Adaptability Measures

Frederick T Schurger, DC, DCCJP

Friday, October 12, 2018

Blair Chiropractic Conference

Nashville, TN

Assessing Patient Improvement in an Upper Cervical Practice

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Ugh, this math homework is awful. How would you define a numerator and a denominator?

There's a fine line between them.

You are supremely unhelpful.

Validity & Accuracy

- If you can hit a man with a shovel, knock him down a flight of steps & get him clear consistently, I will examine your technique

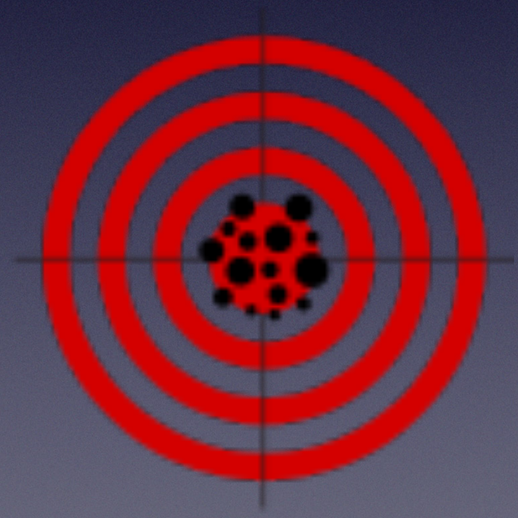
  - BJ Palmer

- Are we reliable?
- Are we valid?
- How can you show it clinically?

Unreliable & Unvalid

Unreliable but Valid

Reliable, Not Valid



Both Reliable & Valid

Outcome assessments

- Measures you can use in your daily, clinical practice

1. Chiropractic assessments
2. General health outcome assessments
3. New & emerging technologies for outcomes
    - AAI & AOS

Chiropractic Assessements

- Functional Mechanical Asymmetry
  - SAM/Posture
- Imaging
  - Cervical curves
  - Atlas plane line/nasium

FUNCTIONAL PELVIC DISTORTION

Functional Leg Length Inequality

Functional Mechanical Asymmetry

Hinson R, Brown SH. Supine Leg Length Differential Estimation:An Inter- and Intra-Examiner Reliability Study. **Chiropr Res J**, 1998; 5(1):17-22.

Overall intraclass agreement among examiners was high (>0.9), as was intra-examiner reliability.

The doctors were able to reliably measure the recumbent LLI to within 1/4” in 80% of cases and within 1/8” in 60% of the trials.

Interexaminer Reliability of Supine Leg Checks for Discriminating Leg-Length Inequality

H. Charles Woodfield, RPh, DC,[a,b] B. Burt Gerstman, DVM, MPH, PhD,[c] Renate Henry Olaisen, DC, MPH,[d] and Dale F. Johnson, PhD[e]

Abstract

Objective: The purpose of this study was to quantify interexaminer reliability of a standardized supine leg check procedure used to screen for leg-length inequality.

Methods: Two doctors of chiropractic used a standardized supine leg check procedure to examine 50 volunteers for leg-length inequality. The order of examination was randomized. The side and magnitude of leg-length inequality were determined to the nearest 1/8 in. Subjects and examiners were blinded. Interexaminer reliability was assessed with a Bland-Altman plot, tolerance table of absolute differences, a quadratic weighted κ statistic for quantitative scores, and a Gwet's first-order agreement coefficient for dichotomous ratings.

Results: The quadratic weighted κ statistic to quantify the reliability of the rating scale was 0.44 (95% confidence interval, 0.21-0.67), indicating moderate reliability. The 2 examiners agreed exactly 32% of the time, within 1/8 in 58% of the time, within 3/16 in 72% of the time, and within 3/8 in 92% of the time. The Bland-Altman plot revealed possible heterogeneity in reliability that requires additional study. The examiners agreed on the presence of a leg-length inequality of at least 1/8 in in 40 (80%) of 50 subjects (first-order agreement coefficient, 0.76), suggesting good agreement for this diagnostic category.

Conclusion: The examiners showed moderate reliability in assessing leg-length inequality at 1/8-in increments and good reliability in determining the presence of a leg-length inequality. (J Manipulative Physiol Ther 2011;34:239-246)

Key Indexing Terms: *Leg-Length Inequality; Chiropractic; Reproducibility of results; Observer variation*

Examination for leg-length inequality (LLI) as a sign of neuromuscular dysfunction and vertebral misalignment is a common screening and diagnostic procedure used in chiropractic and other manual therapies.[1-3] There are several methods for assessing LLI. These include radiographic examination, orthopedic procedures (eg, tape measure), and quick visual and tactile checks. The most common chiropractic methods are visual and tactile checks widespread use of such procedures, their reliability and validity are still uncertain.[3-9]

Leg-length inequality is classified as either anatomical or functional. Anatomical LLI refers to measured differences in the bony anatomy of the lower extremity. The criterion standard for identifying and measuring anatomical LLI is computed tomographic scanogram.[10] Knutson[6] estimates that approximately 90% of the population have anatomical

Is the Supine Leg Check Valid?

Hinson R, Pfleger B. Pre- and Postadjustment Supine Leg-Length Estimation. **J Chiropr Education**, 2000; 14(1):37-8.

ANOVA revealed no significant across-doctor differences in the predata (p=.106), but did show a significant assessor effect in the postdata (p=.008).

In other words, doctors were able to pick up a change in the functional leg length inequality in the group of patients receiving an upper cervical adjustment.

After an adjustment the FLLI was reduced 32% compared to only 7% in the non-adjusted control group but it did not reach the level of statistical significance. **No ruler was used so magnification error or shift error may be the reason.**

Leg Length Alignment Asymmetry In A Non-clinical Population And Its Correlation To A Decrease In General Health As Measured By The SF-12: A Pilot Study

Gary A. Knutson, DC[†], Edward F. Owens, Jr., MS, DC[††]

ABSTRACT

Purpose: To determine if there is an association between a test commonly used by chiropractors as a sign of subluxation/joint dysfunction – supine leg length alignment (LLA) asymmetry - and health-related quality of life as measured by the SF-12 questionnaire, in a non-clinical population.

Design: Volunteers answered the SF-12 and background questionnaires and were then examined for supine LLA by a chiropractor blinded to their answers.

Setting: Gatherings of people in the general population.

Participants: Fifty-five unscreened volunteers.

Examiner: Chiropractor with approximately 20 years of clinical experience.

Main Outcome Measures: The association of supine LLA asymmetry with general health based on the two summary scores - physical (PCS) and mental (MCS) - of the SF-12.

Results: There were 27 volunteers with LLA asymmetry, they had a mean PCS of 49.6 and a mean MCS of 47.9. In the no-LLA asymmetry group (n=23) the mean PCS was 50.8, and mean MCS of 54.0. A multiple regression analysis found that of the variables gender, age, back pain (current/former) and LLA asymmetry, the only factor to approach significance with the SF-12 MCS/PCS was the presence of LLA asymmetry. A t-test found there was a significant difference (p=0.017) in the MCS between the supine LLA asymmetry and no-LLA asymmetry groups.

Conclusion: This pilot study suggests that in this group of volunteers (n=50) from the non-clinical general population, those who demonstrated a commonly used sign of subluxation/joint dysfunction - supine leg length alignment asymmetry - had a significantly (P=0.017) lower measure of general health as determined by the SF-12 survey than those volunteers without such asymmetry. Further investigation to clarify this relationship and to establish whether there is a connection between the putative entity of chiropractic subluxation and unloaded leg length alignment asymmetry is recommended.

Key Indexing Terms: *Leg length inequality, Chiropractic, SF-12, quality of life*

Knutson GA, Owens EF. Leg length alignment asymmetry in a non-clinical population and its correlation to a decrease in general health as measured by the SF-12: a pilot study. **J Vertebral Subluxation Res**, November 1, 2004:1-5.

This study examined a group of volunteers from the general population who were not currently under treatment for back pain. These subjects were found to have a significant relationship between the presence of supine LLI and a decreased rating of general health (SF-12 questionnaire).

Knutson GA. Incidence of foot rotation, pelvic crest unleveling, and supine leg length alignment asymmetry and their relationship to self-reported back pain. **J Manipulative Physiol Ther**, 2002; 25(2):110E.

