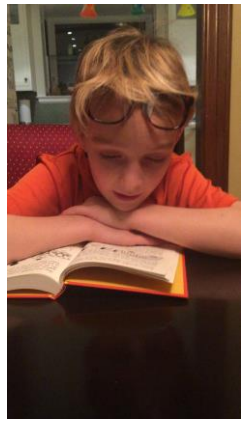

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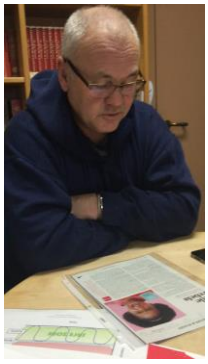
Another Example



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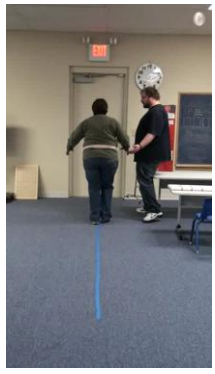
Impact on Posture



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Now with BNO

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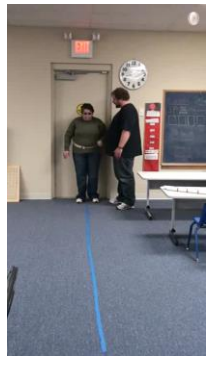
Lastly, with prisms



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Vision & Vestibular

Sensory Mismatch!

- The information getting to the brain from one or more systems may be incorrect and/or the processing of the information from the brain may be incorrect
- The result from either sensory conflict that usually leads to imbalance, dizziness and often time nausea
- Automaticity is knocked out
- She is a very complex case
- As these patients EMERGE OUT of their injury, more comes to the surface

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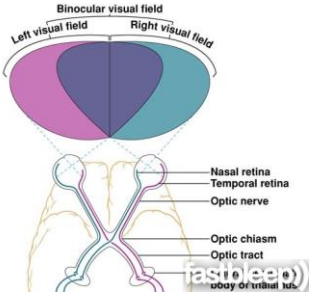
Competing visual fields



154

Research…

Visual evoked potentials (VEP) evaluating treatment for post-trauma vision syndrome (PTVS) in patients with traumatic brain injuries (TBI)
Brain Injury 1994
W. V. PADULA, S. ARGYRIS and J. RAY

Effect of binasal occlusion (BNO) on the visual-evoked potential (VEP) in mild traumatic brain injury (mTBI)
Brain Injury 2013
KENNETH J. CIUFFREDA, NAVEEN K. YADAV, & DIANA P. LUDLAM

Effect of binasal occlusion (BNO) and base-in prisms on the visual-evoked potential (VEP) in mild traumatic brain injury (mTBI)
Naveen K. Yadav & Kenneth J. Ciuffreda
Brain Injury 2015

Neural mechanisms underlying neurooptometric rehabilitation following traumatic brain injury
Caitlin M Hudac[1]
Srinivas Kota[1]
James L Nedrow[2]
Dennis L Molfese[1,3]
Eye and Brain 2012

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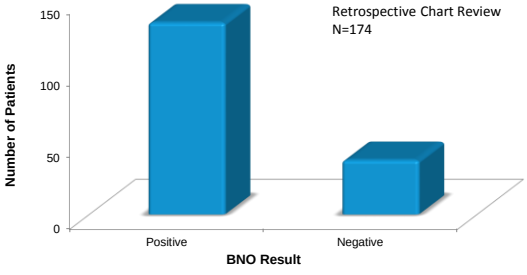
BNO Response During a Reading Task

(McGuire et al 2016 – unpublished)



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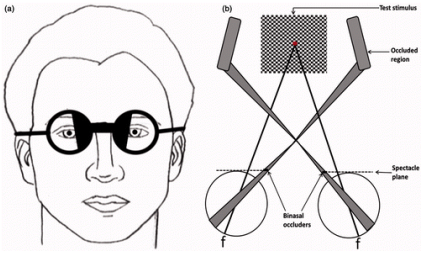

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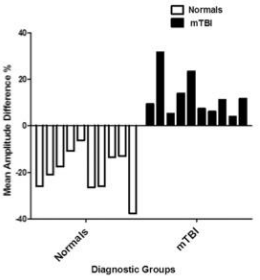
Cuiffreda et al 2013

- mTBI patients & healthy controls
- Assessed with VEP
- With and without binasal occlusion



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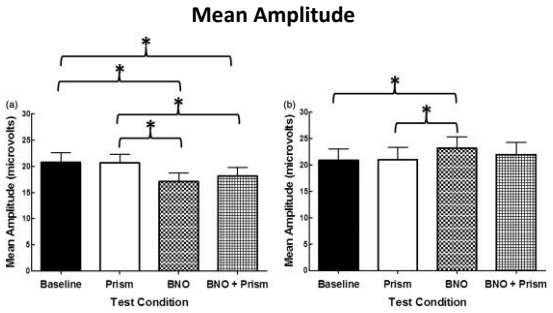
Yadav et al 2015 – BNO & Prism



