



SeekingHealth Educational Institute

Seeking Health Educational Institute (SHEI) identifies and assimilates clinically-relevant research in the areas of nutrigenomics and methylation. We then deliver it to the health professional – and layperson – via webinars, seminars, conferences, forums, podcasts, videos and articles.

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A Bit About Me...

- Nutritionist
- Researcher



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Lifestyle Influences on Patient Physiology

Case History - KT

- Generally 'healthy', KT is a qualified nutritional therapist and ND
- Presenting symptoms - a little weight gain, low energy, some inflammation, lack of focus
- Upon testing, her genetic profile highlighted that she has MTHFR-/-
- She wanted a specifically designed supplementation and dietary programme.



Framing

- “How’s your diet?” ... “Good - grain and sugar free, lots of veggies”
- “How’s your sleep?”... “A bit poor and disrupted, but ok”
- “Are you physically active? ...”I train once a week I as I’ve read that’s good for me. I am also quite active during the day...”
- “How’s your stress?”....”You know what its like living in London...busy, hard, but lots of fun”
- “Are you taking regular ‘me’ time?”.... “I’m just too busy...but as I said I’m having fun”

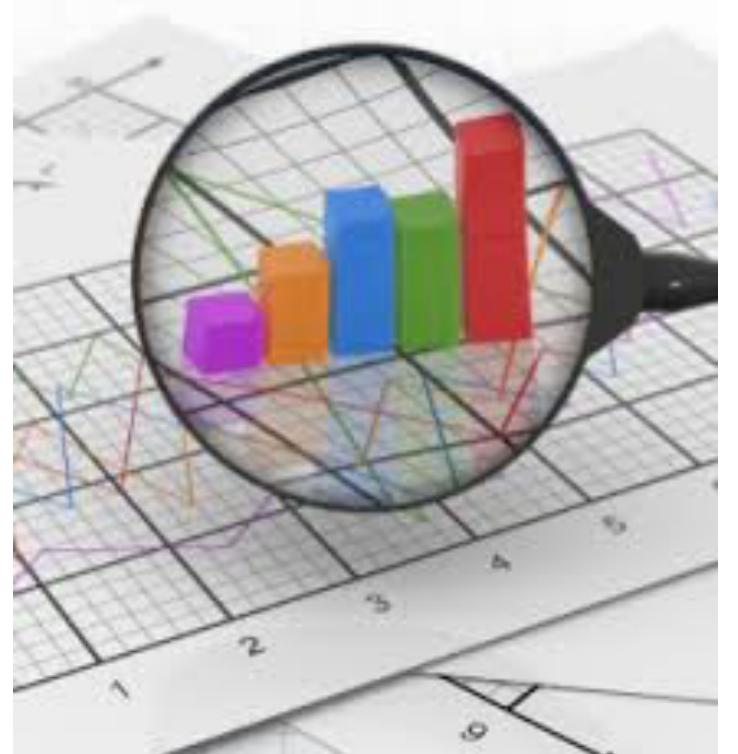


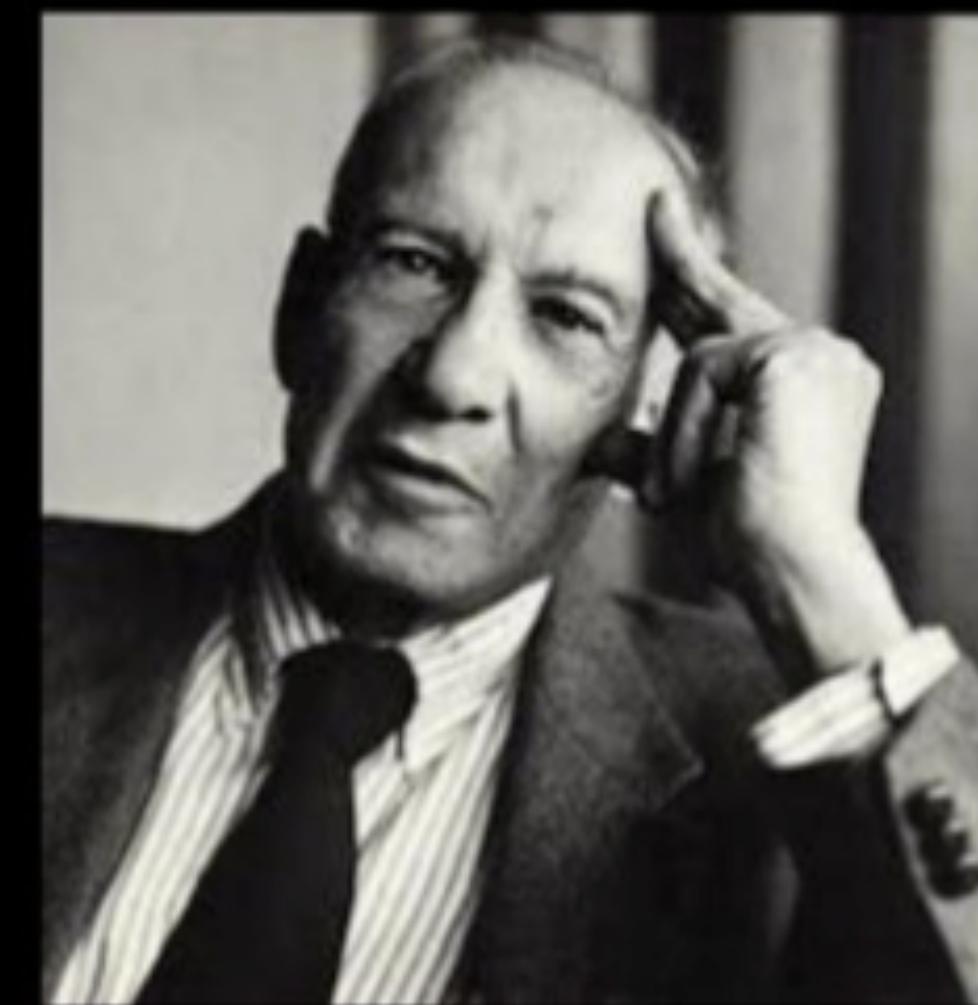
Back to Basics

- Are we missing the forest for the trees?
 - Do we need to debate which forms of supplements to use?
 - Decide which adrenal profile to run?
 - Allergy test for certain foods?
- Or will we achieve more ‘return on investment’ through addressing the basics?



How to Track Lifestyle Influences





**“If you can’t
measure it,
you can’t
manage it”**

Peter Drucker

How to choose?



No Data
Unawareness

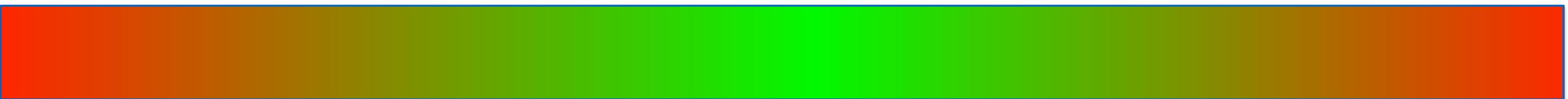


Useful Data

Dynamic Guidance



Too Much Data
Ruled by Tracking



Choice of Data



Data of Limited use

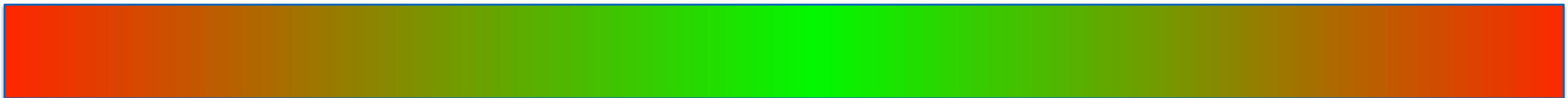
Very Practical

Useful Data

Practical

Very Useful Data

Less Practical

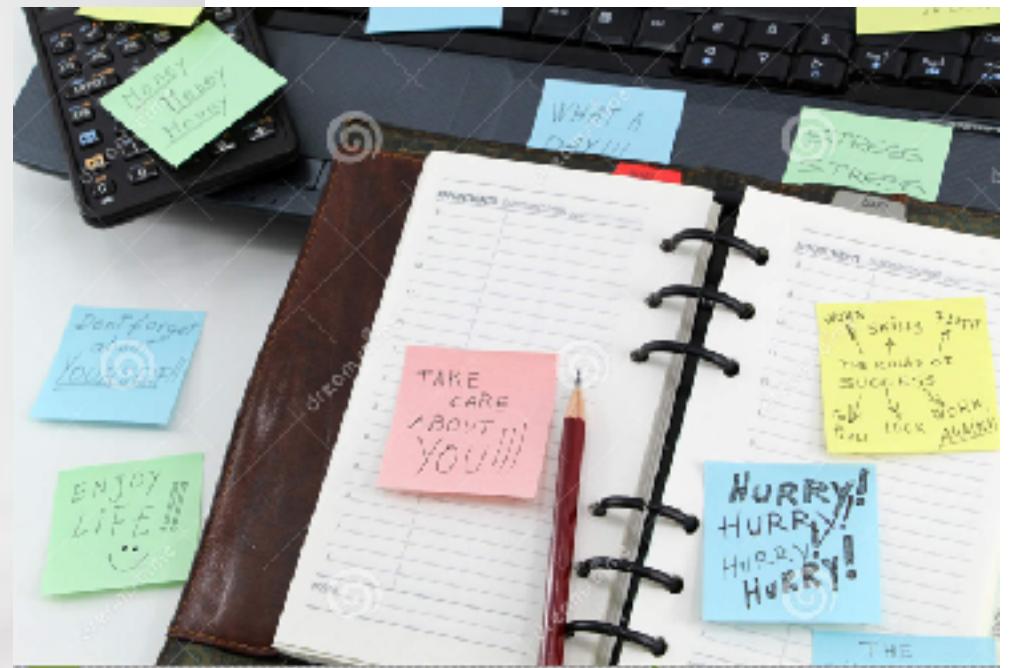


Which Markers?

- Lifestyle influences that are mostly modifiable.
- That provide a good insight into our metabolism.
- Easy to quantify and track
- Ongoing tracking enables clients to make connections and learn how to make wiser choices.
- Compliance.