The validity of the supine leg check was evaluated against a 'bronze standard' of back pain in the general population. The study found 51% of people in a **non-clinical population**, had a supine functional short leg. A **moderate association with recurrent back pain**, and a **significantly increased pain intensity (VAS)** related to the back was also found.

Knutson GA. Incidence of foot rotation, pelvic crest unleveling, and supine leg length alignment asymmetry and their relationship to self- reported back pain. **J Manipulative Physiol Ther**, 2002; 25(2):110E.

…**Results:** Fifty-one percent (n=74) of volunteers examined had supine leg length alignment asymmetry (LLA). Pain intensity on a Visual Analogue Scale was significantly higher (*P*<.001) for those demonstrating supine LLA than for those without LLA. Those with back pain and recurrent back pain were significantly (*P*<.001) more likely to have supine LLA. The validity indices of the supine leg check showed acceptable levels for sensitivity (87%), specificity (84%), and positive predictive value (73%) in recurrent back pain. Findings also indicated a high incidence of supine LLA in volunteers with chronic back pain (85%).

Modified Prill Assessments

- No research into validity or reliability (to date)
- Anecdotally good
- Needs more research….

Health Outcome assessments

- Functional Rating Index (FRI)
- Neck Pain Disability Index (NDI)
- Revised Oswestery Low Back pain Disability
  - Why is it revised?
- VAS (can we say 1, 2, 3?)
  - Quad VAS
- Short Form 12 (SF-12)/SF-36
- All available on ChiroTouch

Functional Rating Index

- The Functional Rating Index combines the concepts of the Oswestry Low Back Disability Questionnaire and the Neck Disability Index and seeks to improve on clinical utility
- **VALIDITY**: Construct: The Functional Rating Index correlated with the Disability Rating Index (0.76), the Short Form-12 Physical Component Score (0.76), and the Short Form-12 Mental Component Score (0.36). Responsiveness: Overall, the size effect was 1.24, which is commendable. Clinical utility: Time required by the patient and staff averaged **78 seconds per administration**, which is noteworthy. Effect of Sociodemographics: Total scores were not affected by education, gender, nor age, suggesting minimal external validity bias.
- **CONCLUSIONS**: The Functional Rating Index appears to be psychometrically sound with regard to reliability, validity, and responsiveness and is clearly superior to other instruments with regard to clinical utility. The Functional Rating Index is a promising useful instrument in the assessment of spinal conditions.

Functional rating index: a new valid and reliable instrument to measure the magnitude of clinical change in spinal conditions.
Feise RJ1, Michael Menke J. Spine 2001 Mar 1;26(5):596.

Functional Rating Index

For use with **Neck and/or Back Problems** only.

In order to properly assess your condition, we must understand how much your **neck and/or back problems** have affected your ability to manage everyday activities.
For each item below, **please circle the number which most closely describes your condition right now.**

1. Pain Intensity

0	1	2	3	4
No pain	Mild pain	Moderate pain	Severe pain	Worst possible pain

2. Sleeping

0	1	2	3	4
Perfect sleep	Mildly disturbed sleep	Moderately disturbed sleep	Greatly disturbed sleep	Totally disturbed sleep

3. Personal Care (washing, dressing, etc.)

0	1	2	3	4
No pain; no restrictions	Mild pain; no restrictions	Moderate pain; need to go slowly	Moderate pain; need some assistance	Severe pain; need 100% assistance

4. Travel (driving, etc.)

0	1	2	3	4
No pain on long trips	Mild pain on long trips	Moderate pain on long trips	Moderate pain on short trips	Severe pain on short trips

5. Work

0	1	2	3	4
Can do usual work plus unlimited extra work	Can do usual work; no extra work	Can do 50% of usual work	Can do 25% of usual work	Cannot work

6. Recreation

0	1	2	3	4
Can do all activities	Can do most activities	Can do some activities	Can do a few activities	Cannot do any activities

7. Frequency of pain

0	1	2	3	4
No pain	Occasional pain; 25% of the day	Intermittent pain; 50% of the day	Frequent pain; 75% of the day	Constant pain; 100% of the day

8. Lifting

0	1	2	3	4
No pain with heavy weight	Increased pain with heavy weight	Increased pain with moderate weight	Increased pain with light weight	Increased pain with any weight

9. Walking

0	1	2	3	4
No pain; any distance	Increased pain after 1 mile	Increased pain after 1/2 mile	Increased pain after 1/4 mile	Increased pain with all walking

10. Standing

0	1	2	3	4
No pain after several hours	Increased pain after several hours	Increased pain after 1 hour	Increased pain after 1/2 hour	Increased pain with any standing

Name _____
PRINTED

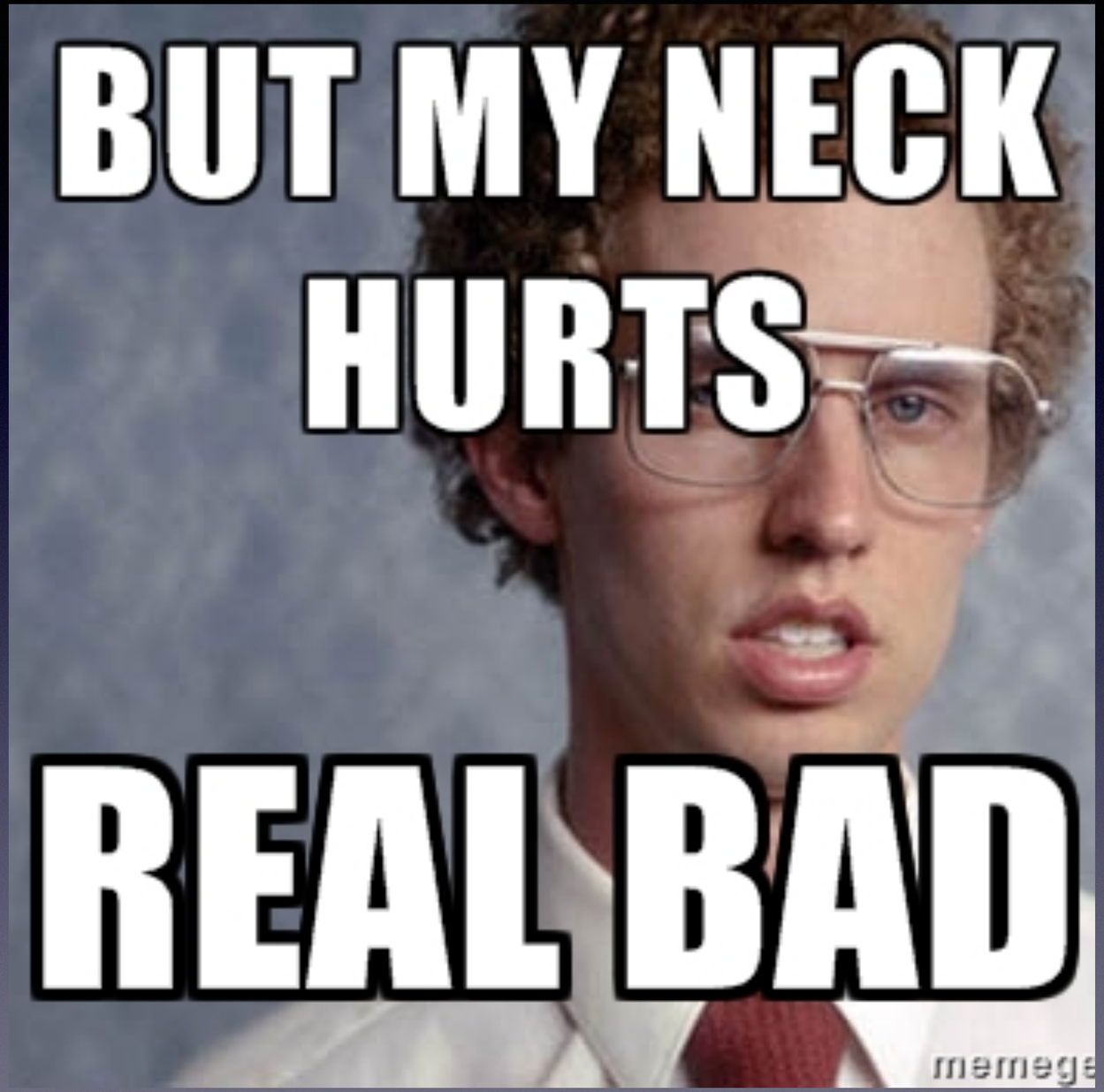
_____
Signature

_____
Date

Total Score _____

NDI

- Modification of the Oswestry Low Back test
- 5-point improvement to be clinically significant (10%)
- Around since 1989



Revised Oswestry

- Recreation/Social life is the “modified” test
- 0 –20: Minimal disability
- 21–40: Moderate Disability
- 41–60: Severe Disability
- 61–80: Crippling back pain
- 81–100: These patients are either bed-bound or have an exaggeration of their symptoms

Quadratic VAS

1. Pain level at the time of the current office visit;
2. Typical or average pain since the last visit (or since the initial visit or since the onset of the condition) depending on the chronicity of the condition;
3. Pain level at its best since the last visit, time of intake or onset of the condition; and
4. Pain level at its worst since the last visit, time of intake or onset of the condition.