Visually Normal mTBI

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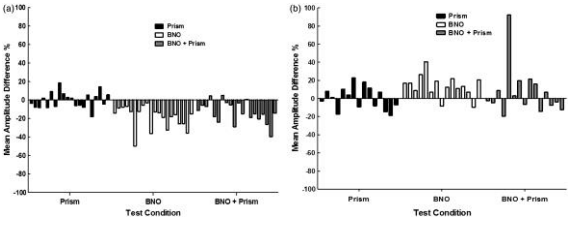
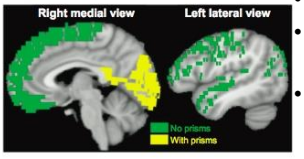
Yadav et al 2015 –Individual Response



Visually Normal mTBI

160

Hudac et al 2012



- Case report – mTBI
- Prism and BNO
- Increased speed of processing
- Appropriate area of the brain used for visual task

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How to use BNO

- Assess them reading with and without BNO to see if there is a change
- Can also assess them walking or doing VOR exs
- Use BNO for reading, computers, TV *(The Evil Triad)*
- Some patients use it when walking, driving, busy environments
- Put tape on the inside of sunglasses so it is not so visible
- Can use it for vision, vestibular & balance training

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Beyond Lenses – What else can we offer

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Functional Model

- training eye and eye muscle coordination.
- In optometry ranges of vergence and quality of version movements are analyzed for limitations. Therapy includes emphasis on:
  - Fixations
  - Pursuits
  - VOR/Vestibular
  - Convergence
  - Fusion
  - Anti-suppression
  - Saccades
  - Perceptual and memory skills
  - Reaction time

Enhancing Neurological Recovery Through Vision Rehabilitation

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Behavioral Model

- utilizes many of the same approaches of the Functional Model but, in addition,
- incorporates:
- Prescribed lenses to affect function
- Yoked prisms in various orientations (without specific
- orientation) to develop adaptation of vision
- Use of balance boards and walk rails to improve balance
- and movement
- Observation of changes in behavior related to attention,
- concentration and memory

Developmental Model

- utilizes the stage of development to assess and intervene to habilitate:
- Fixations
- Pursuits
- Convergence
- Saccades
- Hetero-lateral movements
- Motor differentiation
- Prescribed lenses to influence development

All Vision Therapy

- All models of vision therapy emphasize:
- Fixation
- Focalization
- Attention
- Concentration
- Action directed from cognitive awareness
- Movement

Neuro-Visual Postural Therapy

- Analysis of the postural base of support (BOS) and biomechanical alignment
- Assessment of the level of visual skills relative to the postural organization
- Establishment of visual-postural organization in relationship to:
- Movement components of extension and flexion
- Movements against gravity (extension) and pro gravity
- (flexion) movement components with rotation
- Head and neck alignment
- Trunk rotation
- Release of focalization to establish change
- Release from Postural Binding
- Bi-modal concept of visual processing
- Preconscious
- Conscious

Principles of Vision Retraining

1)Structure evaluation of the eyes does not provide a complete screening or diagnostic assessment for a comprehensive understanding of the visual system.

2) **Vision is a skill**. Vision learning and relearning have hierarchies that are fundamental to the development and re-establishment of visual pathways in visual perception and visual behavior

3) We should not put central vision exercises on a system that has had a potential concussion. Building on an already challenged peripheral vision and/or vestibular/proprioception system may cause the patient to get worse.

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Question? Is vision helping or hindering recovery?

Double Vision

- Integrity of fixation, pursuits, saccades, VOR, OKN
- Post Trauma Vision Syndrome?
- What do both of these visual difficulties have in common??

Visual field deficit

- Visual field deficit with USI
- Visual field deficit w/o USI
- Visual Midline Shift?
- Its spatial

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Spatial Therapy

- The patient needs an anchor—or grounding—"I do not know where it is in space—I do not know where I am in space"

  Without technology
  1) Bi-nasal occlusion/sector patching
  2) compression—vest/beans bags on shoulder, tight t-shirt thera band

  With technology
  1) Low plus (+0.50)/micro prism (BI/BO)
  2) Yoked prism
  3) tints/filters

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First you have to get their attention!!

- Prioritize—comfortable and attending—posture—best correction
- Relearning
- Education

- First—deal with double vision if it is symptomatic
- Next—visual field with or without neglect--safety

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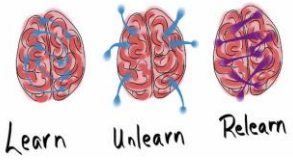
Relearning



1)**Sensory Eye stretches** (close eye stretches)

- Duction work—got to get their attention
- Eye throwing
- Doll's Eye
- Turning chair

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Retraining

2) Pursuits
3) Saccades
4) VOR stabilization
5) Visual Spatial Awareness
5) Convergence
6) Multisensory environment—visual, auditory, vestibular, proprioception

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Priorities for Treatment

Visual Issues

- Double vision
- Light Sensitivity
- Vestibular problems
- Focal/Spatial imbalance
- Focal visual tasks

Move!!