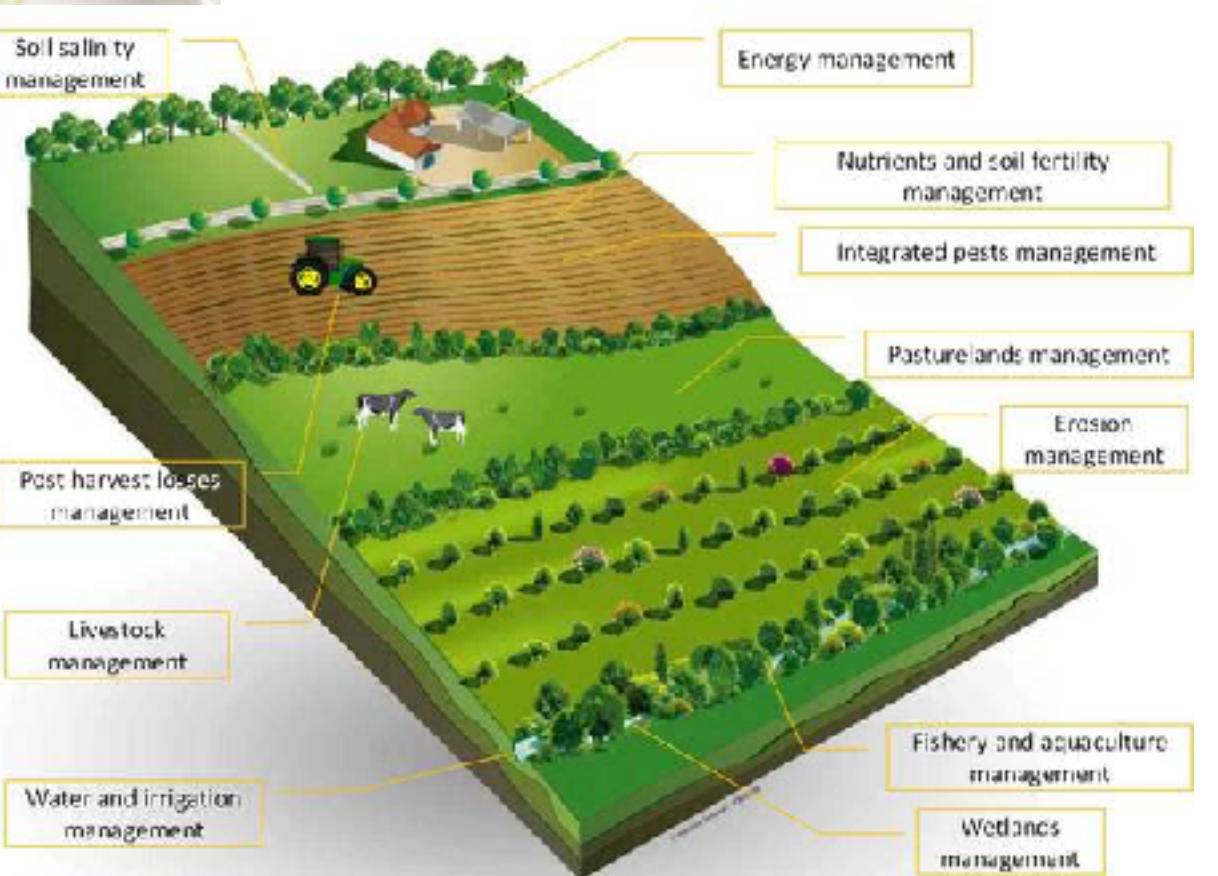
The Big Five



Life-Load



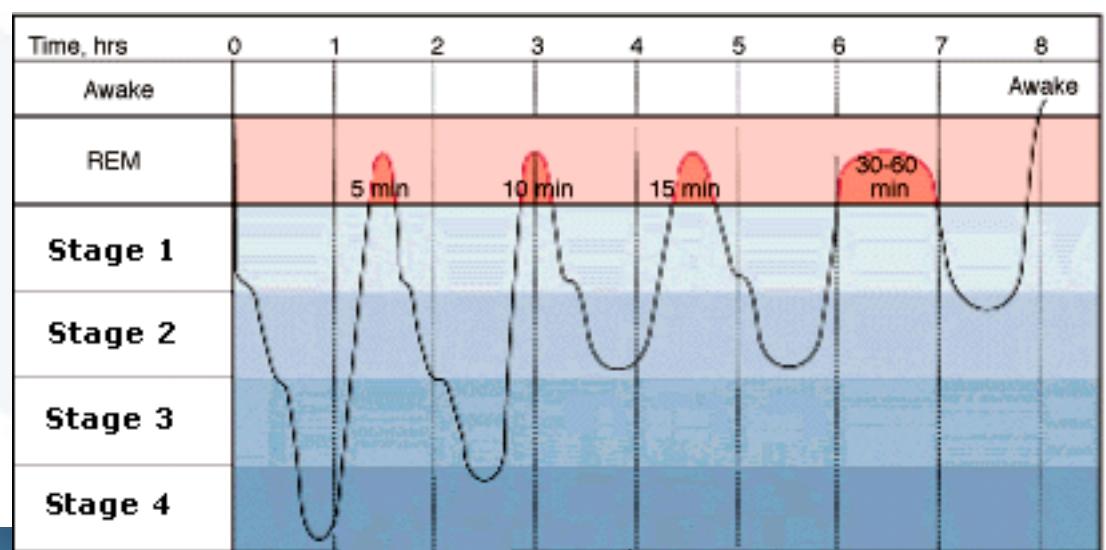
Diet



Inflammation



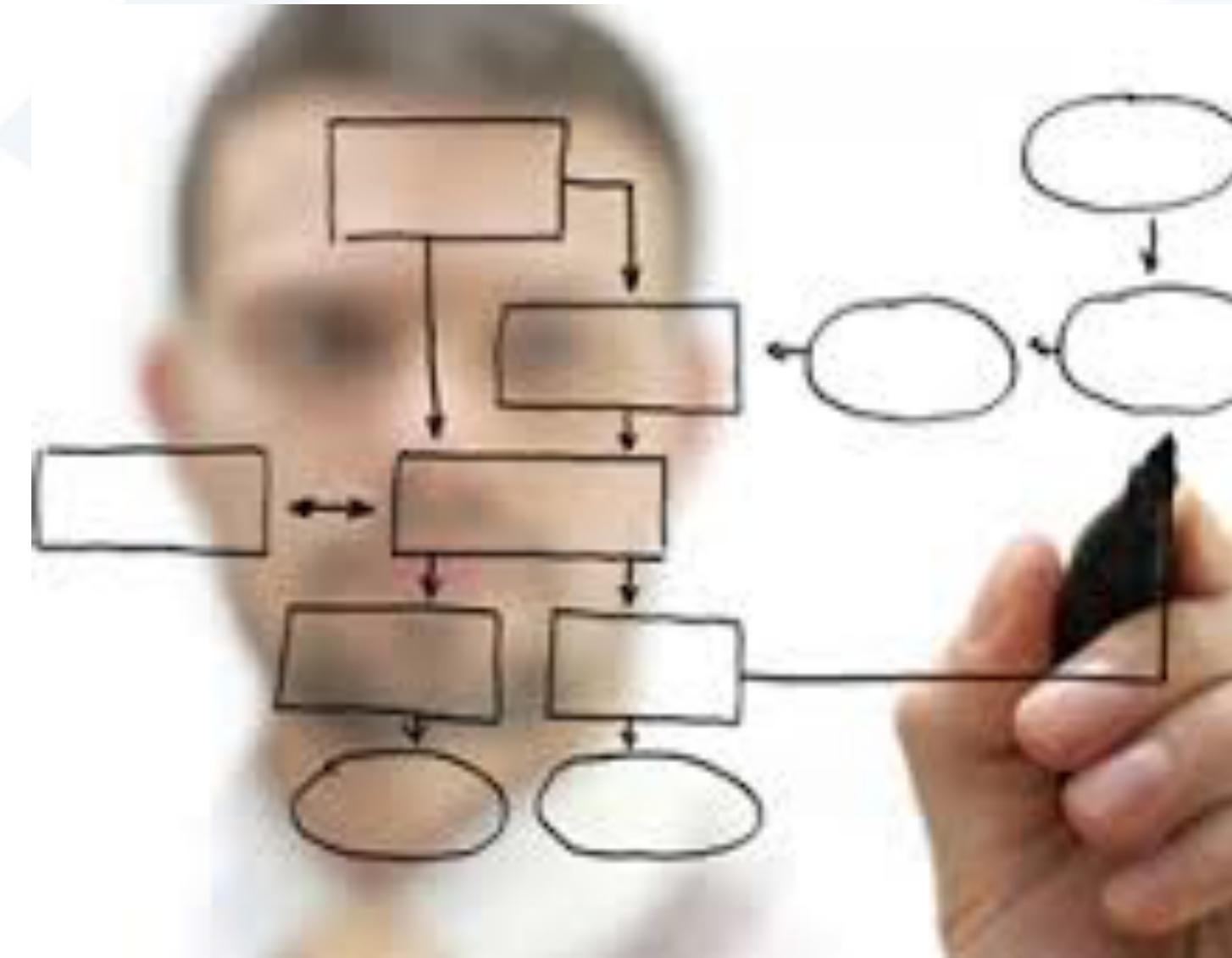
Physical Activity



Sleep



Research Analysis



Research Outline

- Observational Study looking at correlations between lifestyle & defined markers
- Individuals:
 - with a variety of different dietary backgrounds.
 - generally health conscious without diagnosed medical problems or prescribed medications.
 - males and females.
 - Mixed activity levels from elite athletes to relatively sedentary individuals.



The Big Five

- 5 Key lifestyle markers were assessed:
 - Diet: type, quality, quantity and timing
 - Sleep: length, quality and phases
 - Physical Activity: intensity and frequency
 - Life-Load: Eu-stress, Di-stress, recovery
 - Inflammation: type and intensity

Choosing Markers



Diet

- Glucose/ketones
- Macros
- Timing

Sleep

- HRV
- Self Reported Data
- Glucose
- Sleep Score

Devices

- Apps (food recording)
- Glucose/Ketone

Physical Activity

- HRV/HR
- Glucose
- Distance/Intensity

Devices

- Apps
- Wearables
- Glucose/Ketone

Life-Load

- HRV
- Glucose
- Self Reported Data

Devices

- Apps
- Glucose/Ketone

Inflammation

- HRV - life load
- Glucose
- Self Reported Data

Devices

- Apps (HRV/HR)
- Glucose/Ketone

Significance of Markers

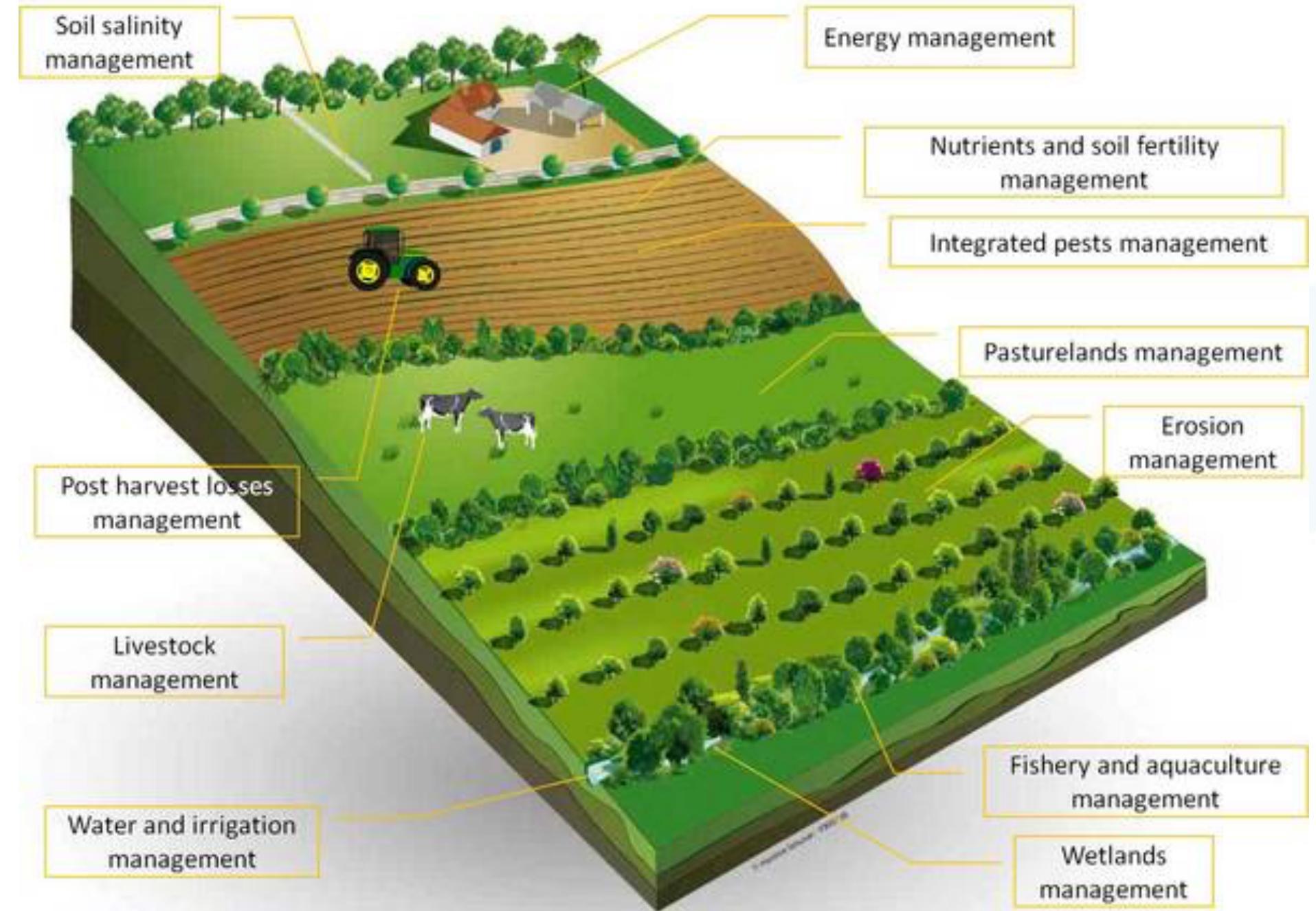
- **Glucose**
 - Ref Range (Fasting): 72 mg/dl - 90mg/dl
 - Significance
- **HRV**
 - Highly Individual compare between your demographics (age, gender, activity)
 - Ref Range (see separate slide)
 - significance: measure of sympathetic tone and inflammation
- **Sleep Score**
 - Reference Range >70% score (length, quality, restlessness, timing)
 - significance: correlated negatively to blood glucose and positively to HRV



