Autonomic Nervous System and Heart Rate Variability Considerations for Evaluating Syntonic Filters

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Financial Disclosures

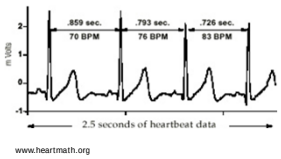
- None

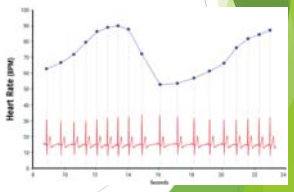
Summary of Presentation

- Heartrate Variability (HRV) and physiologic Coherence as an index of the Autonomic Nervous System (ANS)
- Examining the printout of HRV
- Case examples of using HRV and Coherence for Syntonic Filter Evaluation
- Live demonstration of technique

What is Heart Rate Variability (HRV)?

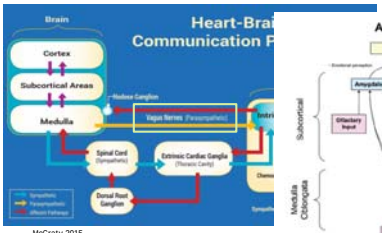
- Fluctuations of time interval between pair of heartbeats
- Cardiac rhythm is regulated by cortical, subcortical, and medulla





www.heartmath.org

Heart-Brain Communication and HRV



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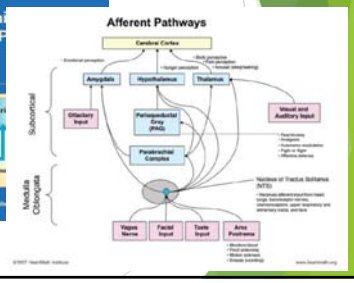
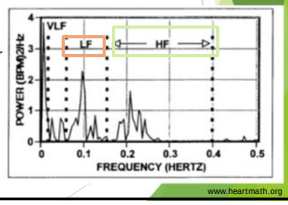


HRV as an index for ANS

- Optimal HRV – self-regulation capacity, neurologic adaptability (resilience), performance
- Too little variation indicates chronic stress, pathology, emotional dysregulation, decreased mental function "Depleted State"
- Low HRV correlated with declining cardiovascular health, increasing biological age, reduced sleep, and increasing risk of chronic disease
- Low HRV also correlates with reduced parasympathetic activity, ANS rigidity, and maladaptive stress coping

Analyzing HRV – Frequency Domain Analysis

- Time Domain – duration of time between heart beats
- Power Spectral Domain (PSD)– separates HRV into components, frequency and amplitude variants of a given rhythm
- High Frequency (HF) – measure of parasympathetic or vagal activity
- Low Frequency (LF) – baroreceptor activity and bp control

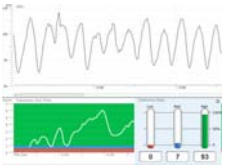


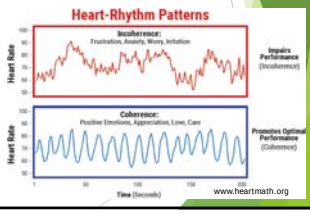
HRV Readout

HRV readout

Optimizing Physiologic Coherence

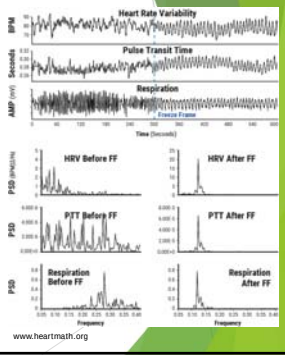
- sine wave, stable and organized frequency, amplitude, shape
- Increased coherence, increased parasympathetic (vagal), increased heart-brain synchronization



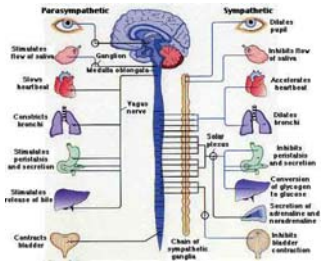


Coherence and HRV

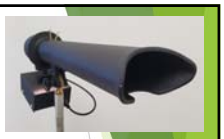
- Coherence = organization, system stability as a whole
- HRV = parasympathetic
- Cross-coherence: increased synchronization between 2+ physiologic systems
- Consistency, harmonious, efficient energy utilization



Sympathetic vs Parasympathetic ANS



Syntonic Phototherapy



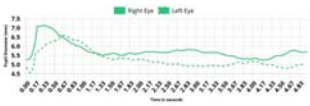
- Full Spectrum Light Glass Color Filters Diffuser
- Different Light Frequencies (Colors) are either motor/sensory stimulants/depressants to influence sensorimotor functions of the eye -Spitler (1930s)