Optometry Tools

- 1) BNO – helps with reading
- 2) Tint – 15% blue
- ***Vision Training***
- 3) +0.50 – releases focal binding
- 4) Base In Prism – 0.5-2 PD – helps to release focal binding

* Don't prescribe before 1-3 weeks

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Starting Treatment

- Start with prism
- Activate limb and trunk
- Add movement for vestibular when tolerated
- Include auditory
- Add a cognitive load
- **Consider:** BOS, surface of activation, tolerance for movement

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Pyramid of Treatment

- Start with exercises that start in the peripheral/spatial vision with vestibular components
- The patient is in "hyper" focal or focal binding if we start with fixations, pursuits, saccades, accommodation and vergences, this patient will become more "locked up" and the symptoms may get worse
- While doing particular exercises, always keep the peripheral awareness open

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Then therapy has to begin where the patient can start

- The patient has to feel safe—so begin lying down or sitting
- Then we have to add movement—limb activation, next truck rotation
- As they can progress then so can the difficulty of the therapy
- Watching for breathing, heart rate—too much and the patient is left in a puddle

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What's driving spatial?

- Vestibular
- Cerebellum
- Parietal
- And what's driving this bus-- Frontal—attention, concentration, focus
- You have to get their attention first!!

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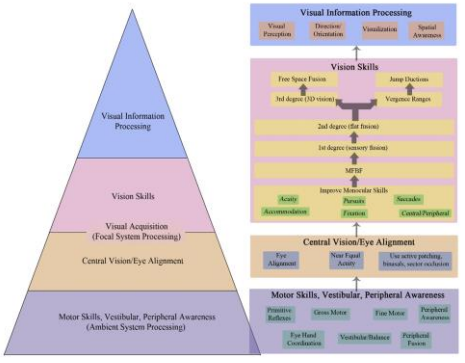

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Spatial/Focal

- Vision (spatial) leads in postural organization of flexion and extension after basic reflexes
- After basic reflexes vision should become the leading process to work with the sensorimotor systems for postural organization and plasticity
- The spatial process is plastic whereas the focal process remains high in plasticity so long as the spatial process is dynamically integrated with the sensorimotor system

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Is vision helping or hindering?

- To get them out of symptoms—which system is causing the most concern??
- To get them out of symptoms—which system or systems do I need to activate or inhibit to get the patient better??
- Use the symptom ratings sheet with question to determine where the symptoms are coming from—may be multiple systems.

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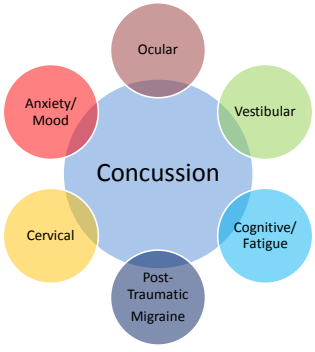
Clinical Trajectories



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Proprioception

- If the proprioceptive system is not operating efficiently, the vestibular system is often affected.
- Tactile input has a large proprioceptive map – you can use this to your advantage in therapy.
- Therapy should target the integration of proprioceptive and vestibular systems for best results (DynaVision is a great tool).
- Problems associated with Proprioceptive:
  - Touch, balance, movement, decreased body awareness, stiff, uncoordinated, clumsy, falling, difficulty ascending and descending stairs, toe walking, slap feet when walking, dyspraxia, difficulty with eating and speaking, etc.

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Adding proprioception

- Have them push on your hand when they are doing skills
- Have thera-band tied around their wrist and pull while doing exercises
- 25,000 proprioceptors in the feet-*vibration therapy!!*
- Vibrating insoles—the bottom of our feet are rich in proprioception

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Treatment: Proprioceptive

- **Weighted Compression Vest:** used to help anxiety, balance and dizziness
  - Could also try Spanx, Under Armor or EC3D



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Weighted Compression Vest

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More Video Examples

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Weighted Compression Vest

- Use for tasks/situations that are difficult:
  - Balance or visual training
  - Busy environments – eg. grocery store
  - Any activities that cause anxiety
  - Driving in a car (driver or passenger)
- Use intermittently and gradually wean down
- Can try just compression or just weight (roughly 5% of body weight, or less)
- Appear to be responders/non-responders

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Weighted Compression Vest Research

- Surprise there is none! (published – **yet**)
- Some research done on pediatric patients for behaviour – mixed results
- 1st Pilot study done with compression only demonstrated significant decrease in anxiety and trending toward improvement in balance
- 2nd Pilot study looked at weight (5%) and compression

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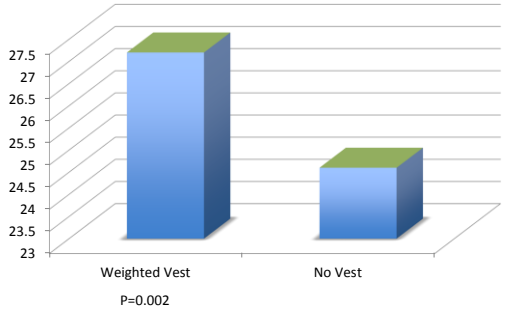
Functional Gait Assessment (n=27)



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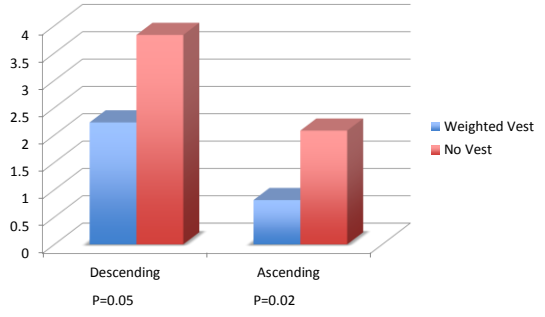
Stairs - Mean Anxiety Scale (0-10)