The Big Five

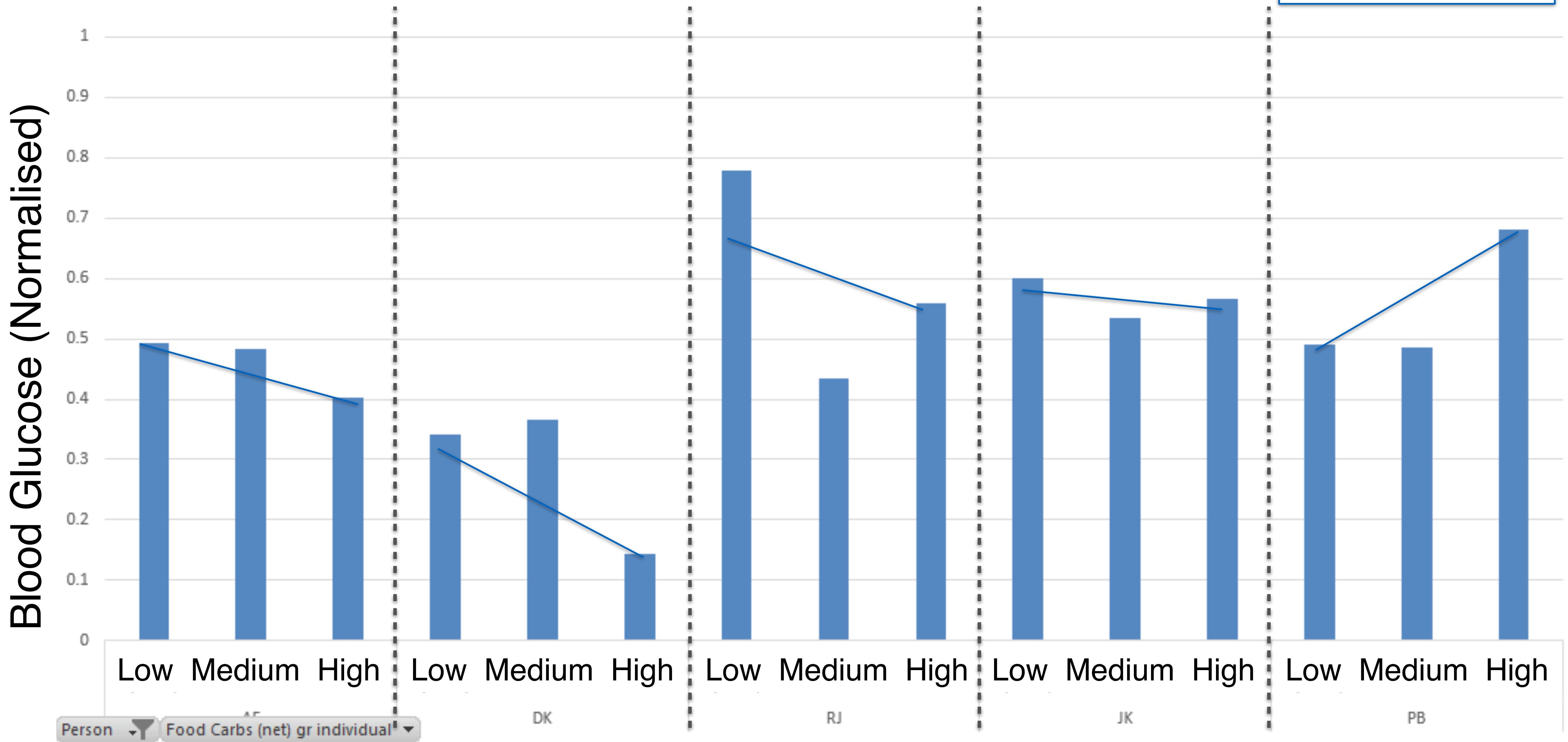


Diet



Carbohydrate and BG Fasting

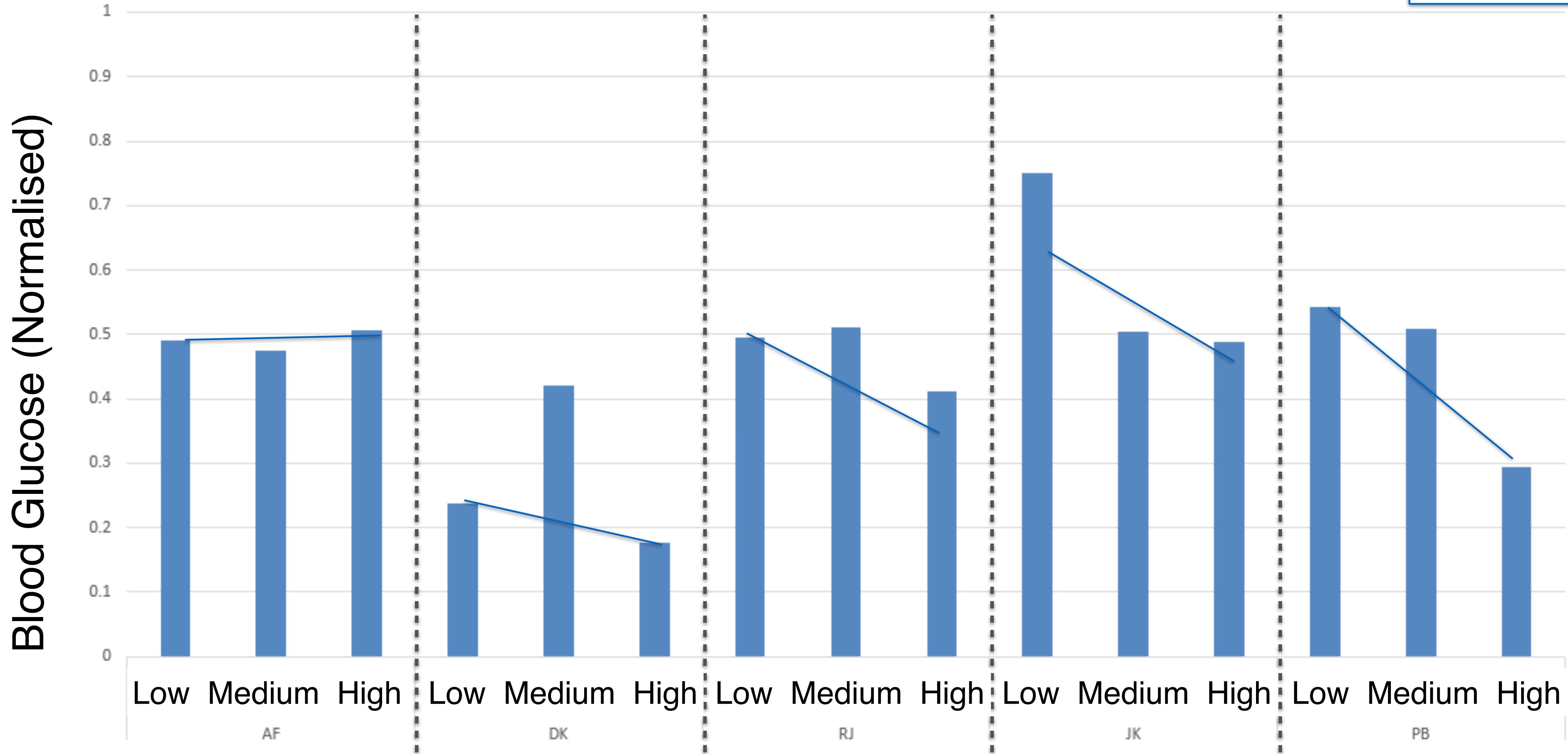
● Carbohydrates



Person ▾ Food Carbs (net) gr individual ▾

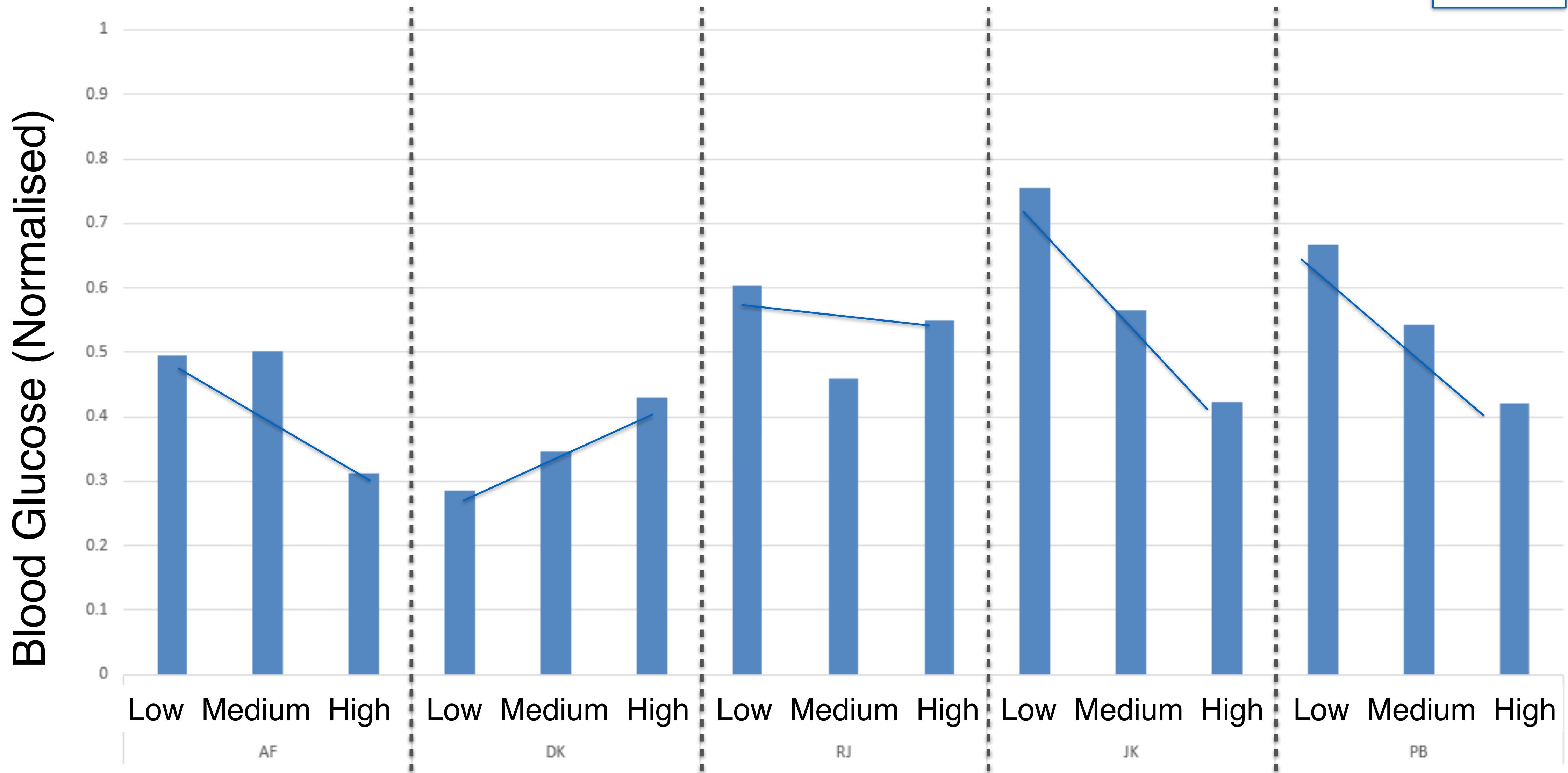
Protein and BG Fasting

● Protein

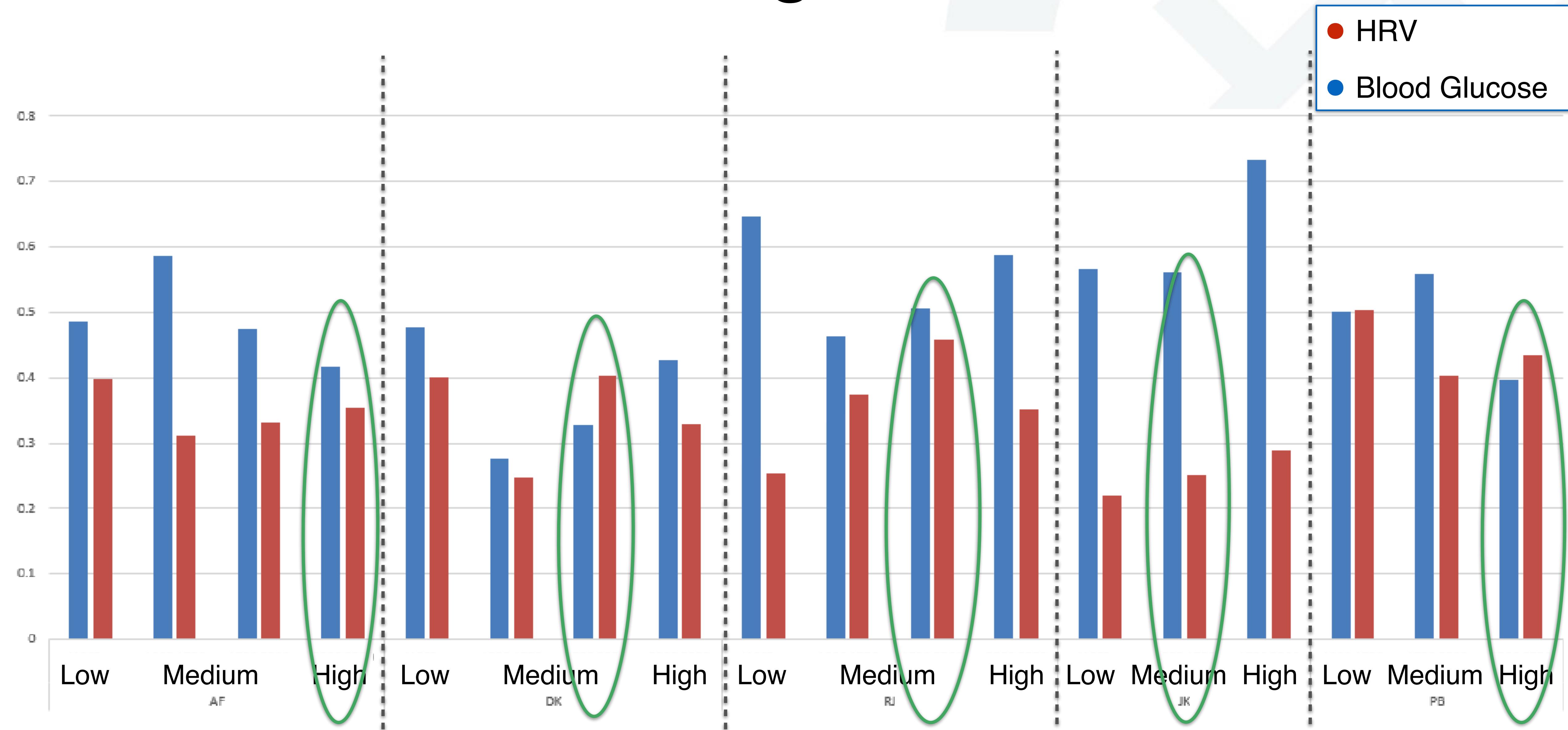


Fats and BG Fasting

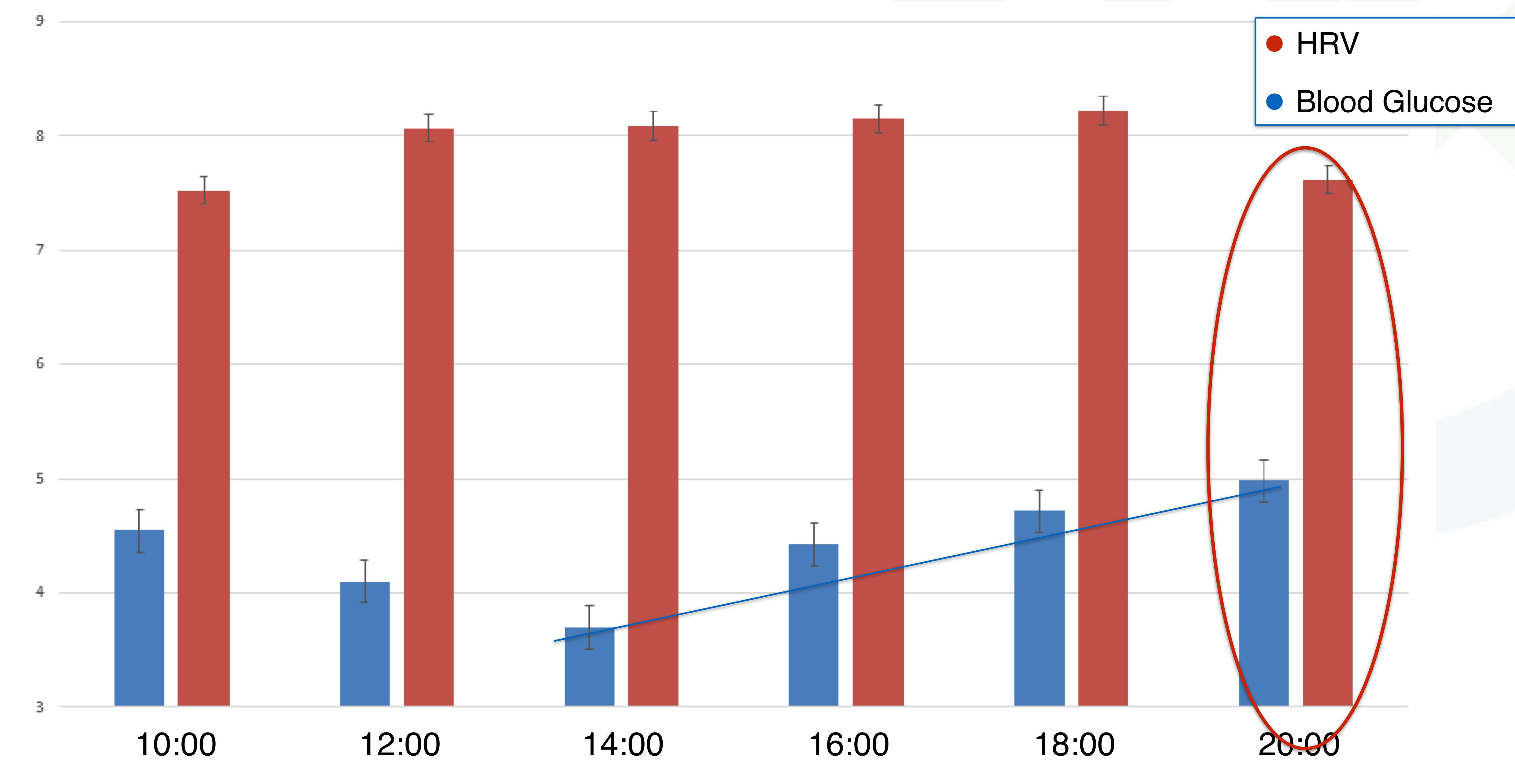
● Fats



Total Energetic Value



Last Time of Eating (Day Before)