The scores from factors 1, 2 and 4 above are averaged and then multiplied by 10 to yield a score from zero to 100. The final score is then categorized as "low-intensity" (pain < 50) or "high-intensity" (pain > 50).

Croft's 1, 2, 3's

0.5 - Stiff

1. Mild

1.5

2. Moderate

2.5

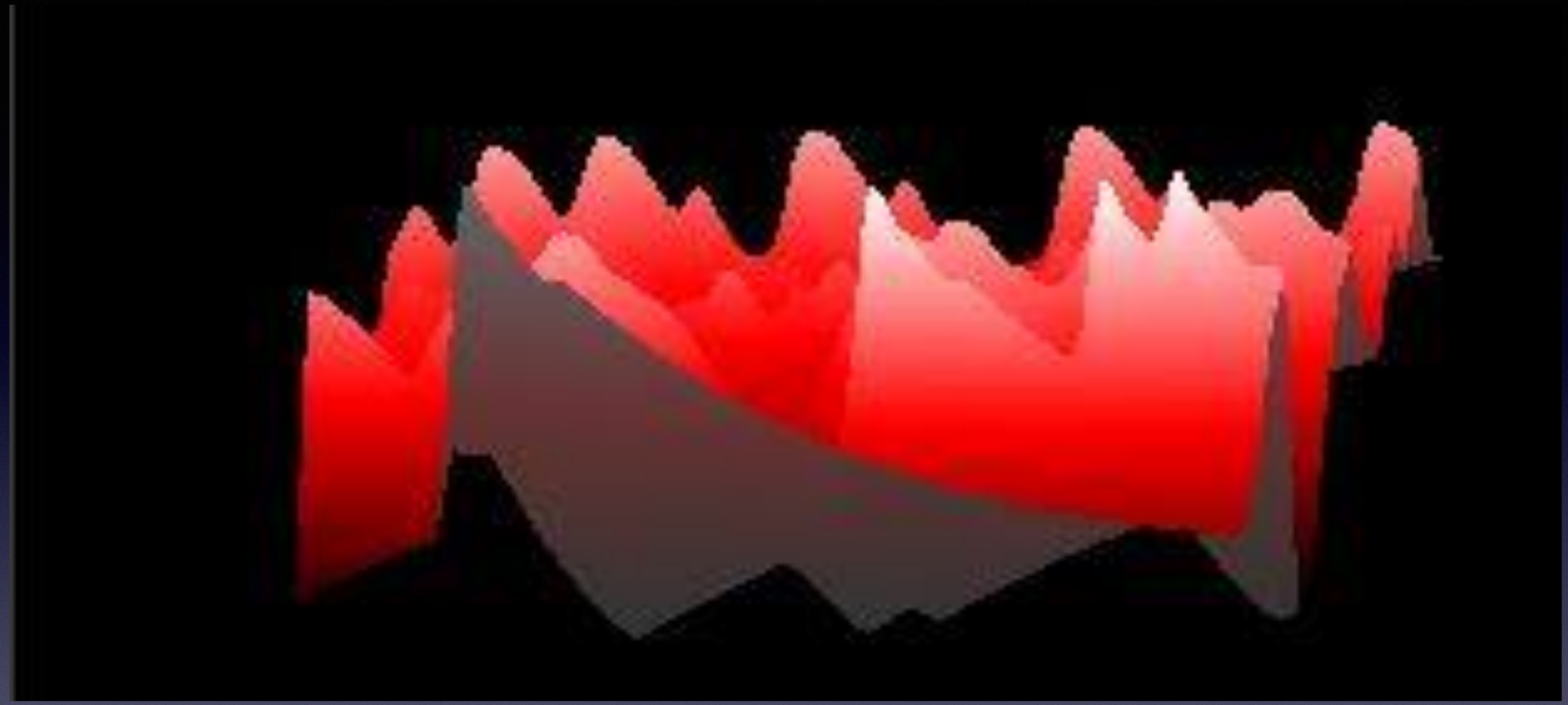
3. Severe

4. Malingering - impossible pain

Short Forms 12 & 36

- Developed by the RAND corporation
- The Short Form (36) Health Survey is a 36-item, patient-reported survey of patient health. The SF-36 is a measure of health status and an abbreviated variant of it, the SF-6D, is commonly used in health economics as a variable in the quality-adjusted life year calculation to determine the cost-effectiveness of a health treatment. The original SF-36 came out from the Medical Outcome Study, MOS, done by the RAND Corporation. Since then a group of researchers from the original study released a commercial version of SF-36 while the original SF-36 is available in public domain license free from RAND. A shorter version is the SF-12.[1] If having only adequate physical and mental health summary scores is of interest, "then the SF12 may be the instrument of choice".[2]
- Both the SF-12 and SF-36 scales are **valid and sensitive to changes in physical and mental health status** in CSM patients, undergoing decompressive surgery. Despite its abbreviated nature, the SF-12 appears to be an adequate substitute for SF-36, and its brevity should increase its attractiveness to both clinicians and patients.

Quality of Life Assessment Using the Short Form-12 (SF-12) Questionnaire in Patients With Cervical Spondylotic Myelopathy: Comparison With SF-36
Singh, Anoushka, PhD*; Gnanalingham, Kanna, FRCS†; Casey, Adrian, FRCS*; Crockard, Alan, FRCS*
Spine: March 15, 2006 - Volume 31 - Issue 6 - p 639-643