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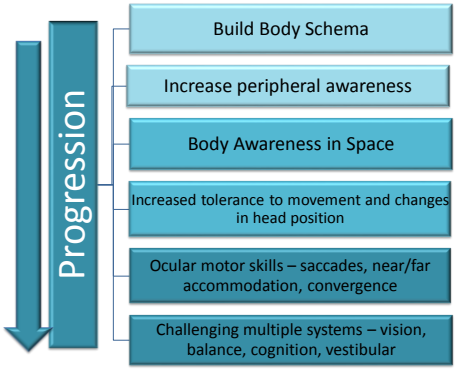
Organization of Visual/Vestibular Treatment



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But first! Build sensory & peripheral awareness

- Ask about sensory changes – "do your right & left sides of the body feel the same?"
- Watch how they walk and turn their head
- Are they?

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Lost in Space Club

- Subset of mTBI patients
- Need to build Body Schema
- Tactile sensory stim – massage, slap, tap, tickle to upper/lower extremity – patient focuses on mapping limb
- Start supine with body awareness during small movements

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Lost in Space Club

- Anticipatory activation activities – "connect your foot to the bed, your belly to your spine"
- Can they roll over?
- Sitting & weight shifting
- Standing & weight shifting
- Shifting with eyes closed and in control
- Activities that build postural control
- Successful practice to reduce anxiety for balance tasks – don't practice and embed bad balance!

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Body Awareness – Peripheral Ball Toss

-try to keep soft gaze forward
-attention on ball/bean bag
-can do this while walking
-same idea bouncing ball on floor

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Body Awareness in Space – Marsden Ball

-walk around ball and maintain fixation
-throw/catch
-duck under and around without touching
-avoid swinging ball

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Dishwasher Exercise

Find and touch the letters and numbers in order (A -1, B-2, C-3…) on the coloured worksheets reaching across your body. Move your head and neck together quickly as you turn and bend down to touch the letter or number on the seat. Then return your head and neck to the starting position quickly and find next letter/number on coloured sheet on wall.

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Visual/Vestibular Integration Exs

- **Blind spot check:** Keeping head still turn eyes to the left, then turn head to look over shoulder keeping eyes looking left. Then return head and eyes forward in one smooth motion. (watch eyes to ensure they return forward without stopping along the way). Repeat same activity looking to the right.

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Visual/Vestibular Integration Exs

- **Rainbow Bean Bag Toss:**

Step 1: Keep head still and eyes on the bean bag. Keep the bean bag in line with the centre of your body and gently toss the bean bag up in the air and catch it. Follow the path of the bean bag with your eyes.

Step 2: Keeping head still and eyes on the bean bag. Lightly throw the bean bag from one hand to the other in the shape of a rainbow. Your eyes should follow the path of the bean bag.

Step 3: Move head and eyes together to follow bean bag

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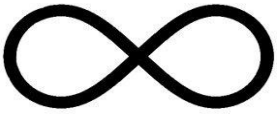
Visual/Vestibular Integration Exs

- **Infinity Walk:** Walk at a comfortable but continuous pace. Look at visual target on the wall. Walk in a sideways figure of 8 or infinity symbol while maintaining visual target. When you are turning around bring head and eyes back to the target as quickly as possible. Repeat several times as symptoms allow.



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Visual/Vestibular Integration Exs

- **Chair Spins:** Spin your chair 180 degrees to the right and stop and fixate on the target. Let any dizziness or disturbance settle then spin chair 180 degrees back to the left. Once again focus on the visual target and let any dizziness or disturbance settle. Repeat this sequence as tolerated.

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VESTIBULAR ACTIVITIES

***make any vestibular task more challenging by increasing speed or amount of movement in task. Can also add a cognitive demand to task*

STAGE 1	*STAGE 2*	*STAGE 3*
• Dishwasher exercise- to chair • Blind spot check –sitting or standing • Padula cube • S walk • Slow infinity walk – keep fixation during turns • Standing 90° turns • Substitution exercises- horizontal and/or vertical	• Dishwasher- to stool or floor • Blind spot check with 180° turn • Infinity walk- lose fixation during turns • Chair spins- slow, 90° turns • Standing 180° turns • Coloured words sheet • VOR with stationary target	• Dishwasher- 360° turns, squats • Infinity walk- add Padula cube, coloured word worksheet, count backwards etc • Chair spins- 180° turns, 360° turns • Standing 360° (can add a throw catch in between) • VOR in space or with moving target • Tandem walk with VOR

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Balance Training

- ***Static*** – good starting point
- ***Dynamic*** – need to add movement
- ***Multi-system*** – add visual &/or vestibular challenge (remember balance between spatial/focal systems), add cognitive load