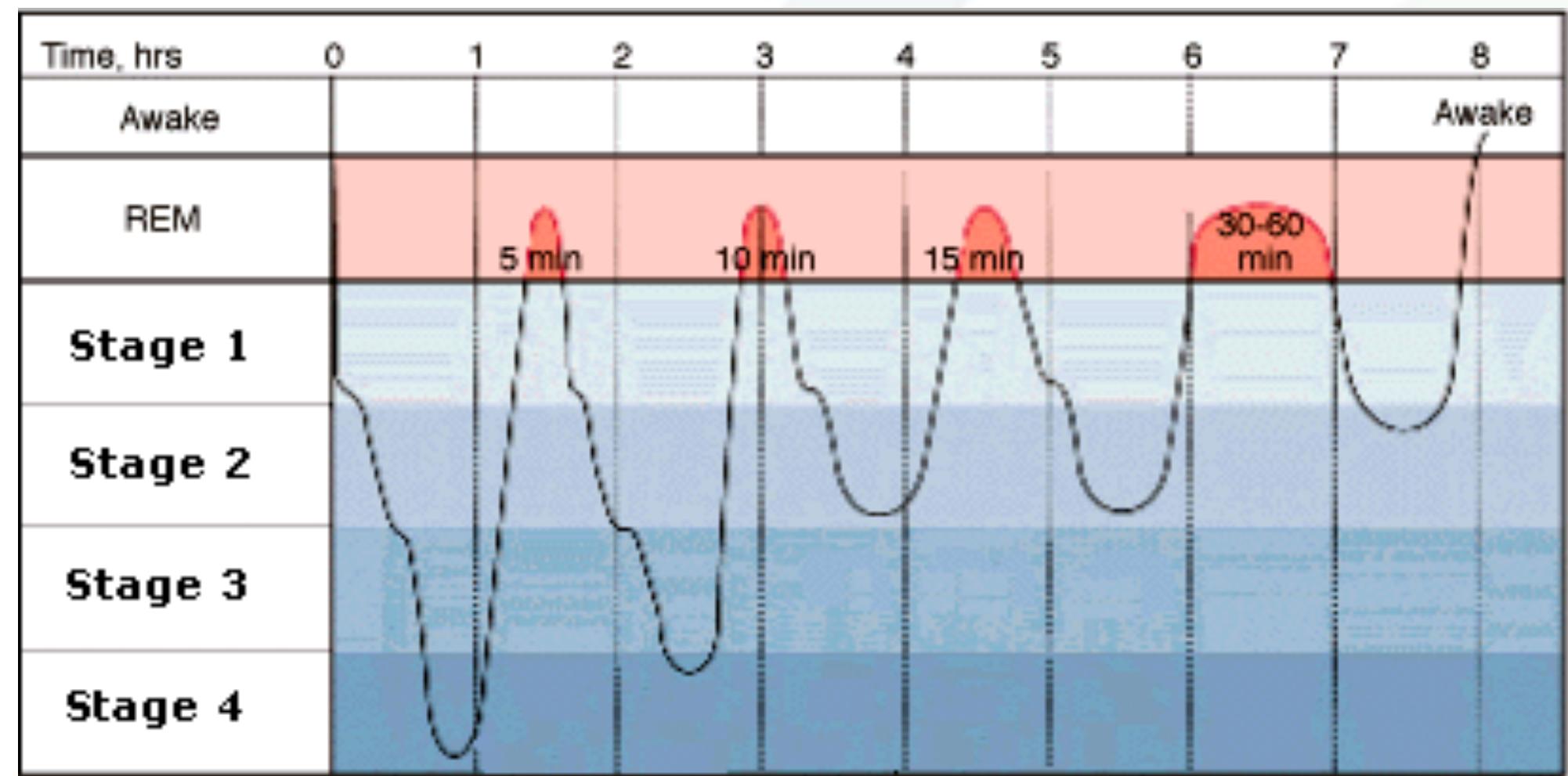


Dietary Findings

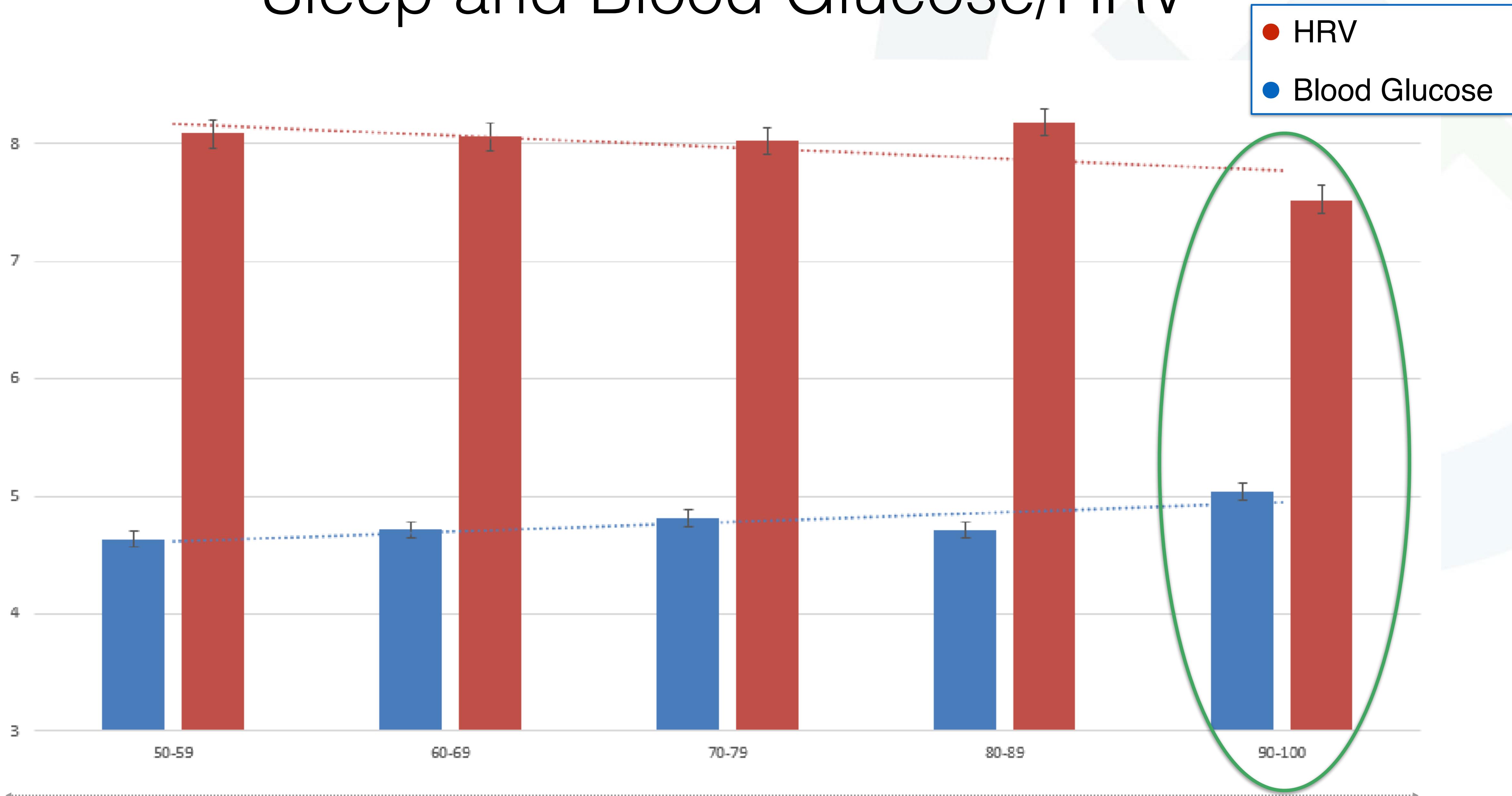
- Fasting and average blood glucose increased in response to:
 - Later evening eating
 - High or low quantity of total food
- Proportion of carbohydrates, protein and fats
 - Affected the individuals differently
 - Highest carbohydrate with highest fat intake generally correlated with highest fasting glucose (see Appendix)
- Small changes in HRV

The Big Five

Sleep



Sleep and Blood Glucose/HRV



Sleep Findings

- Weak/Moderate negative correlation between sleep and blood glucose
- Weak to Moderate Positive correlation between Sleep (quality) and HRV
- Not associated to the length but quality
- Individuals with highest restlessness had the lowest score and worse readings for HRV and BG

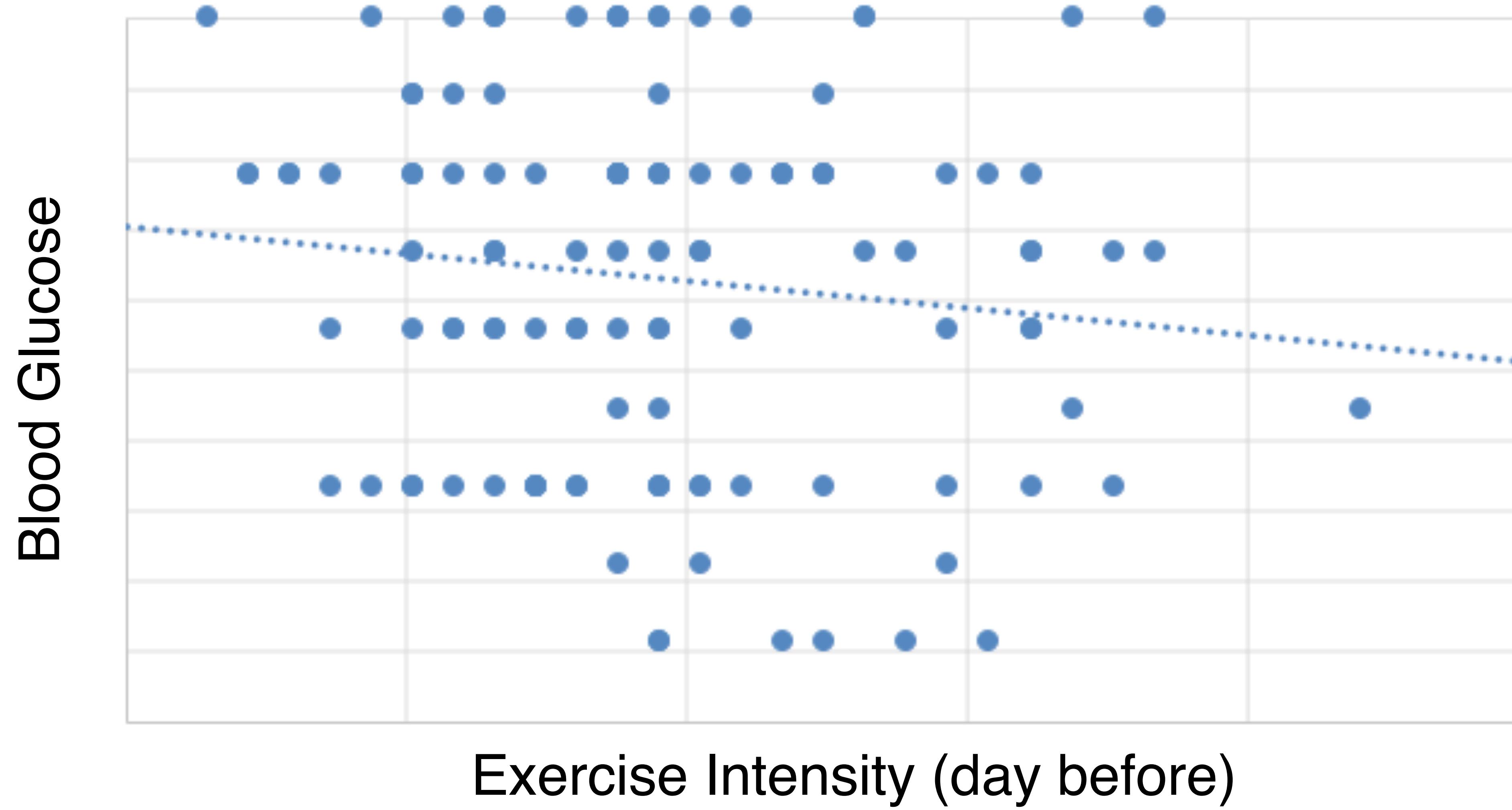


The Big Five

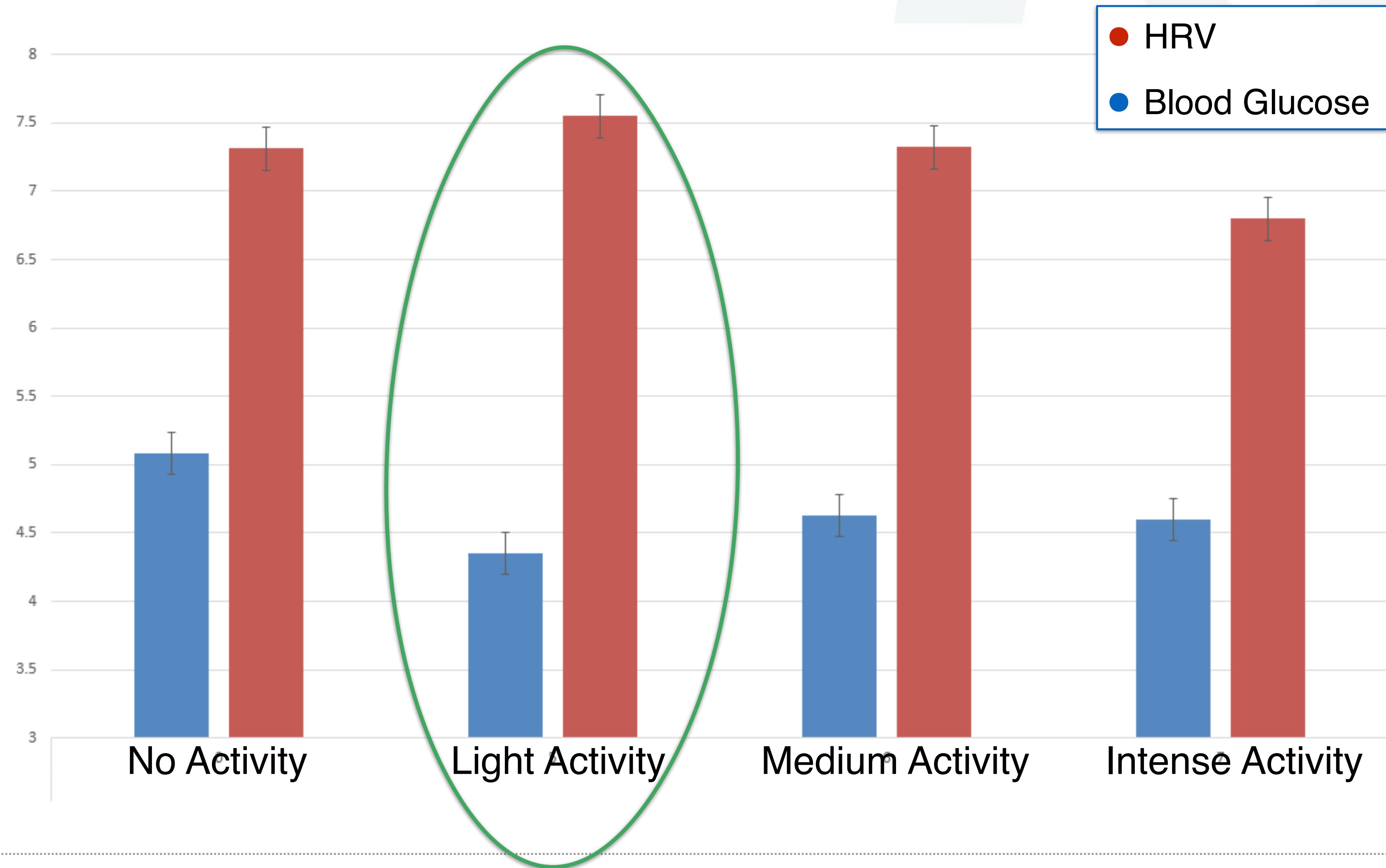
Physical Activity



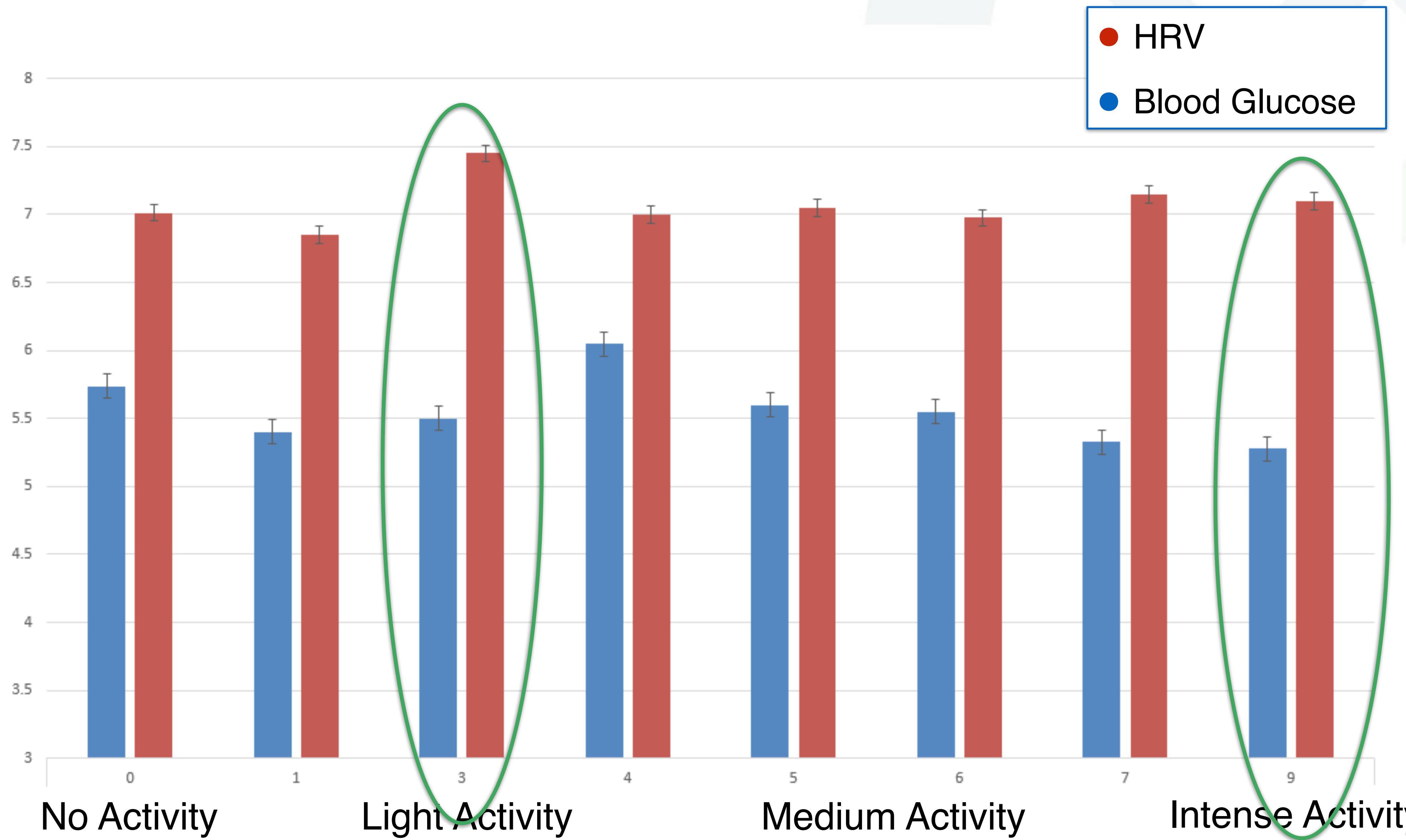
Is It Worth it?