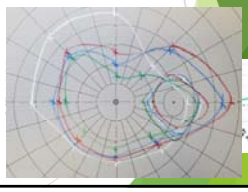
  E.g. alpha (red) = sensory stimulant,
  omega (indigo) = motor depressant

- Prescription based on patient symptoms, medical history, and clinical findings

Current Techniques on Syntonic Filter Evaluation

- Pupillary Assessment (APD) and Pupillary Fatigue
  Re-Dilation after light exposure (p*arasympathetic -Constriction)*
- Color Kinetic Fields
  Contracted Color Fields and enlarged blind spots
- *Techniques are retrospective*





Case 1: Symptomatic TBI - KR

- 50 YOM suffered TBI with LOC (3mo prior) from blunt head trauma with ethmoid fracture to Left orbit after falling off a ladder, mild LEFT ptosis was improving
- CC: momentary diplopia, visual blur at near, excess photosensitivity especially to fluorescent light, neck pain, and difficulty with emotion and anger regulation, daily frontal crowning HA 9/10, visual fatigue within 4 hours of waking, constant bumping into objects, falling several times per week
- BIVSS: 74
- MHx: HTN, DM x10 years (a1C = 7.4), kidney stones

KR initial findings

- Presenting SRX: DVA NVA
  OD +1.75-0.75x120 20/40 20/80
  OS +2.25-1.25x048 20/50 20/100
- CT (D): 4 IRXT (70%); (N) 10 IRXT (70%)
  NPC (RL): 4”/1m
- Pupils: PERRL (-)APD pupil reaction is slow OU omega pupil 3+ OU
- Ishihara: WNL OD, OS
- NSUCO: Pursuits OU 3,3,3,4; Saccades OU 3,3,3,3
- Stereo: 50” Randot +FORMS
- Vergences PB: DBI x/4/2 DBO x/4/0 NBI x/10/8 NBO x/12/8

KR initial workup

- Ocular Health: mild DES, reduced lid tone OS
- DFE: no NPDR, no PDR OU vitreous floaters OU
- Attempted threshold fields (light sensitivity intolerant), confrontation fields suggested Incomplete Left Hemianopsia with inconsistent L field awareness
- No visual neglect (dual presentation w/o extinction)
- Gait Shift Strongly to the LEFT even with walker
- Laterality and Directionality Screening: WNL

KR care plan

- Visual goals: improve vision, reduce headaches, return to reading, improve balance, return to driving
- TBI with LOC, glare sensitivity, IRXT, CI, poor fixation, poor visual stamina, incomplete LHH, spatial shift L gait
- Recommended Treatment Plan:
- New SRX: ADD
  OD +1.50 2BI +1.50 20/60
  OS +1.50 2BO +1.50 20/60
  Therapeutic Tint: Blue-Gray Tint 20% + Deep Red Fitovers
- Ophthalmic Ointment QHS, Refresh gel AT during day
- Vision Therapy

Monthly Follow-ups

- Limitation for Vision Therapy (currently was enrolled in PT, OT, SLP, cognitive, counselling for anxiety and anger, vestibular therapy); Other Factors: Long Symptomatic Commute, WC
- Monthly follow-ups with one pursuit / saccade exercise released: Eye Stretches, Modified Near/ Far, Saccades with large index letter cards, Ball bounce, gross thumb convergence
- By 2nd month follow-up: Headaches daily (8/10) worsens with any visual tasks, and light sensitivity persisted, no diplopia, reading very difficult, visual stamina was poor, no falls but still using walker DVA (cc) 20/60 → 20/30 (20/40 NVA) NPC: 12/20" (RL)
- Supplements: Omega Supplementation 3000mg daily, MacuHealth

KR 4 month follow-up

- completed or was discharged from all other therapies due to sensory intolerance (vestibular), upcoming: neurofeedback therapy, failed driving assessment; very stressed and upset by ongoing sensory intolerance
- Tried to do pursuits and saccadic activities a few times per week (exhaust)
- No falls since 2nd month – PT reported improved balance (L gait shift not as apparent), still neck pain
- Daily HA (8/10) worsens with exertion, today HA 9/10, glare sensitivity persisted but mildly improved
- DVA (cc) 20/30 OD, OS NVA 20/40 OD, OS
- Omega Pupil 2+ OD, OS
- NSUCO: Pursuits OU 3,3,4,5; Saccades OU 3,3,4,5
- CT (D): 4 IRXT (40%); (N): 6 IRXT (40%)