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BALANCE ACTIVITIES		
STAGE 1	***STAGE 2***	***STAGE 3***
• Weight shifting exs – sitting or standing, eyes open or closed • Sitting on Theraball – weight shifting, arm movements, head &/or trunk rotation • Static Balance – eyes open -***Base of Support:*** feet together, stride -***Surface:*** floor, Airex mat -***Challenge:*** arm movements, head movements, coloured letters • BOSU – lunge on fwd/side	• Sitting on Theraball – ball toss, eyes closed, marching • Static Balance – eyes open or closed -***Base of Support:*** one leg, tandem -***Surface:*** floor, Airex mat -***Challenge:*** arm movements, head movements, coloured letters, cognitive task • BOSU – step up/down, mini-squats +/- cognitive task • Extreme Balance Board – eyes open, +/- cognitive task	• Static Balance – eyes open or closed -***Base of Support:*** one leg -***Surface:*** Airex mat or BOSU -***Challenge:*** throw ball, cognitive task, move arms/legs/head • BOSU – single leg or full squats, cross-overs • Extreme Balance Board – eyes closed +/- cognitive task • Bongo Board – eyes open, +/- cognitive task

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Going to the next level

- Dynavision
- Sanet Integrator
- Vision Coach
- BITS Board
- Makoto Arena

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Neuroplasticity: Sensory Learning Program

- an immersion technique that combines:
  - vision (light therapy)
  - vestibular
  - auditory (making the right ear dominant)
  - Proprioception
- in office for one hour everyday, 12 days in a row
- then home therapy (light for 20 minutes 2x a day for 18 days)
- if possible combined with in-office therapy
  - either OT/PT/Speech and/or Neuro-Visual Rehab(VT)

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Sensory Learning Program(SLP)

Natural Enhanced Sensory stimulation	Sensory system	Subcortical Brainstem area	Emergent Faculties
Photo-stimulation (Light)	Ocular system	Thalamus	ocular motilities
			Oral motor
			Vestibular cochlear reflex
		Midbrain	visual-balance integration
Acoustic stimulation	Auditory system	Pons	Auditory sequencing
		Cerebellum	visual-motor Integration
			Visual perception constancy
Rhythmic	Vestibular	Medulla	Auditory-visual integration
Moto stimulation	System	Oblongta	Visual-spatial Integration

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Technology in Action

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Vision Skills

Monocular skills (acuity, fixation, pursuits, saccades, accommodation, central/peripheral)

- Stick/Straw
- Flippers
- Marsden Ball
- Hart charts
- Prism jumps (emphasize JND)
- Lens sorting
- Ann Arbor Tracking
- Split bifocal rock
- Rotating pegboard
- After Image
- Eye stretches - Close & Closed Eye Movements

MFBF

- SVI with R/B glasses
- DynaVision with R/G glasses
- NVR
- Dissociated prisms
- Bar Reader/TV Trainer activities

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Vision Skills

1st degree fusion

- Stereoscope
- Cheiroscope
- Quoits

3rd degree fusion

- 3D Tasks, emphasize SILO
- HTS BI/BO tasks
- VTS4 BI/BO tasks

2nd degree fusion

- Vectograms/Tranagl yphs
- Brock String
- Apeture Rule

Free space fusion

- Lifesaver cards
- Magic Eye
- Barrel Cards
- Free fusion images from Eye Can Learn

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Vision Skills

Vergence Ranges

- Wheatstone stereoscope
- Vectograms/Tranaglyphs
- HTS Computer system

Jump Ductions

- Two vectograms split on stand
- Prism flippers

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Symptoms	Functional Problem	Management	Neuro-optometric intervention
Headaches	Interferes with concentration	Rest breaks Sleeping appropriately	Change rx (slightly plus), BNO micro prism (Majority BI) Cranio-sacral therapy (OT) Syntonic, PEMF Diet,exercise,hydration,CALM,melatonin
Light/noise sensitivity	Symptoms worsen in bright and loud environments	Wear sunglasses, seating away from bright light, avoid noisy crowded environments	Tints, polarization, AR coatings, Micro prism BI, low plus Dynamic exercises—Go-No Go, eye hand exercises—Dynavision, SVI, Senaptic
Dizzy/Balance Problems	Unsteadiness with walking	Class transition prior to bell, elevator pass	Visualization, VOR, BNO, spot patch, vibrating insoles, vibration therapy, cranio-sacral Habituation exercises—lying

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Symptoms	Functional Problem	Management	Neuro-optometric intervention
Anxiety	Can interfere with concentration, student may push through symptoms to avoid falling behind	Reassurance from teachers and team about accommodations, workload reduction, alternate forms of testing	Multisystems therapy, syntonics, prism, low plus, tint, Have them consult PCP conseling
Depression/withdrawal	Withdrawal from school and friends due to stigma and activity restrictions	Time built in for socialization	Exercise, activity, diet, hydration Adjust serotonin levels(PCP)
Sleep disturba	Decreased arousal, shifted sleep	Later start time, shortened day	Syntonics, PEMF, cranio-sacral, melotonin, CALM Diet exercise