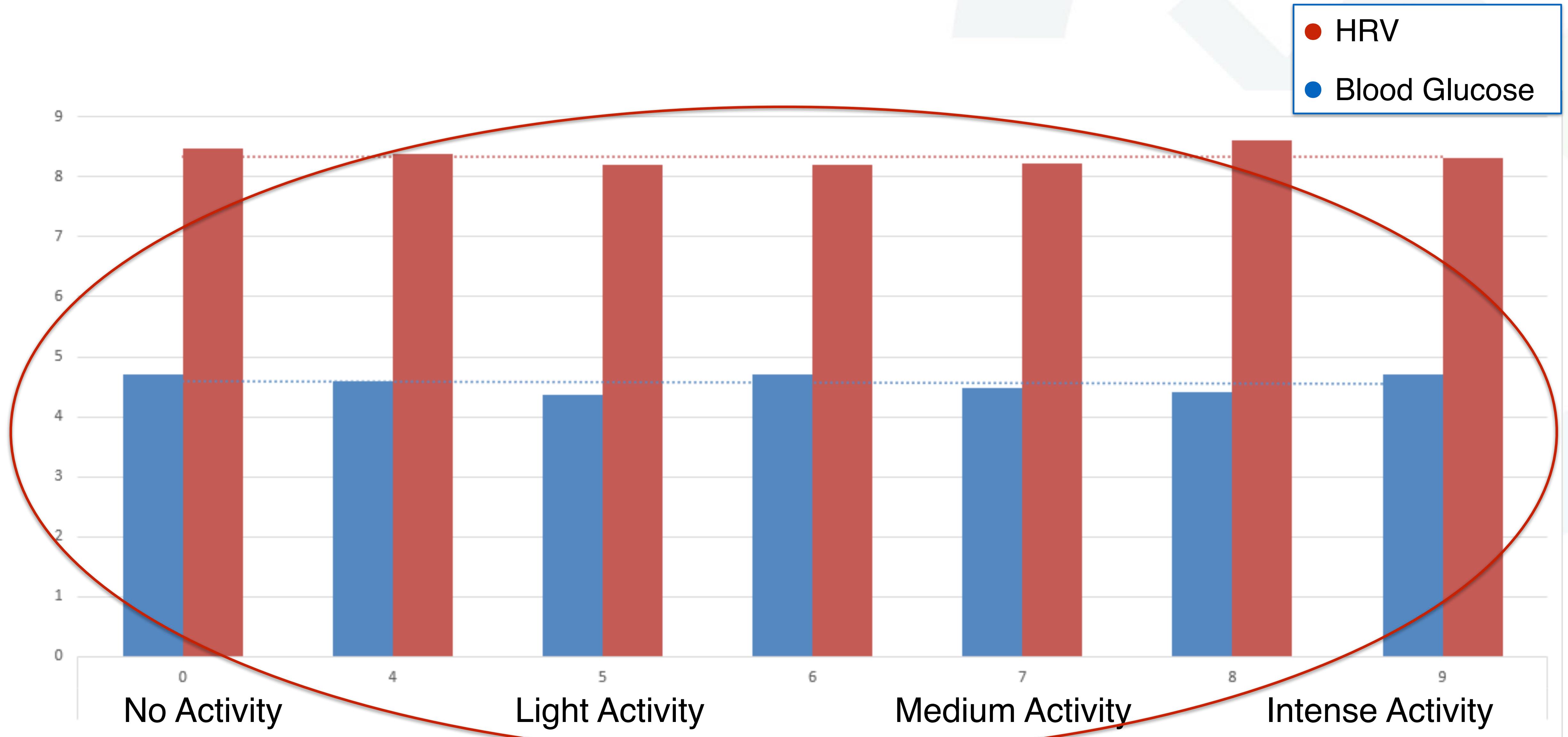
Physical activity vs BG and HRV (non exerciser)



Physical activity vs BG and HRV (regular responsive)



Physical activity vs BG and HRV (exhausted)



Activity Findings

- All participants had a different response to activity type and load
- Essential to identify the optimal load as well as activity
- No activity or too high activity negatively impacts BG and HRV