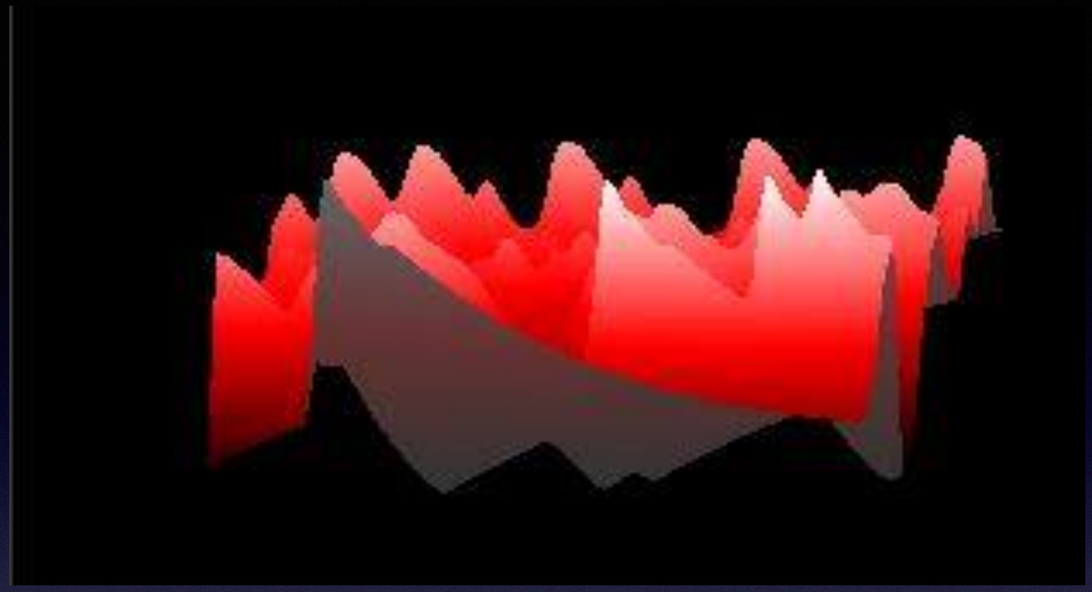


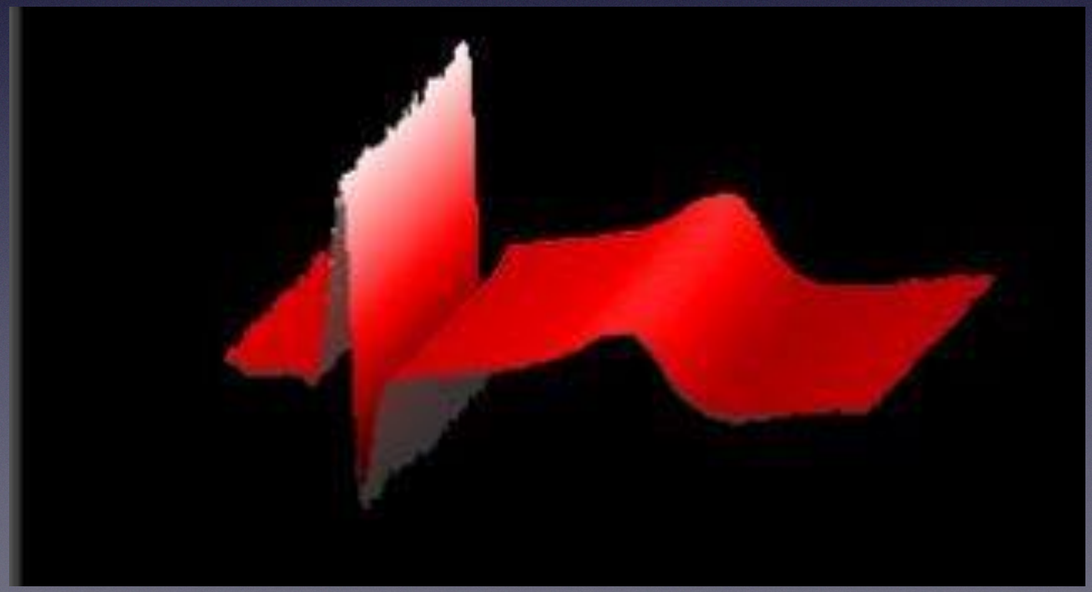
Attenuated Autonomic Insufficiency

Emerging Technologies

AAI

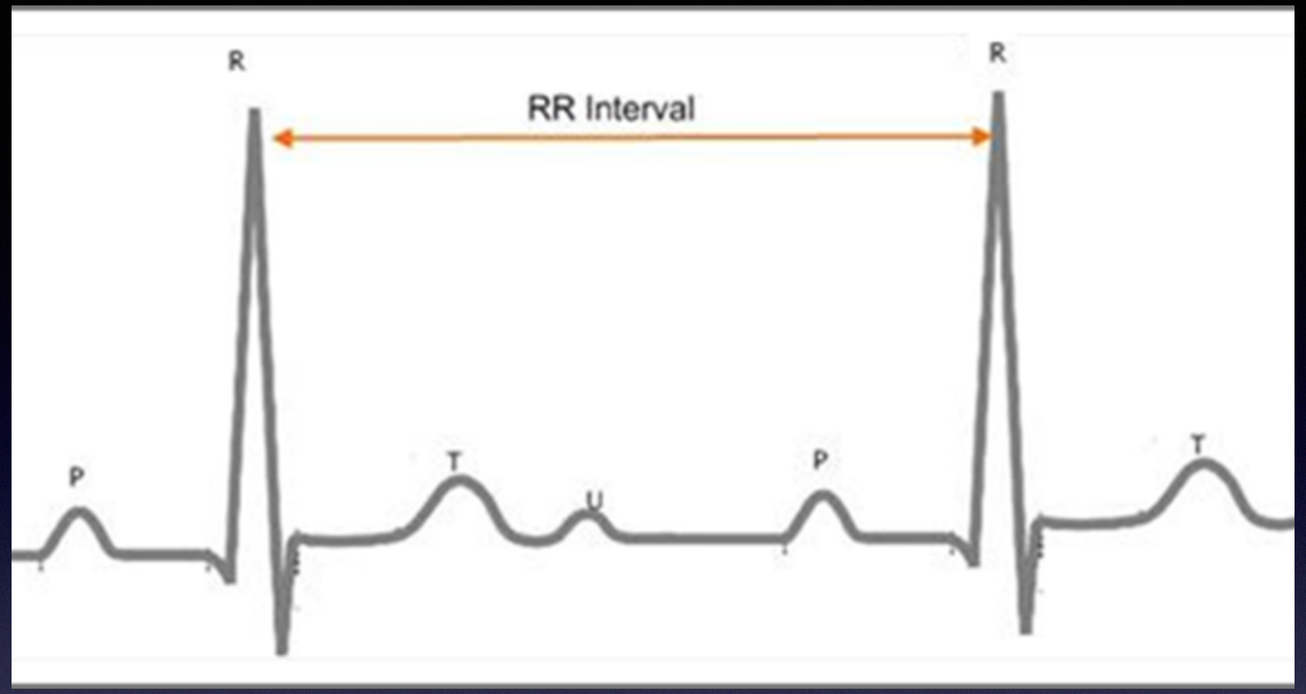
- HRV - Heart Rate Variability
  - Beat to beat intervals
  - rmSSD (parasympathetic)
- Pupillary Light Reflex
- Thermography





HRV

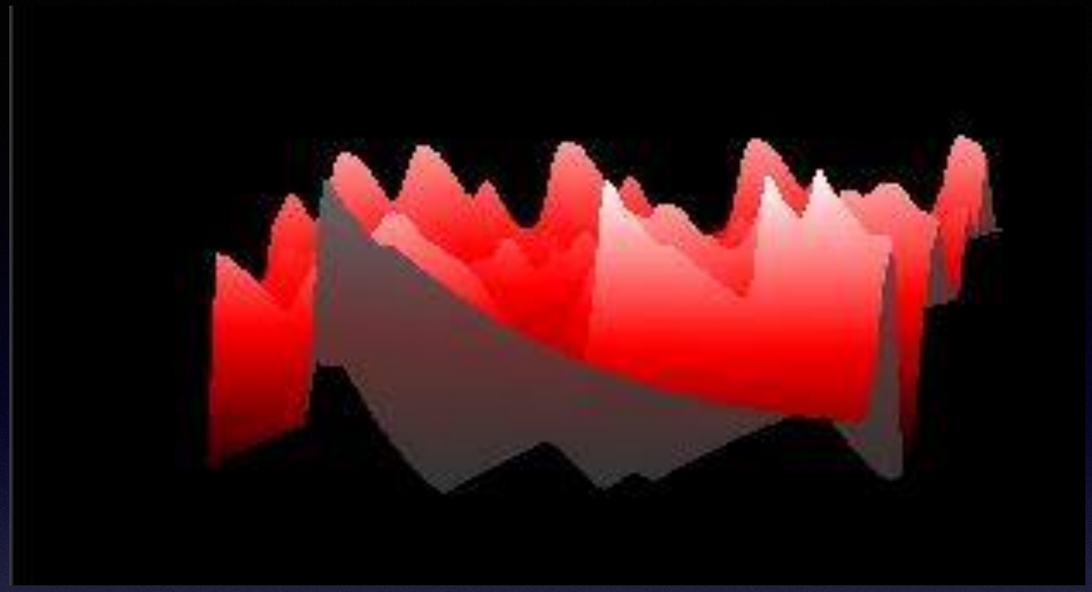
- HRV - Heart Rate Variability
  - Beat to beat intervals
  - SDNN (overall HRV)
  - rmSSD (parasympathetic)
  - High Frequency (parasympathetic)
  - Low Frequency (baroreceptor activity, mix of SNS & PNS)