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Symptoms	Functional Problem	Management	Neuro-optometric intervention
Cognitive problems	Concentrating/ learning	Have a scribe, extended time for tests, quiet room, etc	Check for underlying unresolved vestibular and spatial system problem BNO, spot patch, planning and pacing
Symptom sensitivity	Symptoms worsen with over-activity, resulting in any of the above problems	Reduce cognitive or physical demands below symptom threshold, provide rest breaks, compete work in small increments until symptom threshold	Syntonics, multisystems therapy, planning and pacing
Fatigue	Decrease arousal/activation to engage basic	Rest breaks during classes, homework, exam	Change rx (slightly plus), BNO micro prism (Majority BI) Cranio-sacral therapy (OT) Syntonic, PEMF, planning and pacing 89% of individuals have undiagnosed

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Light Sensitivity

- Optometric solve
- Artificial tears/punctal plugs
- Tints
- Change in rx
- Neuro-Optometric Solve
- Bi-Nasal occlusion
- Tints
- Micro prism
- Yoked prism
- Dynamic therapy-vestibular, gait, eye hand coordination; Go-No Go, balance
- Syntonics (photobiomodulation)
- Listening program(auditory)

the Why?

- Superior colliculus can be excited or inhibited with inferior colliculus which gravitates to sound (auditory) so headphones(bone conduction) and listening program
- Syntonics—helps regulate parasympathetic/sympathetic balance; activates the pineal gland
- Yoked prisms—stimulates parts of the brain that are disengaged; Base up –parietal and base down temporal.
- Dynamic therapy—multi-systems therapy, vestibular, cerebellum, parietal, frontal—with saccades and eye hand coordination

Motion Sensitivity Treatment

- BiNasal occlusion
- Yoked prisms
- Dynamic therapy—vestibular, gait, eye hand coordination
- Proprioception—compression
- Syntonics/low level light therapy
- Cervical—cranio-sacral, acupuncture, pressure points
- Pressure points—pat the top of the head, pinch the trapezius muscle, stomp the foot
- It's spatial!!

Vestibulocerebellar

Findings

- Wide stance gait
- Inability to ambulate
- Strabismus and diplopia
- Positive Romberg
- Nystagmus after head shaking
- Nystagmus-pure horizontal, vertical torsional
- Impaired VOR and VOR cancellation
- Impaired smooth pursuits
- Hypo or hypermetric saccades
- Optokinetic activity leads to decay in movement and induce vertigo or autonomic symptoms
- Overshooting with head thrust
- findings of dysautonomia during exam including abnormal heart rate vulnerability

Treatment

- Gaze stability exercises
- Visual pursuits and targeted saccades
- Rotation exercises specific to specific canals
- Dynamic therapy—movement
- Vibration therapy
- Syntonics
- Cranio sacral
- Compression
- Yoked prisms
- Low plus
- Tint

Cerebrocerebellum

Symptoms

- Recent clumsiness with hands
- Recent clumsiness with feet
- Tripping
- Slight hand shake when reaching for something at the end of the movement

Findings

- Termination tremor with end stage targeting (finger to nose)
- Hypo or hypermetric (dysmetric)—finger to nose and heel to shin
- Dysdiadochokinesia—rapid alteration movement; both hands out and shaking or rapid clapping of hands or single hand on thigh
- Ataxic dysarthria

Spinocerebellum

- need to hold handrail or watch each step carefully when going down stairs
- feeling unsteady and prone to falling in the dark
- prone to sway to one side when walking or standing

Spinocerebellum

Symptoms

- wide stance gait
- instability with ambulation
- Positive Romberg test

Findings

- postural balance exercises (bosu, rocker board, etc)
- Core stability exercises (planking, yoga)

Neuro-optometric therapy

- Helps in
- Posture
- Gait
- Balance
- Getting out of symptoms using lenses, prisms, and tints
- It takes a village and that village is equally important from PT, OT and speech
- Once a optometric rx is found then it needs to be tested with performance testing—that neuro-optometric rehab
- If you are not getting the results you want—change it!!

Other treatments

- Vibration—power plate or vibrating insoles
- Binasal Occlusion—works about 79% of the time to relieve symptoms and help with more fluent reading
- Micro-prism
- Yoked prisms—used a lot with motor activities
- Halo headphones—transcranial stimulation
- PEMF-pulsed electromagnetic field therapy
- Sytonics—photobiomodulation—Low level light therapy

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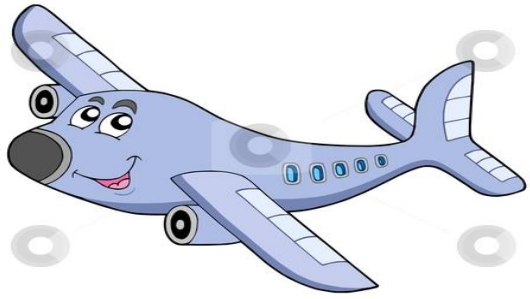
We are building this plane as we are flying it!