The Big Five

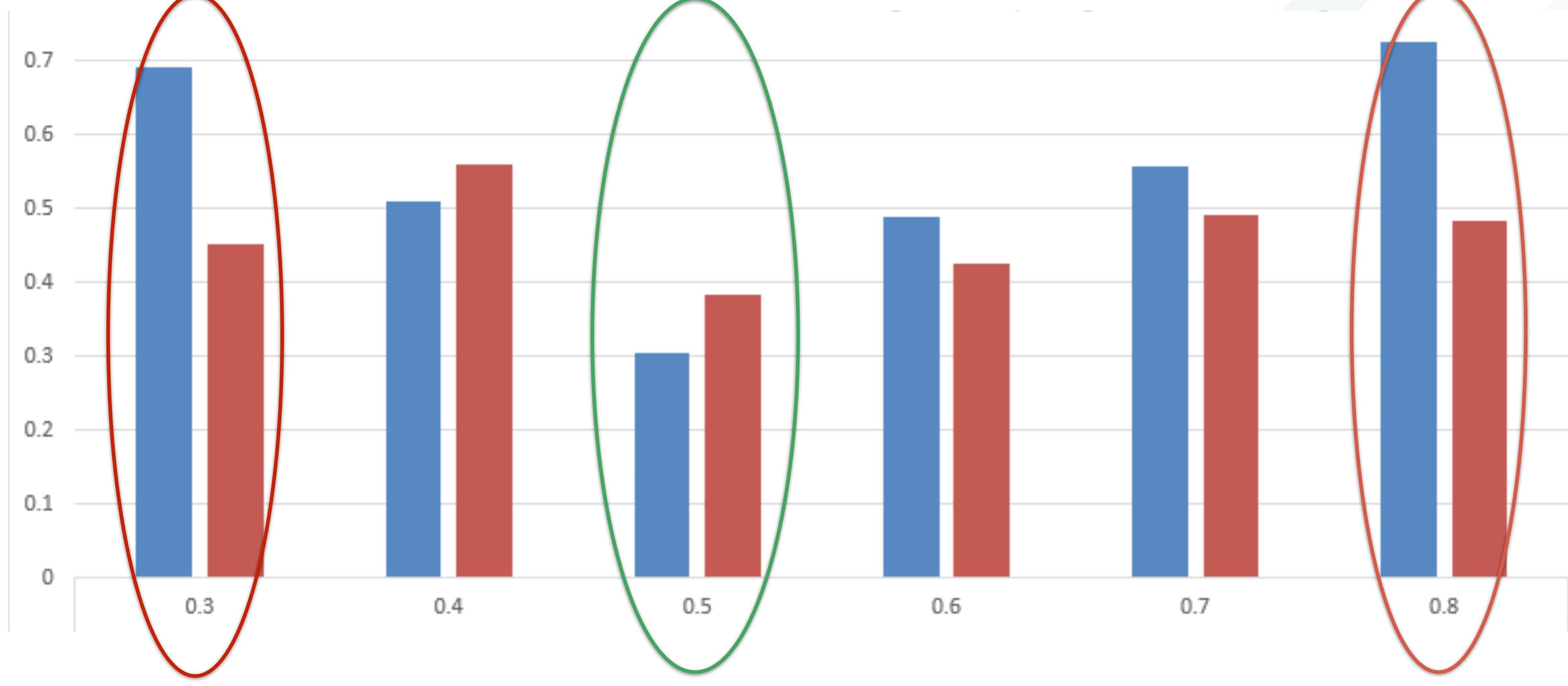


Life-Load

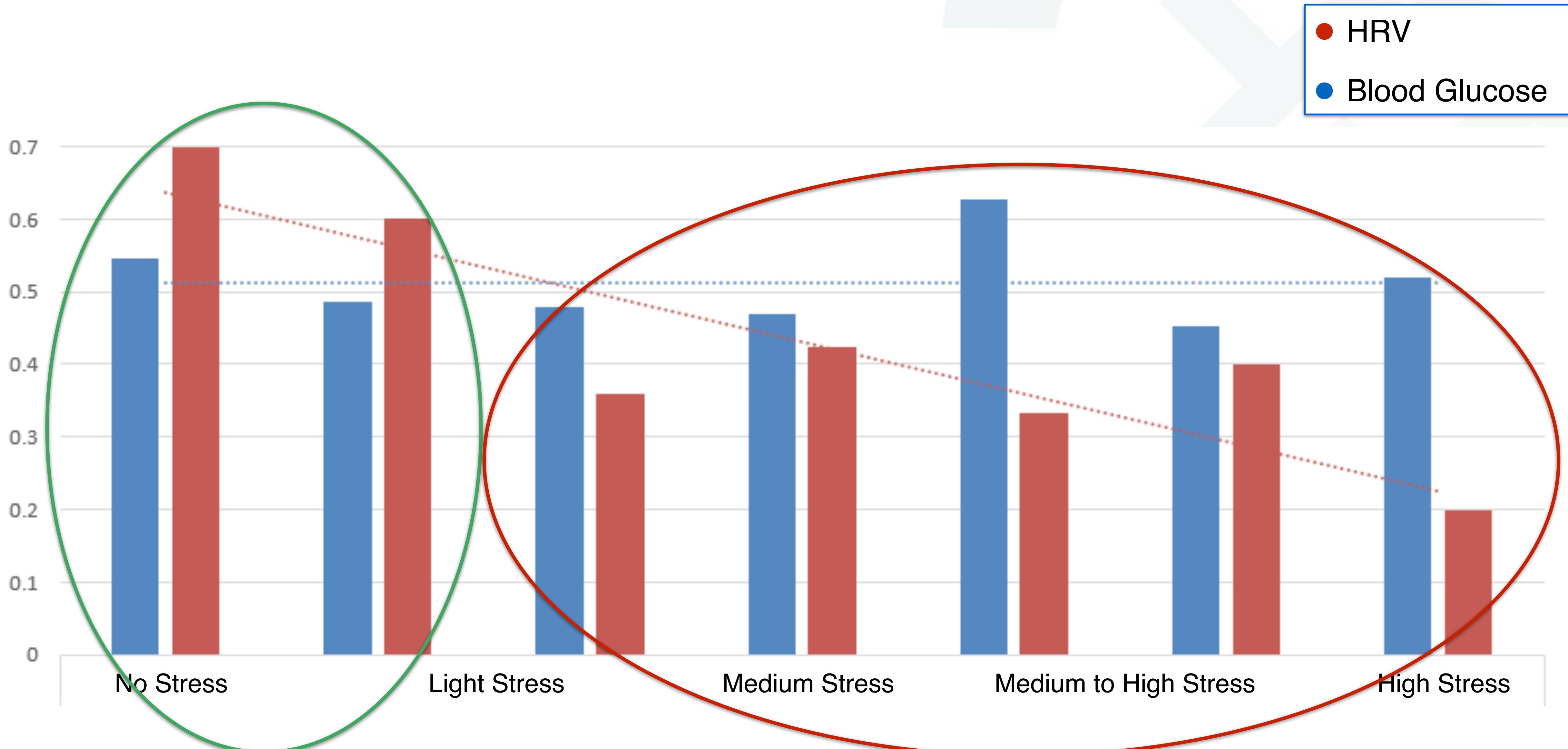


LifeLoad vs BG and HRV

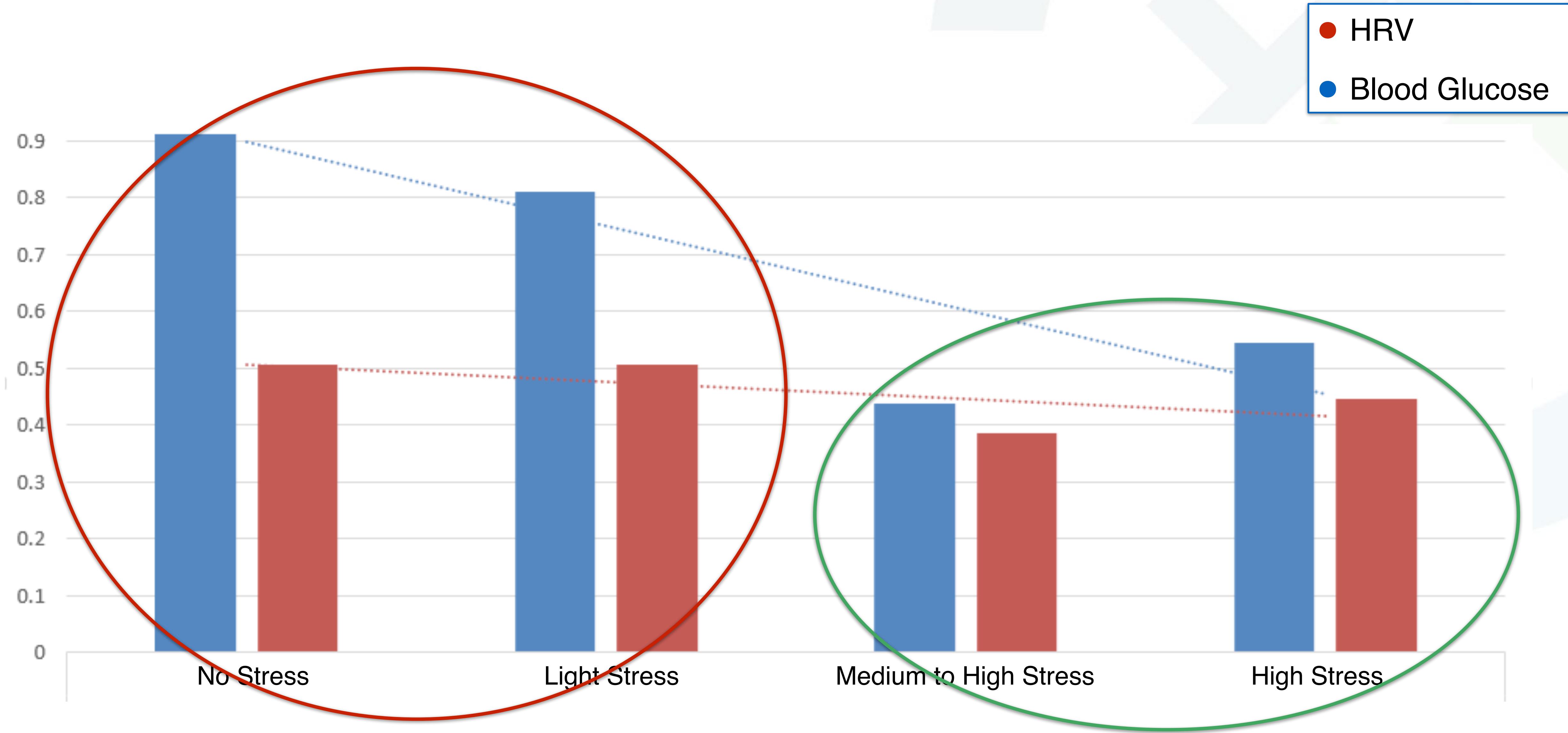
- HRV
- Blood Glucose



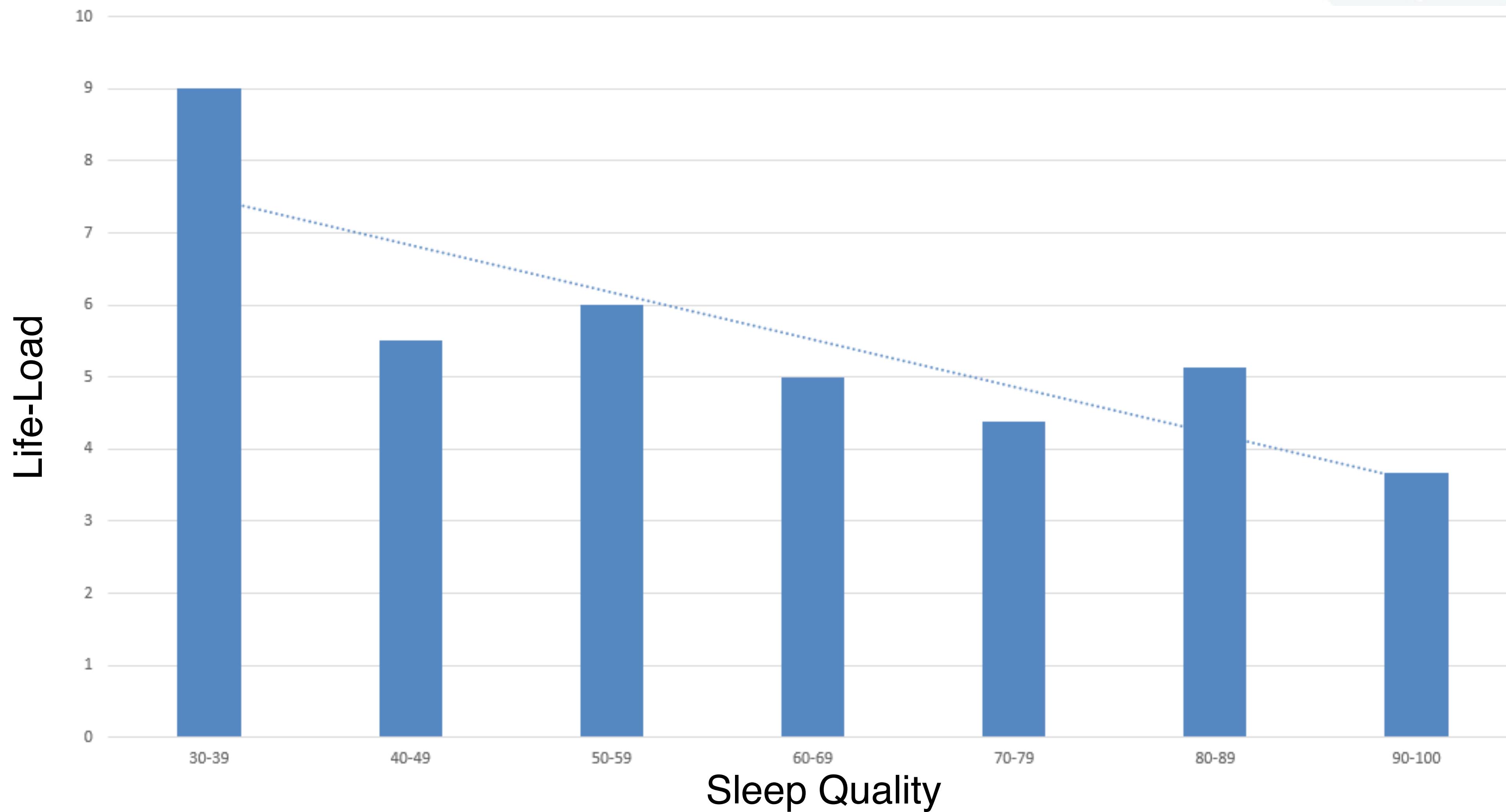
LifeLoad vs BG (and HRV)



LifeLoad vs BG (and HRV)



LifeLoad vs Sleep



LifeLoad Findings

- All participants responded differently to stress
 - For some individuals BG seemed the best marker, in others HRV
 - No stress at all and too high levels of stress seemed to give the worst response
- In some individuals BG improved with stress
- Self perception is highly subjective, so selection of variables and patient guidance is essential

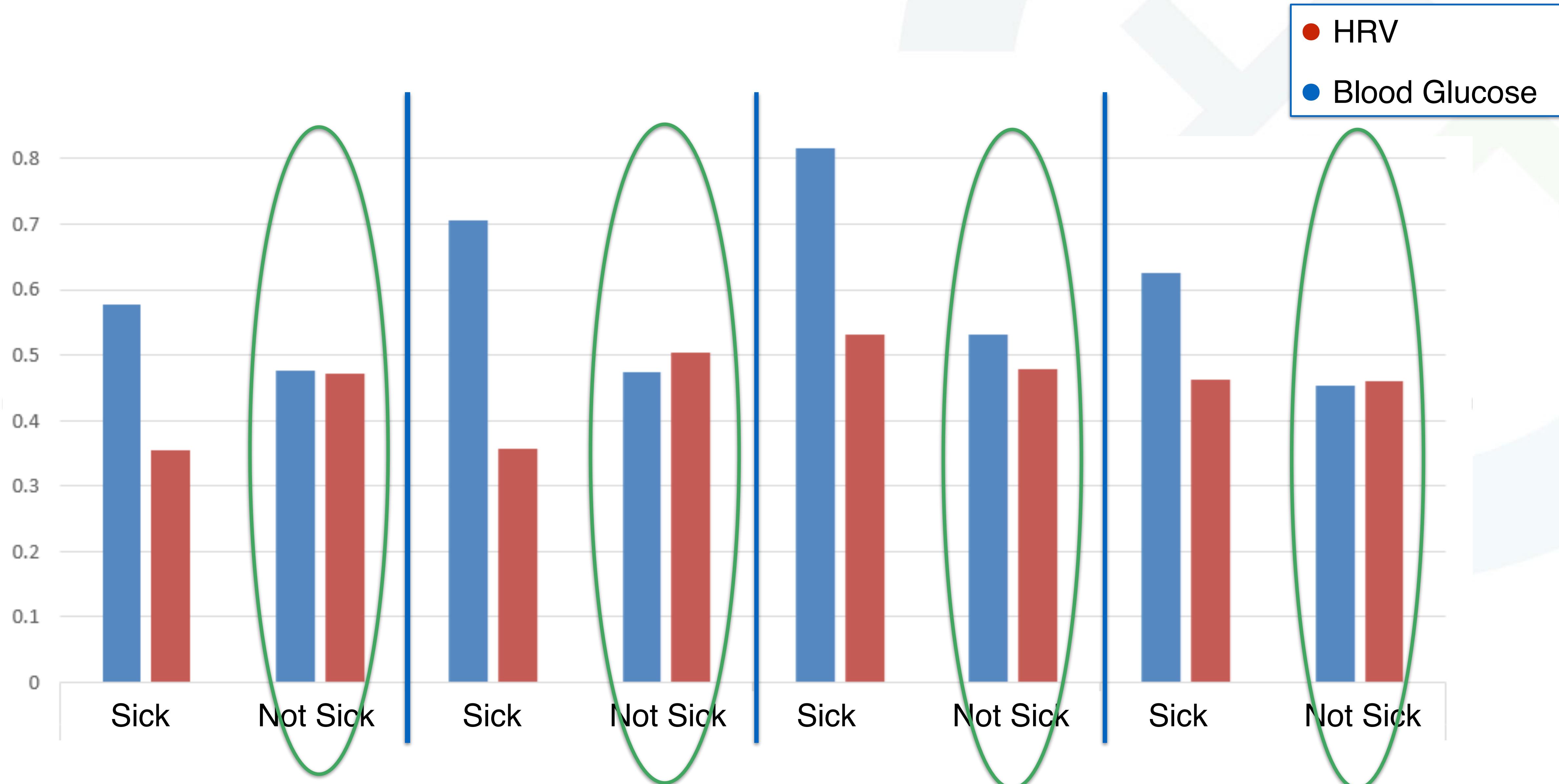


The Big Five

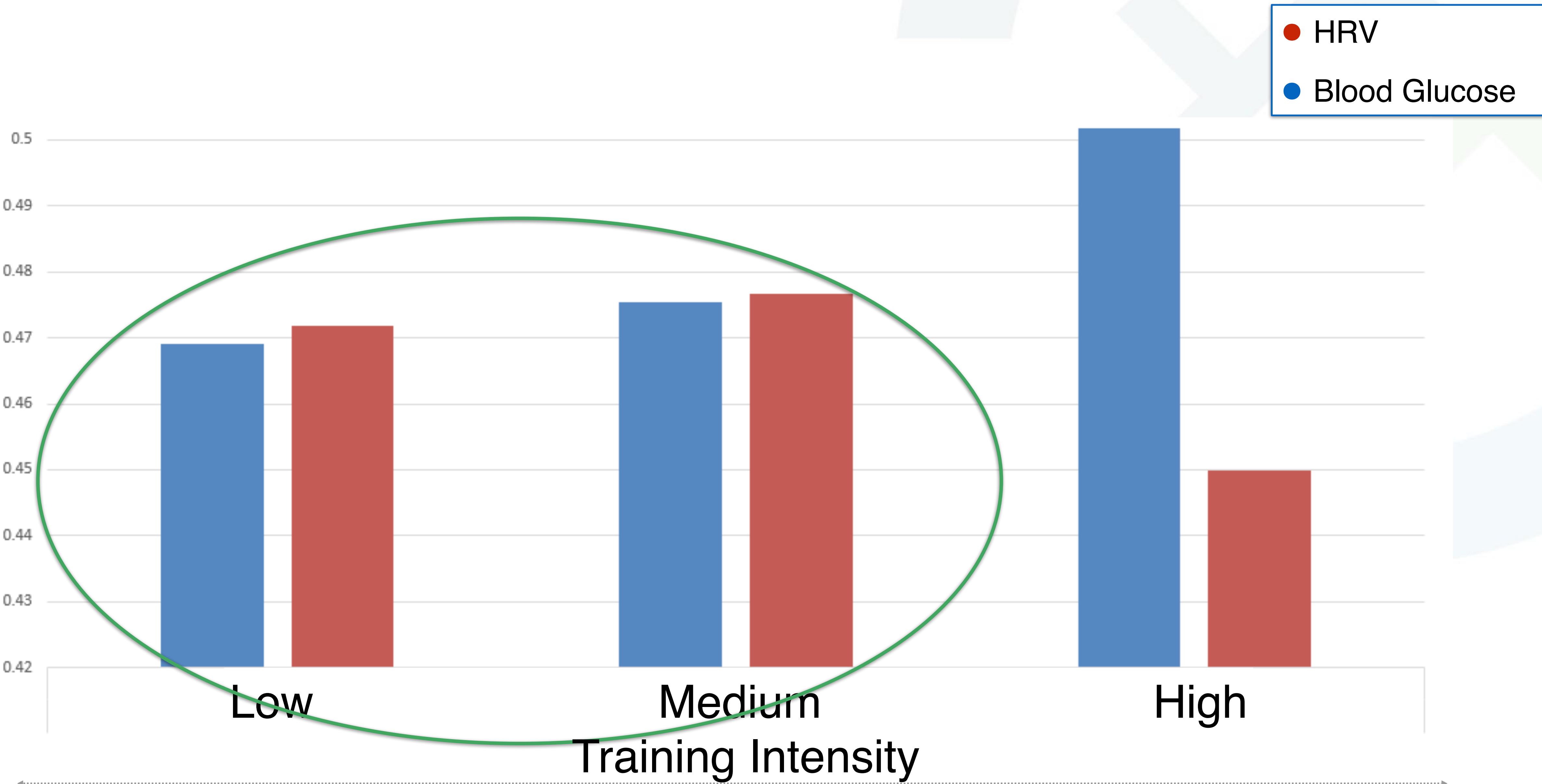
Inflammation



Inflammation (Sickness) vs BG and HRV



Inflammation (Training) vs BG and HRV



Findings

- Inflammation elevates BG
- Reduces HRV and increases HR (both average and baseline)
- Activates pathways which disrupts metabolic flexibility
- Diminishes our ability to withstand stress when it becomes prolonged