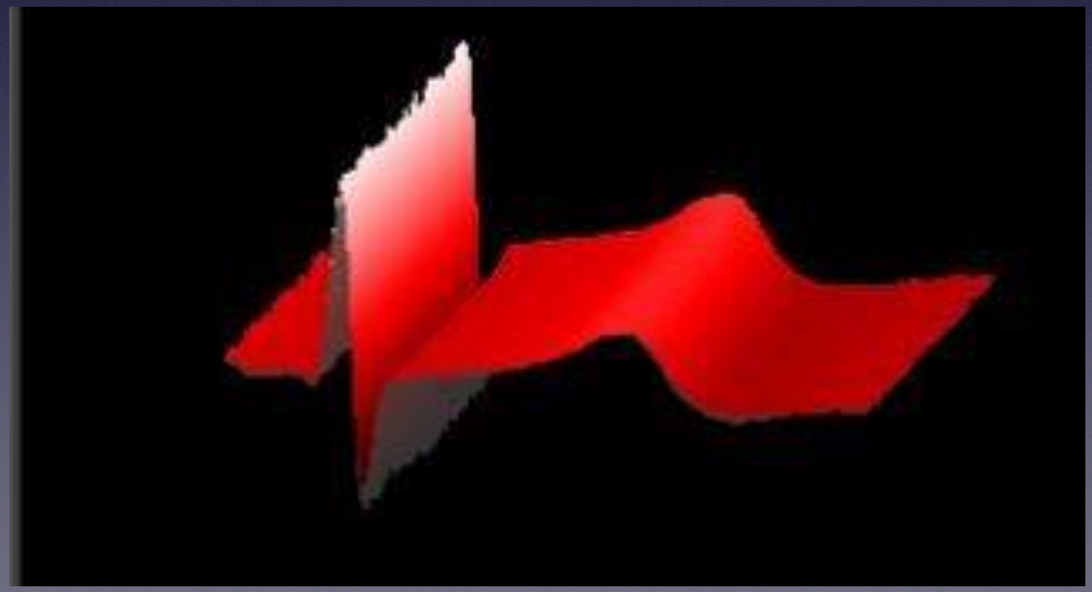


- HeartMath, NerveExpress, Biocom HRV
- iPhone apps
- Kubios & MindWave

HRV Limitations

- Both graphs are the same data
  - Needs to be manually edited
- Not good for determining VS visit to visit (re-exam tool)
- Better for determining capacity of healing
- Daily readings in the AM
- Oura ring & Whoop





HRV Limitations

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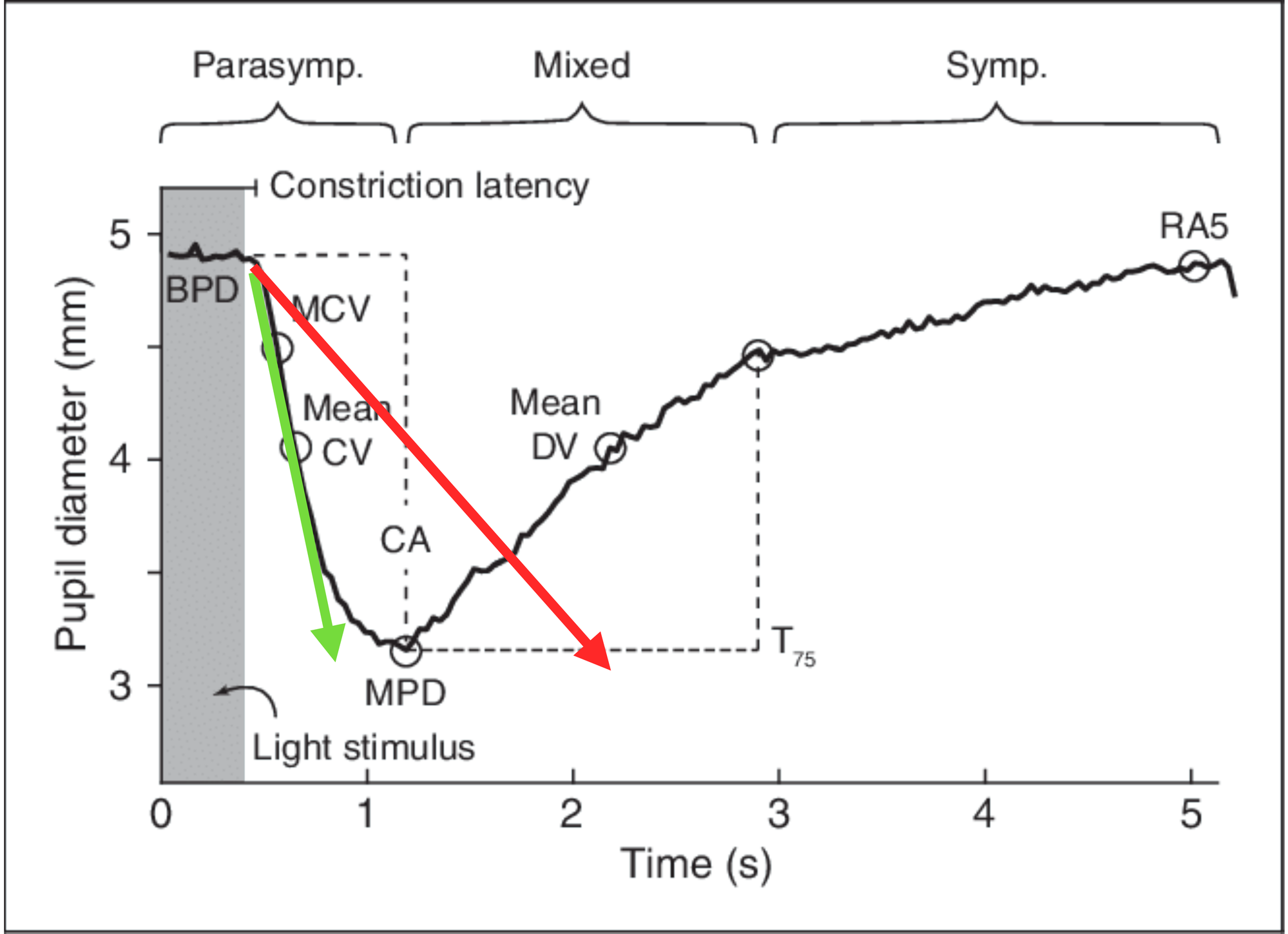
Pupillary Light Reflex

- Very good measure of parasympathetic activity
- Can be done in seconds (daily clinical use)
- Valid & Reliable
- Most devices are not FDA approved at this time or cumbersome


Parasymp.
Mixed
Symp.
Constriction latency
RA5
BPD
MCV
Mean
CV
Mean
DV
CA
MPD
T_{75}
Light stimulus
Pupil diameter (mm)
5
4
3
0
1
2
3
4
5
Time (s)

Altered pupillary light response scales with disease severity in migrainous photophobia, Cortez et al, **Cephalgia** April 2017

Background: **Autonomic dysfunction and light sensitivity are core features of the migraine attack.** Growing evidence also suggests changes in these parameters between attacks. Though sensory and autonomic responses likely interact, they have not been studied together across the spectrum of disease in migraine.