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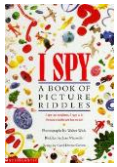
USI TREATMENT STRATEGIES

Enhancing Neurological Recovery Through Vision Rehabilitation

227

Static Predictive Situations (severe)

- Predictive margins and a static presentation (i.e. Reading)
- Compensatory strategies:
  - Red line/velcro along the left edge of the page (used as a cue); velcro acts on proprioception
  - Turn page 90 degrees (now not crossing midline)
- Rehab strategies:
  - Tracking printed words as story is read aloud (i.e. Books on tape)
  - Call out the first and last letter of each word on a page of print
  - Colouring in certain letters on a page (i.e. The "o"s)
  - Scanning a page of objects for a specific one (i.e. I Spy)
  - Card Match
  - T-Square
  - Pen Trail
  - Catch the spotlight



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Static Predictive Situations

- Reading with an uneven indentation on the left side—less predictable
- Cultural significance, most languages are read left to right; so if you find the edge of the paper, and go right, you'll see it all. But what if your language is read right to left?
- Reading words is easier than numbers; words have a context and we tend to fill in the missing parts automatically

229

Dynamic Non-predictive Strategies

- Most times, we encourage patients to 'LOOK LEFT'—the problem is, they turn their head to the left, so this just reinforces the neglect b/c their EYES never cross the midline.
- USI is a misconception of the left visual space, so turning the head left doesn't change this misconception.
- Better to ask them to use another method of finding objects (meal tray example)

230

Dynamic strategies continued...

- Margolis Eye Throwing Technique—relies on proprioceptive and kinesthetic (as opposed to visual) cues. Hard to learn!
- How: have a patient close their eyes, look as far left as they can with their eyes closed, and when they open their eyes, they should see objects previously missed on the left.
- Tapping the left temple can cue for this far left reach
- Learning to throw left, and scan along to the right

231

You can use pencil/paper tasks

- But rather than uniform letters in a row, try random objects, randomly spaced:

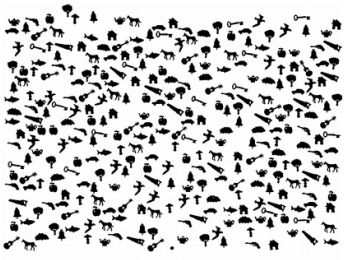

Figure 1 The Bells Test (Gauthier et al., 1989).

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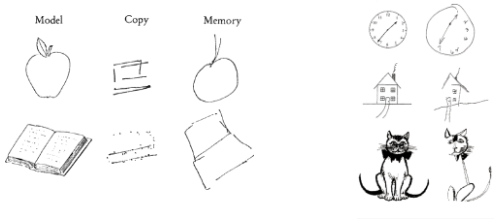
Pencil and Paper

Drawing objects from memory (free draw)

vs

Copying drawings from a diagram



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Arranging Objects Symmetrically within Space

- Have patient place cookies evenly on a cookie sheet
- Have patient set the table for 4-8 people (play with contrast of mats and plates)
- Have the patient place a spoon, napkin and apple in 20 paper bags on a table
- Deal cards to 8 people

234

Search and locate objects vs. Arranging objects in space

- Need to understand the whole in order to arrange in space and then be able to divide up that space symmetrically. Search and locate usually has a 'border' of some sort (the shelf, the room walls, the edge of the paper)

235

Pop-outs vs. variety of objects

- Big difference between the difficulty of:
- Find all the yellow cereal boxes vs. gather the ingredients from this list.
- List gathering is an excellent task to do (scavenger hunts, tools in a tool box, cans in a cupboard, etc.). Add distractor objects not on the list to make it harder!

236

Body Image Awareness strategies

- Individual limb tapping "snow angels" (move tapped limb outwards away from the body) or move the affected limb (if possible)
- Mannequin projections (touching a similar touched part on another person's body)
- Tape down the centre of the patient's body, another corresponding line in a mirror
- Cotton balls stuck to patient's affected side to find
- Pick up dowels at the midpoint of each stick

237

Orientation and Scanning strategies

- ***PRISMS!*** Yes, we need an optometrist for this
- Using coloured objects (green in the right field to start, red in the left field to stop)
- Place +++ objects (cluttered) in left field, right field is uncluttered—bias the left side so that attention will go there
- Numbers on walls
- Computerized visual search activities: Acuvision, Vision Coach, Dynavision, etc (Wii?)
- Visualization of room based on a scan from the doorway or floor plans.

238

Let's tap into some other systems...

- Use the ***Vestibular-Ocular Reflex*** —Caloric Stimulation (ice cold water in the ears!)... Not very pleasant, and only lasts about 15-20 min.
- Use ***proprioceptors in the neck***—by vibrating posterior neck muscles, neglect can be improved (or using TENS)
- Use the ***Optokinetic Reflex***—high contrast vertical lines moving horizontally pulls the eyes to the left (kind of like when driving down the highway and trying to look at one telephone pole as it goes by—passengers only please!)
- ***Occlude the 'unneglected field'*** with opaque tape, it forces patients to scan into the neglected field.
- ***Muscle proprioception systems***--Massage, Slap, Tap & Tickle the affected arm/hand/leg/foot.
- ***Tactile Search*** for objects (eliminate vision altogether)—cotton balls stuck to patient

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Awareness

- Awareness to a left neglect is key; once this is established, then compensation can occur to decrease the impact.
- Asking a patient, "how do you think this task will be challenging to you?", most don't even realize that it's a 'left neglect' issue at all

240

Technology and Life Hacks

- Many of our patients do not have time to simply wait and do therapies until they are recovered.
- Many need to cope with life in whatever way they can.
- What happens when we live in a very visual world, and we are not efficient with using our visual system (which leads to multiple symptoms?)