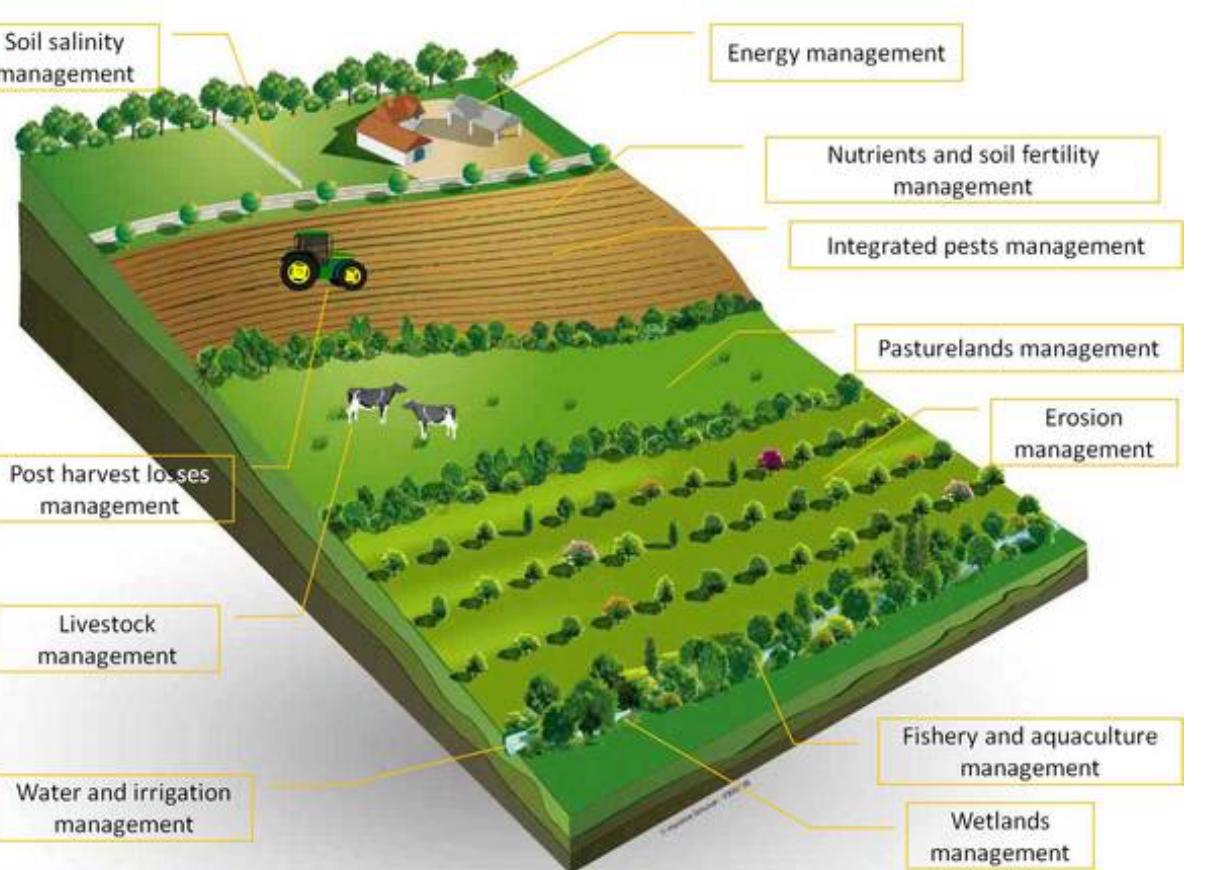
The Big Five



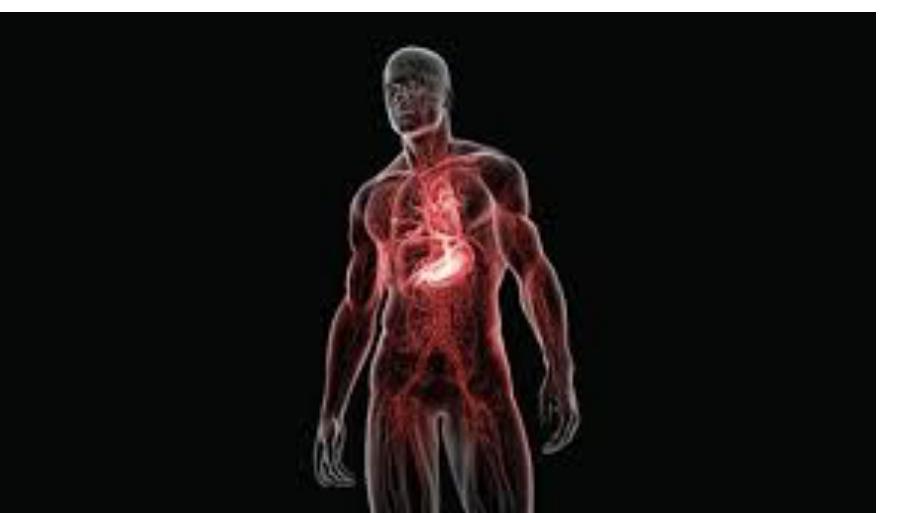
Life-Load



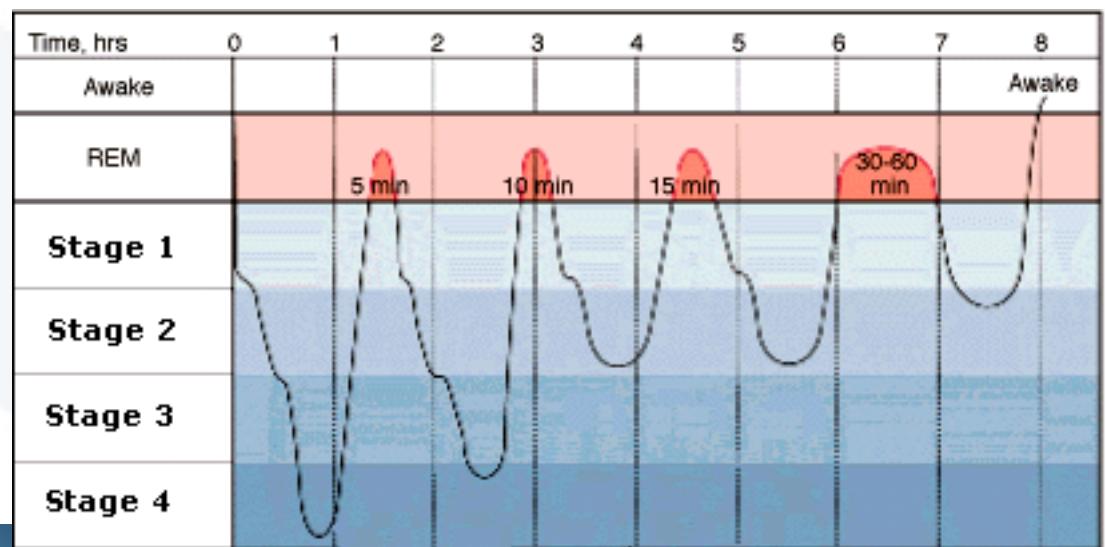
Diet



Inflammation



Physical Activity



Sleep



Take home points

Meal Timing

- The last meal of the day late afternoon generated the best BG reading.

Macros

- Adjust the carbs, protein and fat ratio to individuals - (carbs + fats=!)
- Adjust the totally energetic intake accordingly (-20%?)
- Improvements in BG ranged from -15mg/dl to -40mg/dl.

Sleep

- Negatively correlated to perception of stress the day before
- Negatively correlated to late eating

Physical Activity

- No activity or too high activity can both be very detrimental. Adjust individually.
- Aim to start with 20-30 minutes of any physical activity that will reach 70%-85% of Max HR 2-3 times a week
- If training on a regular basis consider monitoring HRV and BG to guide the training rather than adhering to fixed routines

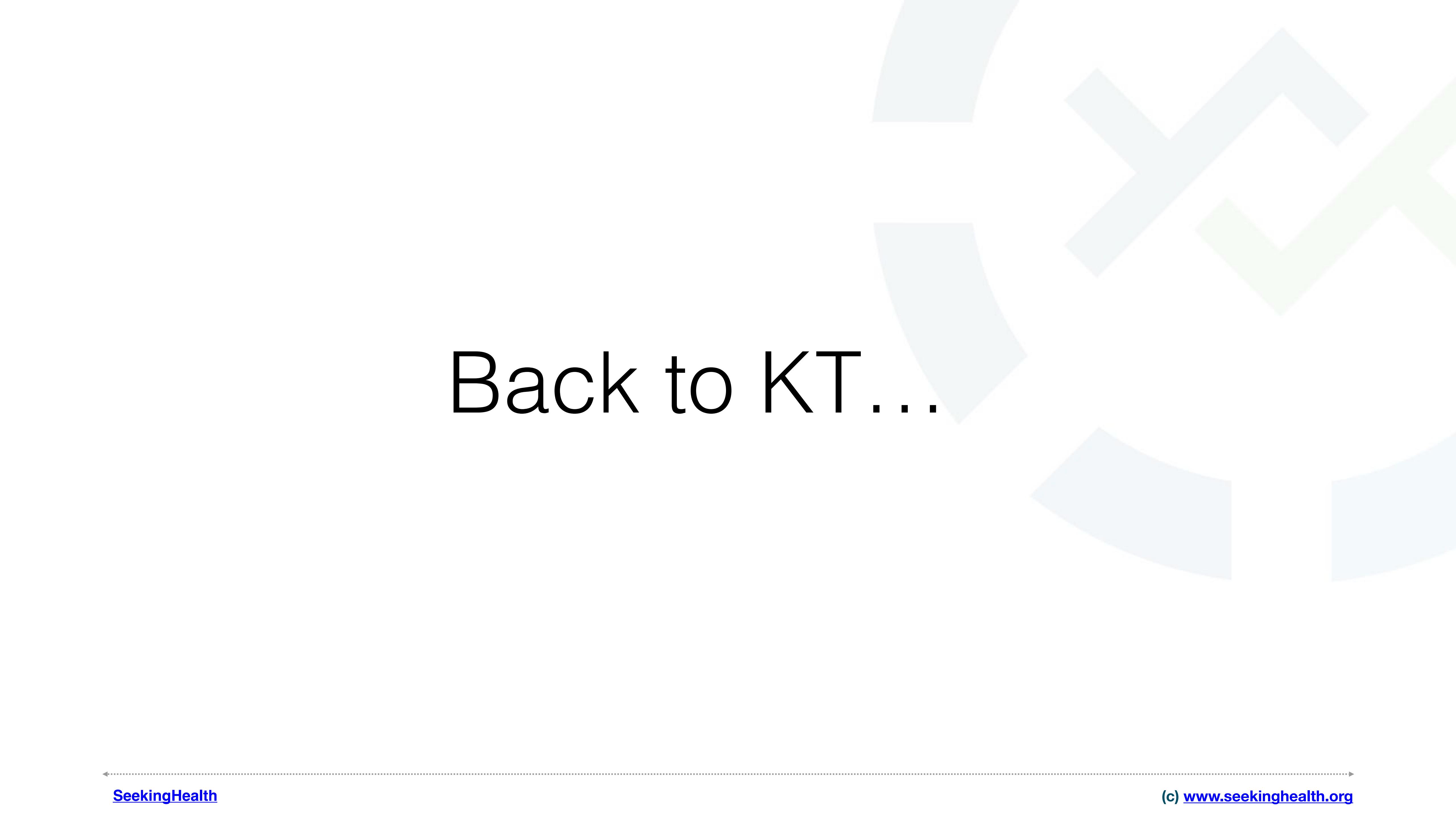
Stress (LifeLoad)

- Adjustments to optimal life-load and stress management positively impacts both HRV and BG

Inflammation

- Affected and affecting by all of the above





Back to KT...

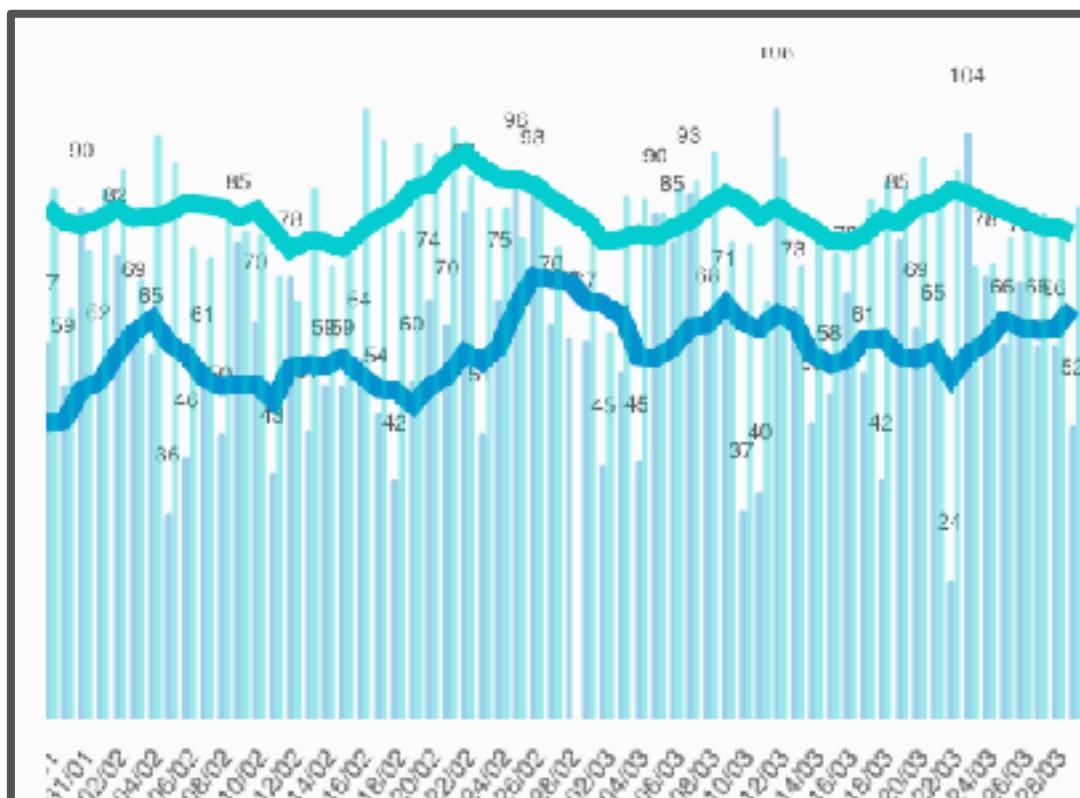


KT

- ✓ Diet generally ‘good’, healthy carbs and not in excess, lots of veggies, good quality protein and healthy fats.
- ✓ “Are you physically active? ...”Once a week I go all out as I’ve read that’s good for me”
- ✗ “How’s your sleep?”... ”Poor and disrupted, but ok”
- ✗ “How’s your stress?”....”You know what its like living in London...busy, hard, but lots of fun”
- ✗ “Are you taking regular ‘me’ time?”.... “I’m just too busy...but as I said I’m having fun”

Small changes, Big Impact

Sleep Length



Baseline correlation

0.03

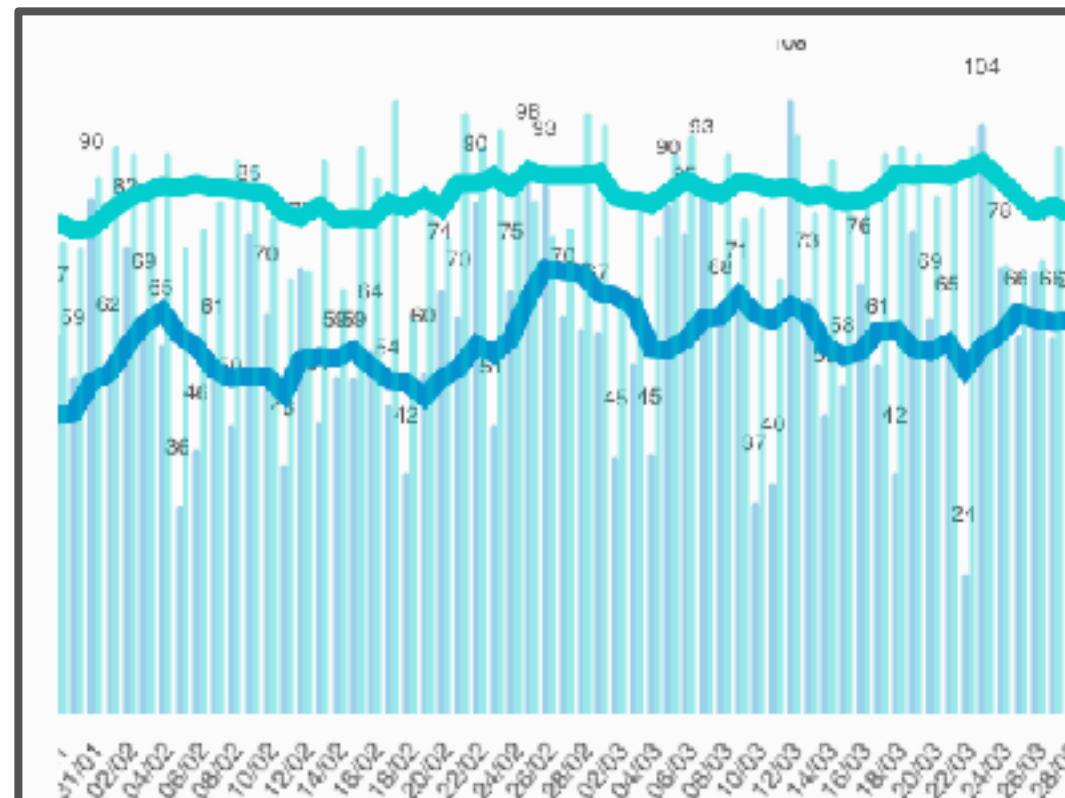
The baseline correlation between rMSSD and Sleep time during the past 60 days is very weak