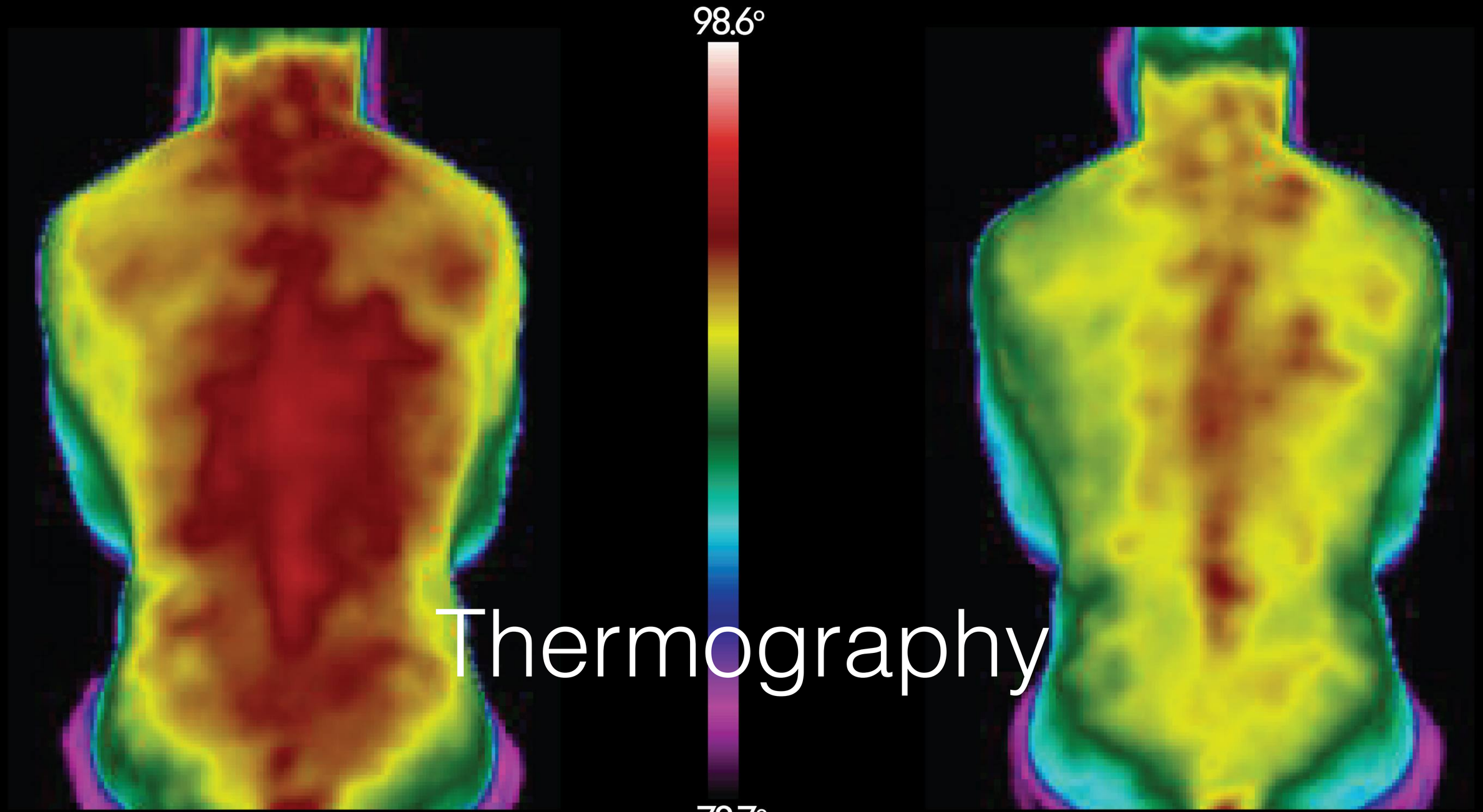
Methods: We performed digital infrared pupillometry while collecting interictal photophobia thresholds (PPT) in 36 migraineurs (14 episodic; 12 chronic; 10 probable) and 24 age and sex-matched non-headache controls. Quantitative pupillary light reflexes (PLR) were assessed in a subset of subjects, allowing distinction of sympathetic vs parasympathetic pupillary function. A structured questionnaire was used to ascertain migraine diagnosis, headache severity, and affective symptoms.

Results: **Photophobia thresholds were significantly lower in migraineurs** than controls, and were lowest in chronic migraine, consistent with a disease-related gradient. Lower PPT correlated with smaller dark-adapted pupil size and larger end pupil size at PPT, which corresponded to a reduced diameter change. **On PLR testing, measures of both parasympathetic constriction and sympathetic re-dilation were reduced in migraineurs with clinically severe migraine.**

Conclusions: In summary, we show that severity of photophobia in migraine scales with disease severity, in association with shifts in pupillary light responses. These alterations suggest centrally mediated autonomic adaptations to chronic light sensitivity.

PRE ADC Correction

POST ADC Correction



Thermography

What is thermography?

- Detects & analyzes infrared emissions of the body
- Hot Boxes
- Neurocaligraph Introduced to Chiropractic by Dossa Evan's in the 1930's
- Non-invasive
- Over 40 years of research!!

- Used for:
  - Spinal Nerve root irritation
  - Articular facet syndrome
  - Peripheral nerve injuries
  - Sympathetic pain syndromes
  - Vascular disorders
  - Myofascial trauma
  - Local inflammatory processes
  - Vertebral Subluxation Complex

Paraspinal Digital Infrared Imaging, William Amalu, 1999

titronics

What is thermography?

- Recognized by:
  - ACA Council on Diagnostic Imagining
  - ICA Council on Diagnostic Imaging
  - AMA Council on Scientific Affairs
- In use by:
  - Johns Hopkins
  - Georgetown Univ
  - Cedars-Sinai
  - Tulane Univ
  - International

Paraspinal Digital Infrared Imaging, William Amalu, 1999

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What is thermography?

- Comparative studies of thermography with CT, MRI, EMG, myelography & surgery revealed:
  - **High Degree of Sensitivity (99.2%)**
  - **High Degree of Specificity (up to 98%)**
  - Predictive value
  - Reliability

Paraspinal Digital Infrared Imaging, William Amalu, 1999

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Science/Neurology involved

- Dermal microcirculation of the body
  - Controlled by the **Sympathetic** & Sensory Nervous system
  - Vasodilation
  - Vasoconstriction
- Original theories:
  - Heat from
    - Nerves - Chiropractic
    - Diseased organs - Medicine
- **We are only able to measure the top 5 mm of skin temp**

Paraspinal Digital Infrared Imaging, William Amalu, 1999

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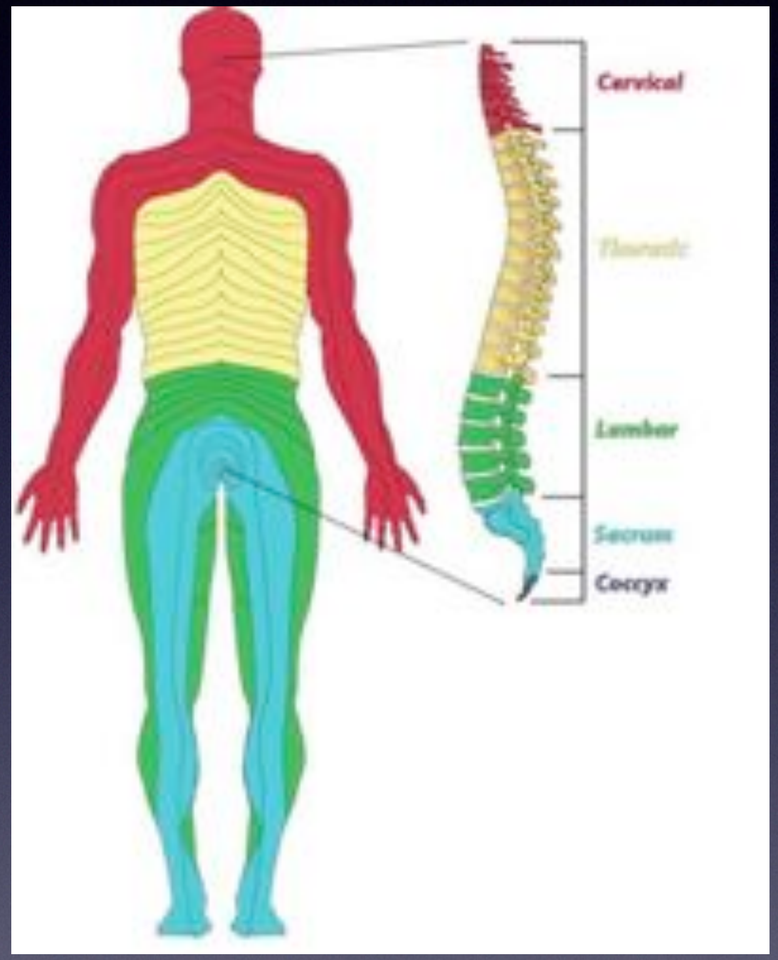
Science/Neurology involved

- Thermal symmetry is desired
- Measuring the paraspinal & dermatomes (top 5 mm)
- Absence of thermal symmetry lead to:
  - Hyperthermia
  - Hypothermia