241

Vision is needed for READING

- Use of blinders to block portions of text on a page so that it becomes less distracting and visually overwhelming

242

Technology for Reading

audible
an amazon company

Voice Dream

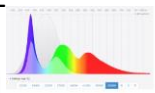
243

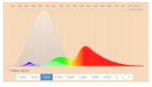
Vision is needed for COMPUTER USE

244

COMPUTER USE

Blue Light Filter





DRAGON NATURALLYSPEAKING

245

There's an App for THAT!

Bluetooth

246

Grocery Shopping

- Makes Lists
- Browse Flyers
- Compare Prices
- Save clippings for Price Matching

Take a photo of your grocery list, make it your LOCK screen photo

247

POWER OF THE LOCK SCREEN

- Put a photo of 'how to contact me if you find my phone' info
- Put important medical info including emergency contact information
- Put a to-do list or a 'priority task' so that you won't forget
- Inspirational quotes or reminders (i.e. Don't stay on your phone too long!)

248

Calendar

- The built in calendar (both iOS and Android) are assets to helping with scheduling tasks.
  - Colour code to make it easier to see priority tasks
  - Set alerts to remind you of appts

249

LISTS!

Alarmed! Timers

Make various lists; share with family

GPS of locations

250

Use the Camera as a tool…

- Take a screen shot of everything you need to keep track of; email it to yourself as a receipt
- Need a grocery list, but tend to forget it… take a photo of it, and use it as your screen saver, now you don't even need to unlock the phone
- Can't remember people's names? Take photos of them
- WRITE ON THE PHOTOS

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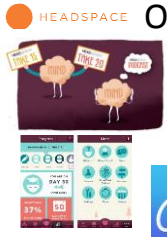
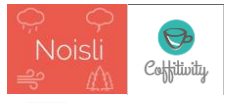
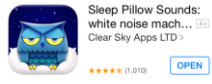
On the Go Relaxation



Mindfulness

White Noise





Colorfy

252

Use Voice Prompts (i.e. Siri)

- To input an appointment into the calendar
- To set a reminder task
- To create a memo/note
- Voice recorders to help with remembering to do something (beats calling yourself and leaving a message)

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Therapy Apps

254

Some apps are fun (and therapeutic!)

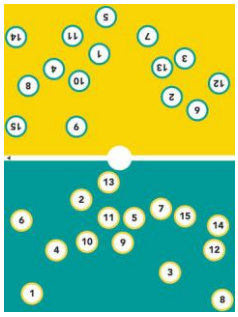
- Omicron

255

- Word Mess

256

- Count Battle (levels of difficulty)



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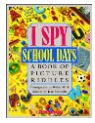
Hidden Object

- Doodlefind
- Hidden Doodles
- Super Search 60
- Little Things Forever

OLD school: I Spy



Mahjong

258

Visual Logic

- BlockWick

- Rush Hour

- Number Link

- Clockwork Brain
  - (4 cognitive/visual tasks in 1)
- Qbitz

259

Visual Perception

- Mosaic HD

- Matrix Match 3

- Tangram

260

Brain Training

- Lumosity 

- Posit Science 

- Elevate 

261

Breakout Session References

Eye/tongue/body exercise and sucking exercise came from Svetlana Masgutova classes

www.masgutovamethod.com

262

Breakout Session References

Anat Baniel Method: Gentle ways to loosen the body

- Ted Talk on YouTube with a simple exercise
- Other Anat videos on You Tube
- AnatBanielMethod.com

  CDs, live streaming, courses

263

Breakout Session References

Therapeutic Tape:

- RockTape.com has great classes as well as cool prints on their tape. Try the FMT class.
- Kinesiotaping.com has tape and classes

264

Breakout Session References

Therapeutic Tape:

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- Kinesiotaping.com has tape and classes

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Interestingly, the three websites are all programs that use developmental and reflex models to addressing the management of neuromusculoskeletal conditions.

www.rehabps.com

www.AnatBanielMethod.com

www.masgutovamethod.com

266

Case Study

- 15 year old female sustained a concussion in volleyball
- Dove for a ball rotated and hit back of head on the floor
- Therapy for poor accommodation, extreme symptoms with near work
- 10 sessions later, can do Brock string, NPC to nose with good control, pursuits with good eye teaming, +/-1.50 flippers with ease
  - BUT – VERY symptomatic!!!
- Should be an "easy" case, what is wrong?

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Case Study (cont'd)

- Peripheral work was missing!
  - What to do with a 15 year old?
    - DynaVision, peripheral identification, scan board, reminders to keep vision "open"
    - Scanning and walking with head movement and hand coordination
- After starting session with peripheral work – student athlete ended session without complaint of eyestrain for the first time!
- And on follow up remained symptom free
- Started exertion protocol and finished with releasing her back to full play—they did not have an AT so we did the work

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Case study

- 13 year old had a clavicle injury 5 months ago, recovered started playing in soccer
- Reports no real incident of concussion but was having a lot of difficulty in school
- VOMS confirmed receded NPC and increase in symptoms with the screening
- Described most all the symptoms of PTVS and IMPACT scores were not to baseline

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