KR HRV and Syntonics

- 4 min omega, 5:45min alpha omega, 8 min mu-upsilon, 11min lights off

Syntonics Treatment

- Alpha-omega (Ruby) + Mu-upsilon (Blue Green) 10 minutes each color (up to what is tolerable), once per day
- Continue nutritional supports
- RTC 3 weeks for evaluation

Syntonics and Progress over the next 1.5 years

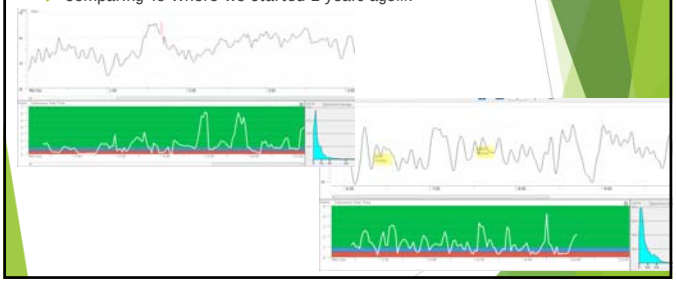
- Alpha-Omega + Mu-Upsilon
- Upsilon-Omega-N + Pi-Omega / Mu-upsilon
- N + Mu-Upsilon
- Delta-Omega + Mu-Delta

Clinical Progress after starting syntonics

- Omega Pupils 2+ OD, OS
- NSUCO: 4,4,5,5 OD, OS pursuits and saccades; NPC (RL): 3"/10"
- Lifestyle: enjoyed being outside at his farm (amber filters outside, removed tint from indoor SRX), reading 15min, reported mood more stable, cane assisted, persistent daily HA normally 6/10

KR >1 year out

- Comparing To Where we Started 2 years ago….



Case 2: Multiple Sclerosis - DS

- 52yof previous episode of optic neuritis with loss of vision in both eyes for a day which led to MS diagnosis 5 years prior
- Presenting symptoms: dizziness and visual fatigue which she described as constant feeling of "orthostatic hypotension" which worsens with exposure to bright lights. Constant occipital headache 6-7/10 upon waking up. Eye pain of unknown cause 4-5/10. Unsteady gait.
- Sustained visual attention on any task at near point such as reading was intolerable after 1 minute

DS initial findings

- Presenting SRX:

		DVA	NVA
OD +4.00	ADD+1.50	20/30	20/40
OS +4.00	+1.50	20/30	20/40

- CT (D): 2xp; (N) 8xp
  NPC (RL): TTN
- Pupils: PERRL (-)APD omega pupil 1+ OU
- Ishihara: WNL OD, OS
- NSUCO: Pursuits OD, OS 4,4,5,5; Saccades OD, OS 4,4,5,5
- Stereo: 150" Dino animals PBV: unable to tolerate BO
- Vergences PB: DBI x/10/4 DBO x/6/6 NBI x/12/10 NBO x/10/8

DS care plan

- Visual goals: improve vision, reduce dizziness
- MS (currently stable) with prior optic neuritis OU, mild DES, glare sensitivity, xp, vergence infacility, dizziness
- Recommended Treatment Plan:
- New SRX:

		ADD	
OD +4.00	0.5 BD	+1.50	20/25
OS +4.00	0.5 BD	+1.50	20/25

- Vision Therapy

Unable to Tolerate VT

- Requested a break after 5 sessions all completed while lying supine on the floor due to excess dizziness Activities: gravity awareness, thumb saccades, slow pursuits, Angels in the Snow, Passing Marsden Ball between Hands
- Symptoms including headache and dizziness would worsen during therapy and patient was unable to fully recover after prolonged rest
- Went to ER exhausted one day after VT session
- Syntonics evaluation with Heartmath

Mu-Delta vs Mu-Theta

- 2min alpha omega, 3.5min delta omega, 4 min mu-delta, 5 min mu-pi, 6min mu-theta

Slow and Steady Improvement (1 year)

- Alpha-omega + mu-theta (gradual 3 minutes each to 10 minutes each once per day)
- VT different approach: reduced frequency of in-office sessions (focused on two exercises per session improving tolerance)
- After months of therapy: DS recover after any offset from VT, gaze stabilization (VOR activities) while seated, reduce overall dizziness and headaches to 'manageable levels' in day to day life

Live demo of using HRV and coherence for syntonic filter selection

- Attach sensor
- 1.5-2 minutes of RESTING STATE recording
- Set up Syntonics, Input Filter, monitor HRV and coherence Live
- Continue monitoring after "Lights Off" 2minutes+
- Turn off recording

Conclusion

- Heart Rate Variability and Coherence can serve as a real-time biofeedback tool for autonomic nervous system considerations during syntonic filter selection for symptomatic patients

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