Paraspinal Digital Infrared Imaging, William Amalu, 1999

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Science/Neurology involved

- Hypothermia
  - Vasoconstrition
  - Chronic spinal neuropathophysiologic conditions
  - long standing subluxations
- Hyperthermia (2 mechanisms)
  - Vasodilation
    1) Acute - Nociceptive stimulation & substance P release
    2) Decrease in Sympathetic Activity & **loss** in of normal dermal vascular control

Paraspinal Digital Infrared Imaging, William Amalu, 1999

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Science/Neurology involved

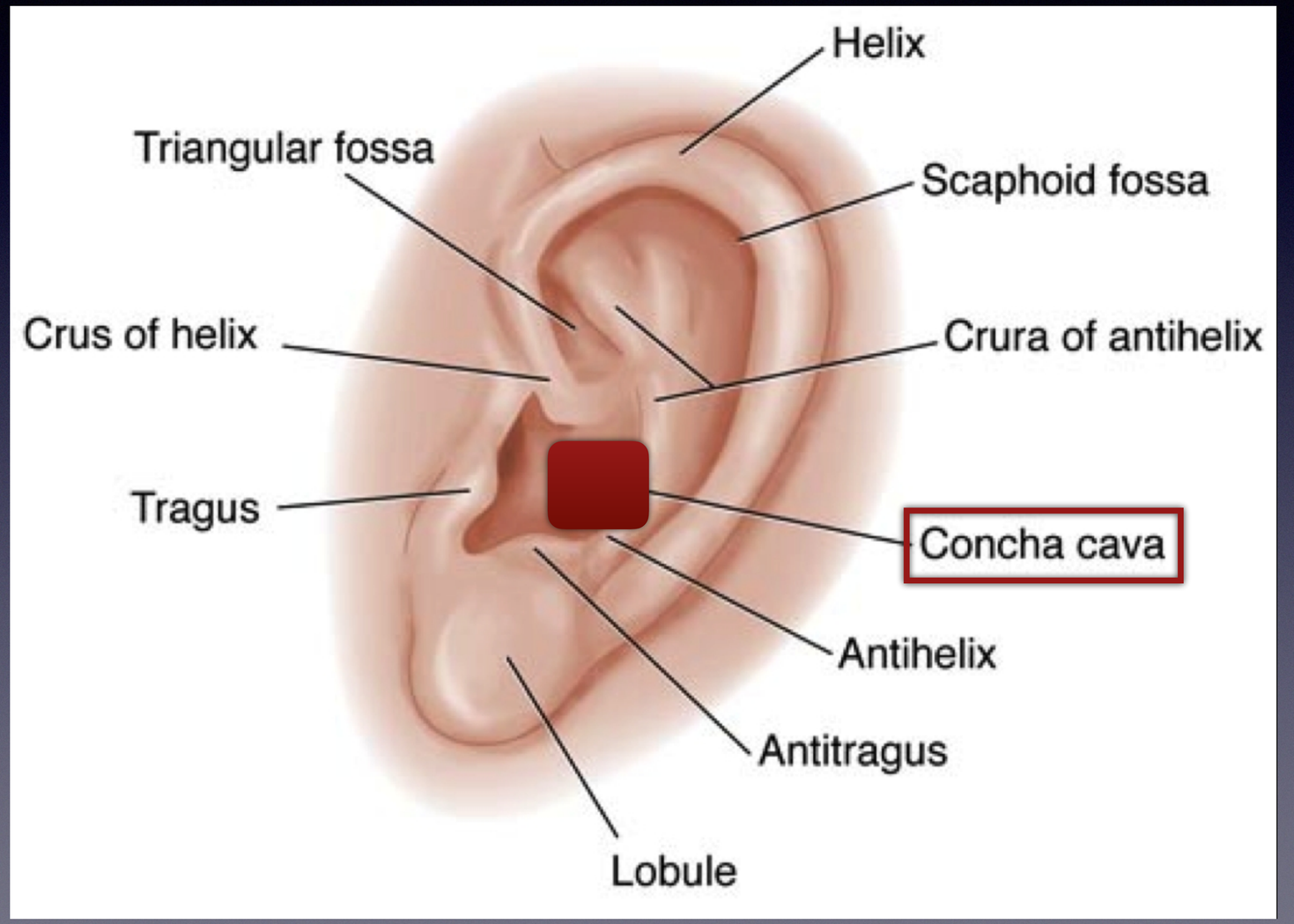
- Infrared imaginig is a direct reflection of the function of the nervous system
- The temperature of any one area of the skin becomes a direct reflection of the neurologic control of that area
- Normal neurologic function shows almost no thermal differentiation - Homeostasis
- Consistent, asymmetrical thermal differentials indicate loss of neurlogic control - Neuropathophysiology - Pattern
- **Neuropathophysiology - paraspinal thermal asymmetry of 0.5˚C +**

Paraspinal Digital Infrared Imaging, William Amalu, 1999

titronics

Concha Cavum

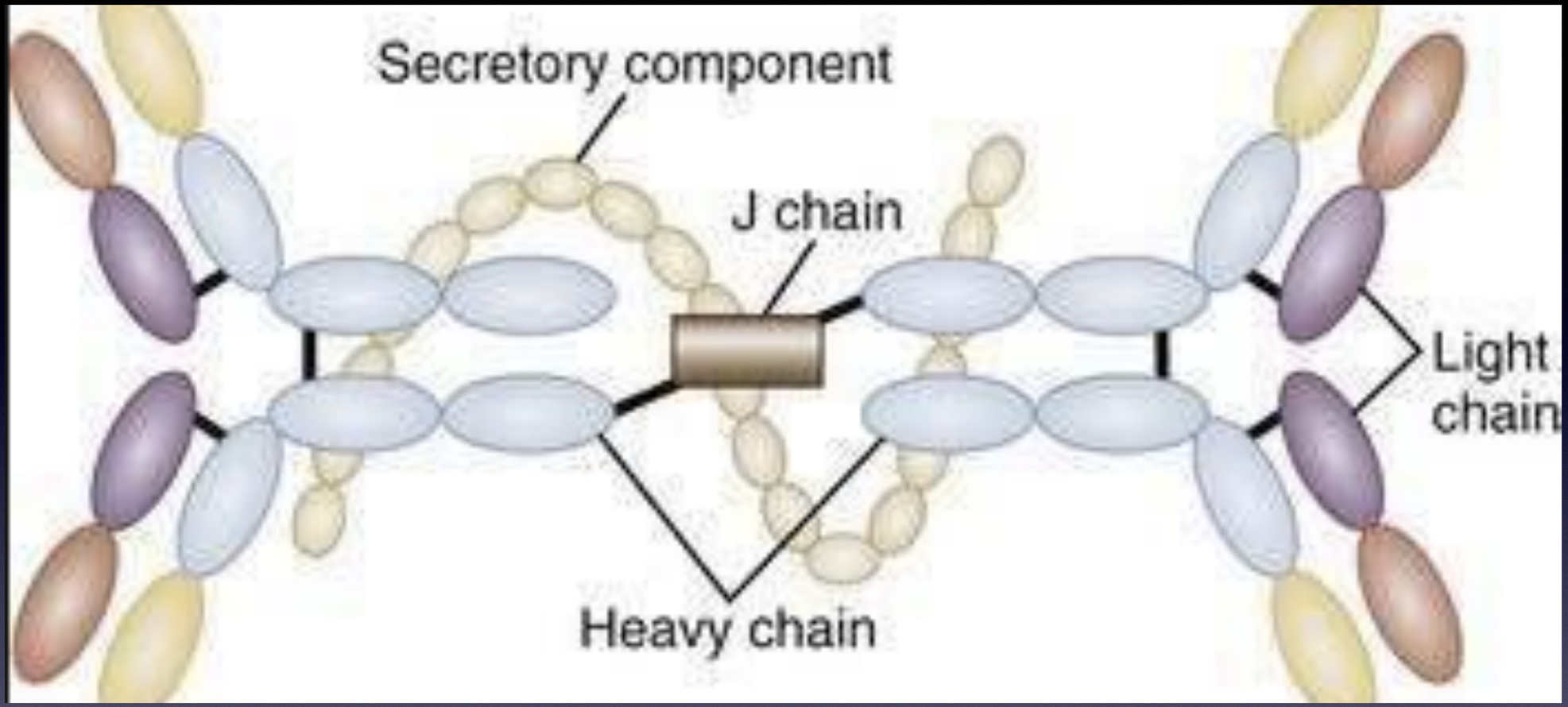
- Innervated by the parasympathetic
  - May have an inverse relationship with Mastoid Fossa readings



Clinical Uses

- Upper Cervical Practices
- **Pattern Analysis**
  - **Discern the need for an adjustment**
  - **Know when an adjustment was actually made**
- Break Analysis with additional correlative findings (motion palpation, x-ray analysis, etc)
- Full Spine Graphs

titronics



Secretory IgA

Secretory IgA

- Secretory IgA (SIgA) is the primary immunoglobulin produced on the mucosal surfaces of the body. This not only includes the lining of the digestive system, but also the sinuses and nasal passages, upper respiratory system, the eyes, bladder, vagina, and urethra in both men and women. Secretory IgA helps in preventing antigen (i.e., allergen, bacteria, yeast) penetration through the various mucosal surfaces, as well as neutralizing a pathogens ability to proliferate and expand their particular tissue penetration. **Without adequate SIgA production our body is vulnerable to excessive overgrowth of opportunistic infections and systemic immune dysfunction**. Once it is secreted it plays a number of specific roles within the immune system, such as:
  - Inhibits pathogen adherence to the mucosal membrane
  - Neutralized viruses
  - Prevents various pathogen toxins from infiltrating the mucosal lining
  - Down regulates the immune response for what is called ‘oral tolerance’
  - Regulates other immune reactions

https://mysunrisecenter.com/the-importance-of-secretory-iga-for-our-immune-health-and-the-probiotic-bacteria-that-can-help/

Secretory IgA

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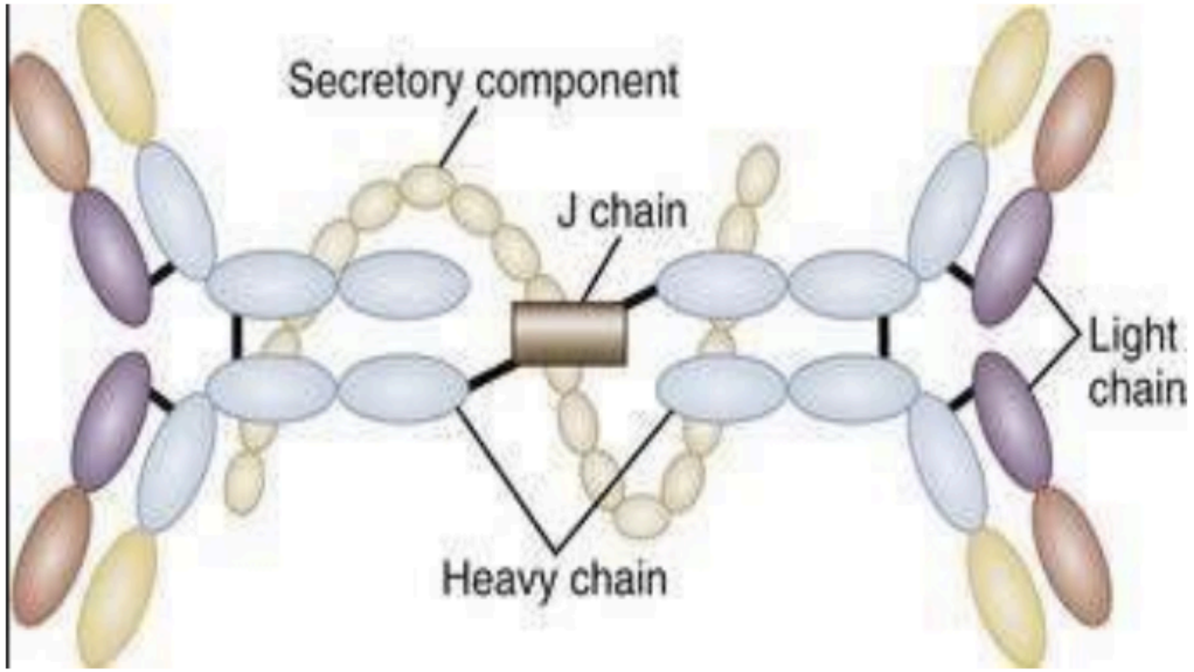
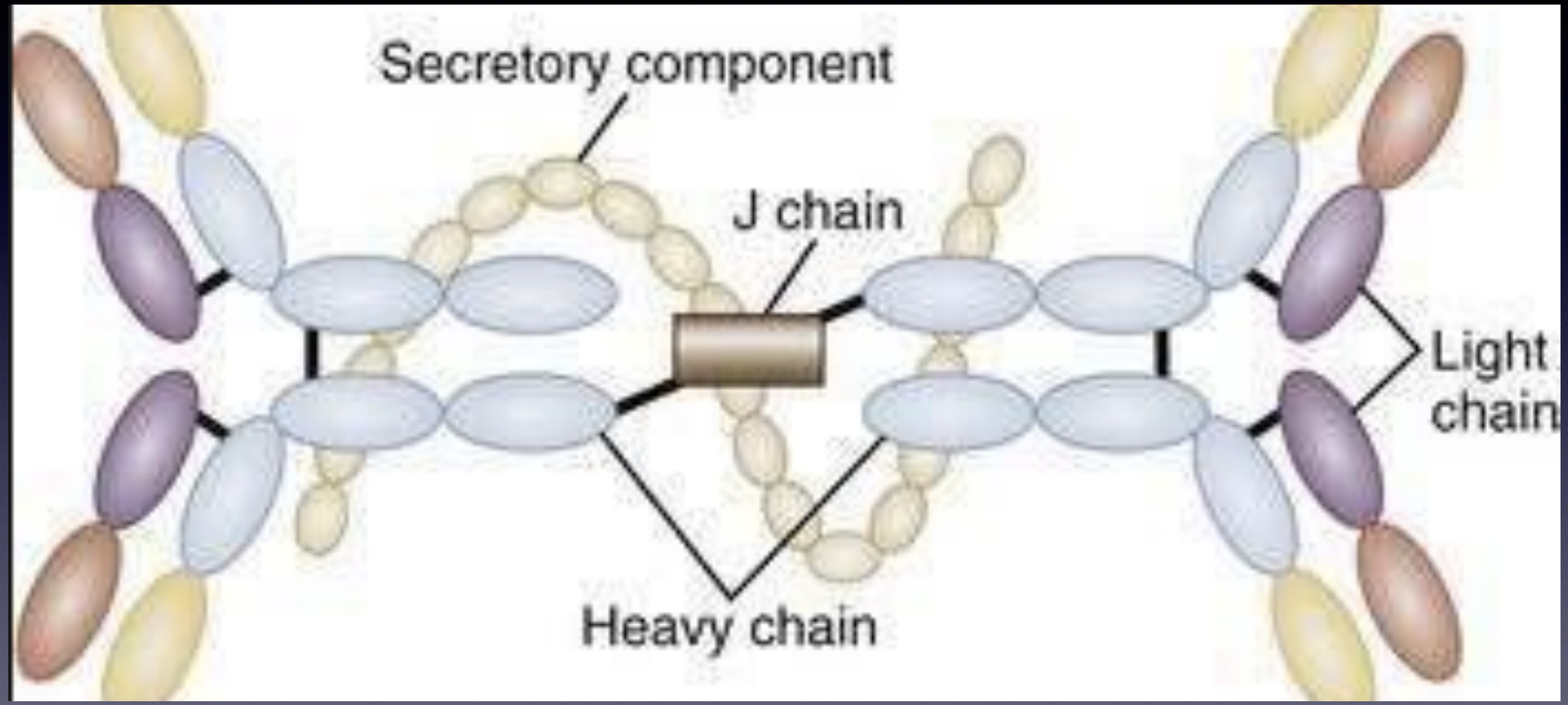


The Importance of Secretory IgA For Our Immune Health and the Probiotic Bacteria That Can Help

By admin / Comments (0)

Secretory IgA



The Importance of Secretory IgA for our Immune Health and the Neck Correction that can help