Day to day correlation

0.08

The daily correlation between rMSSD and Sleep time during the past 60 days is very weak

Quality



Baseline correlation

0.44

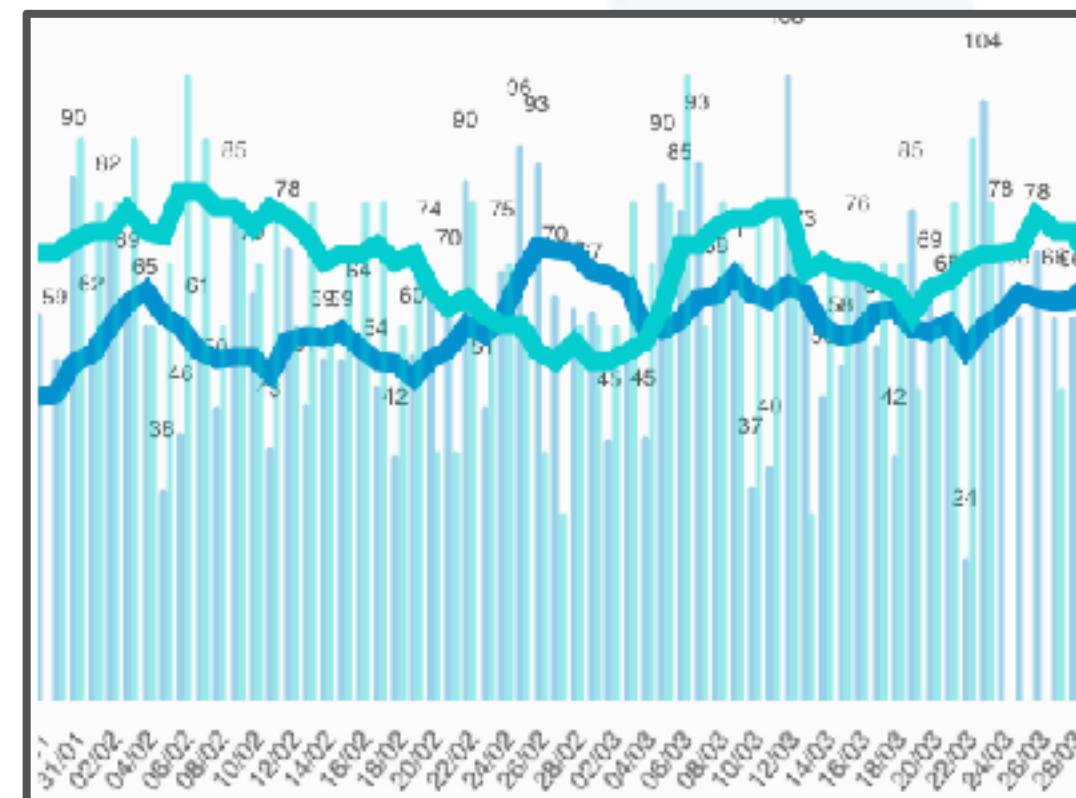
There is a moderate positive baseline correlation between rMSSD and Sleep quality in the past 60 days

Day to day correlation

0.21

There is a weak positive daily correlation between rMSSD and Sleep quality in the past 60 days

Stress Previous Day



Baseline correlation

-0.38

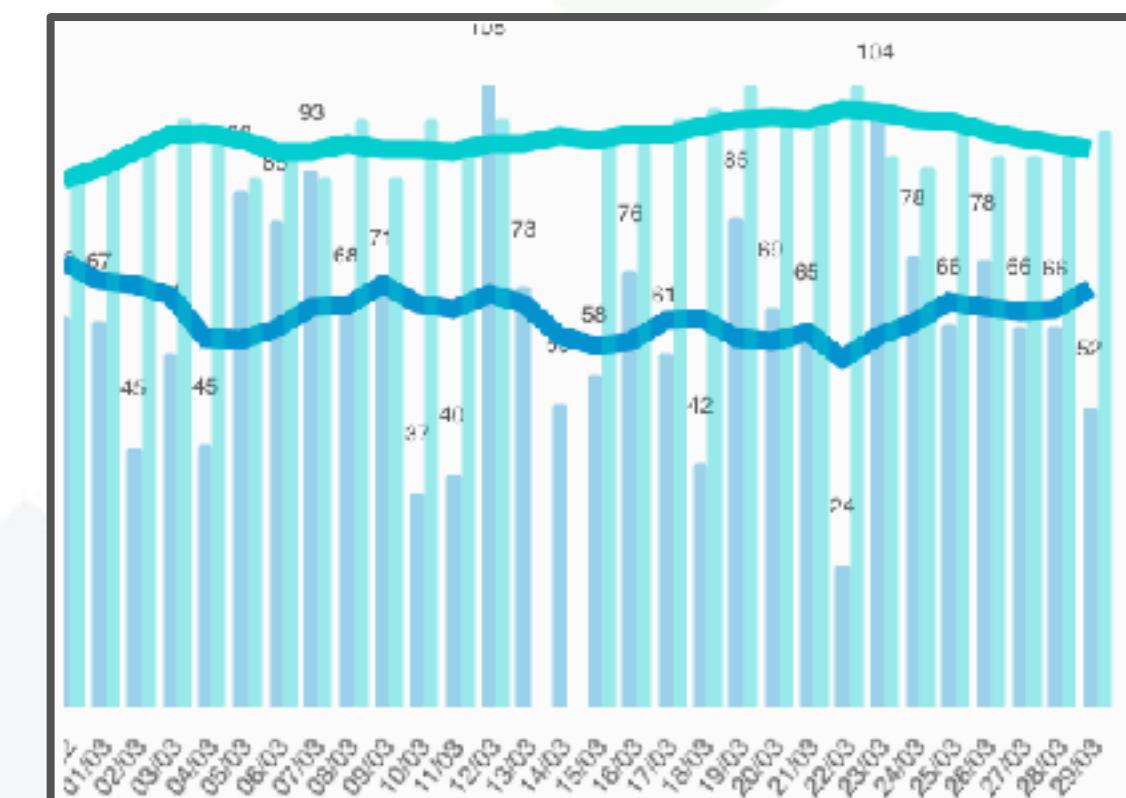
There is a weak negative baseline correlation between rMSSD and Stress Previous Day in the past 60 days

Day to day correlation

-0.11

The daily correlation between rMSSD and Stress Previous Day during the past 60 days is very weak

Glucose Fasting



Baseline correlation

-0.73

There is a strong negative baseline correlation between rMSSD and Glucose in the past 30 days

Day to day correlation

-0.38

There is a weak negative daily correlation between rMSSD and Glucose in the past 30 days

Recommendations for KT

✓ **Sleep**

- ✓ Finish eating last meal at 18:30
- ✓ Finish any stimulatory activity 2-3 hours before bed time
- ✓ Get as much daylight as possible
- ✓ Create a sleep routine, dim lights, blue light blocking glasses, earplugs, light black out curtains etc

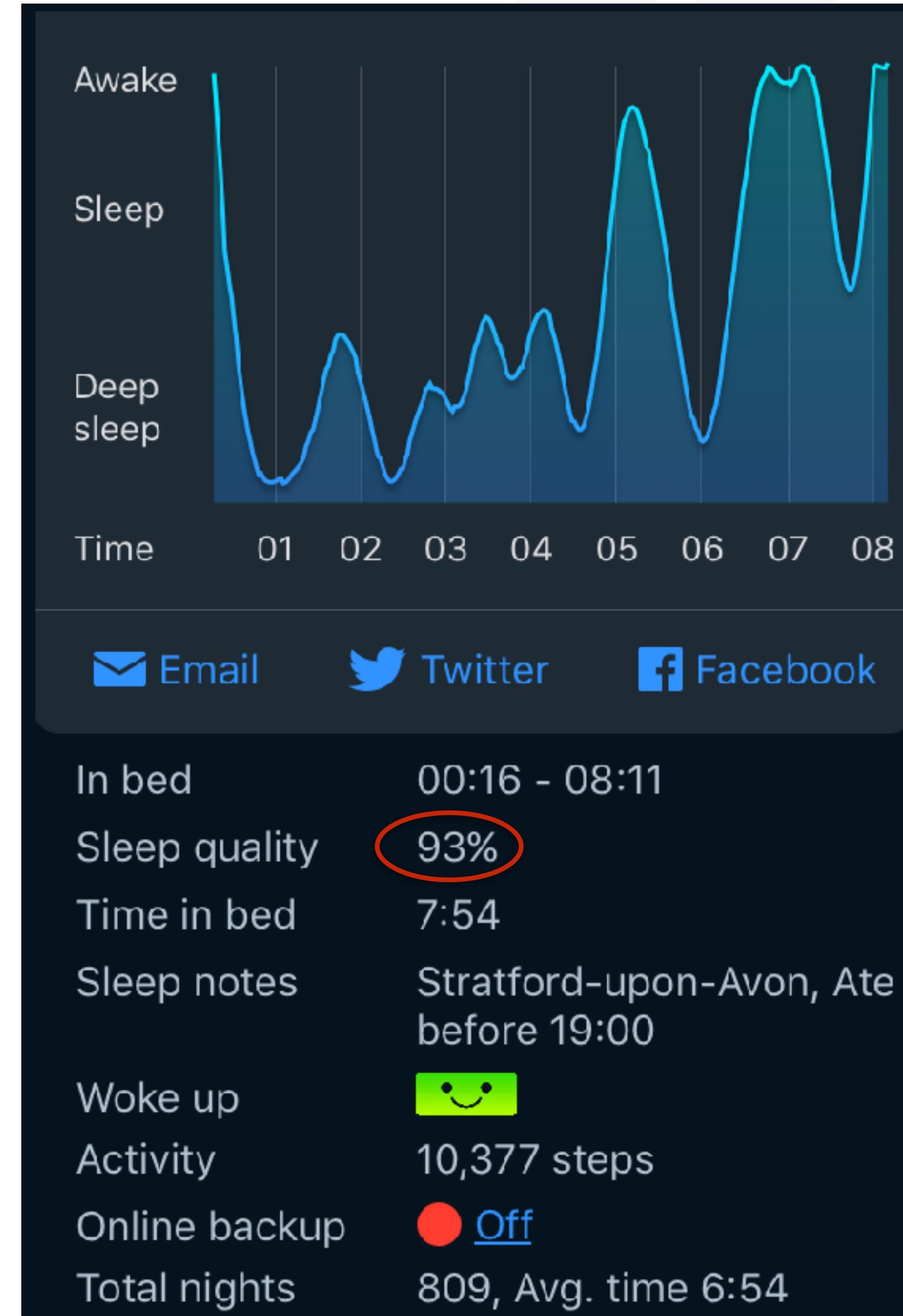
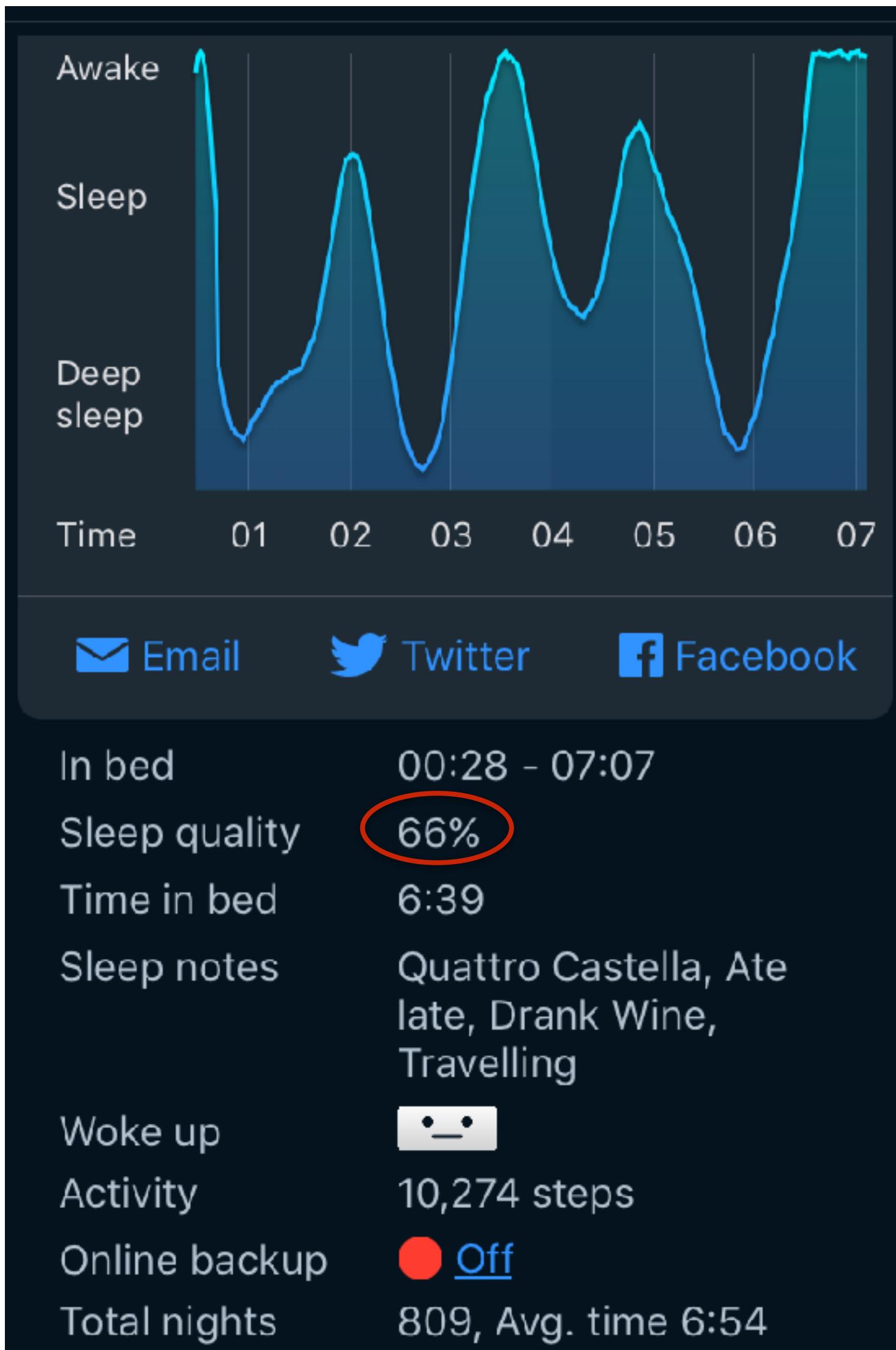
✓ **Stress Response**

- ✓ Regular 'me' breaks during the day (reading her book in sunlight)
- ✓ for every 2hrs work, take 30 minutes of personal/social activity
- ✓ Learn to say 'No'

Results

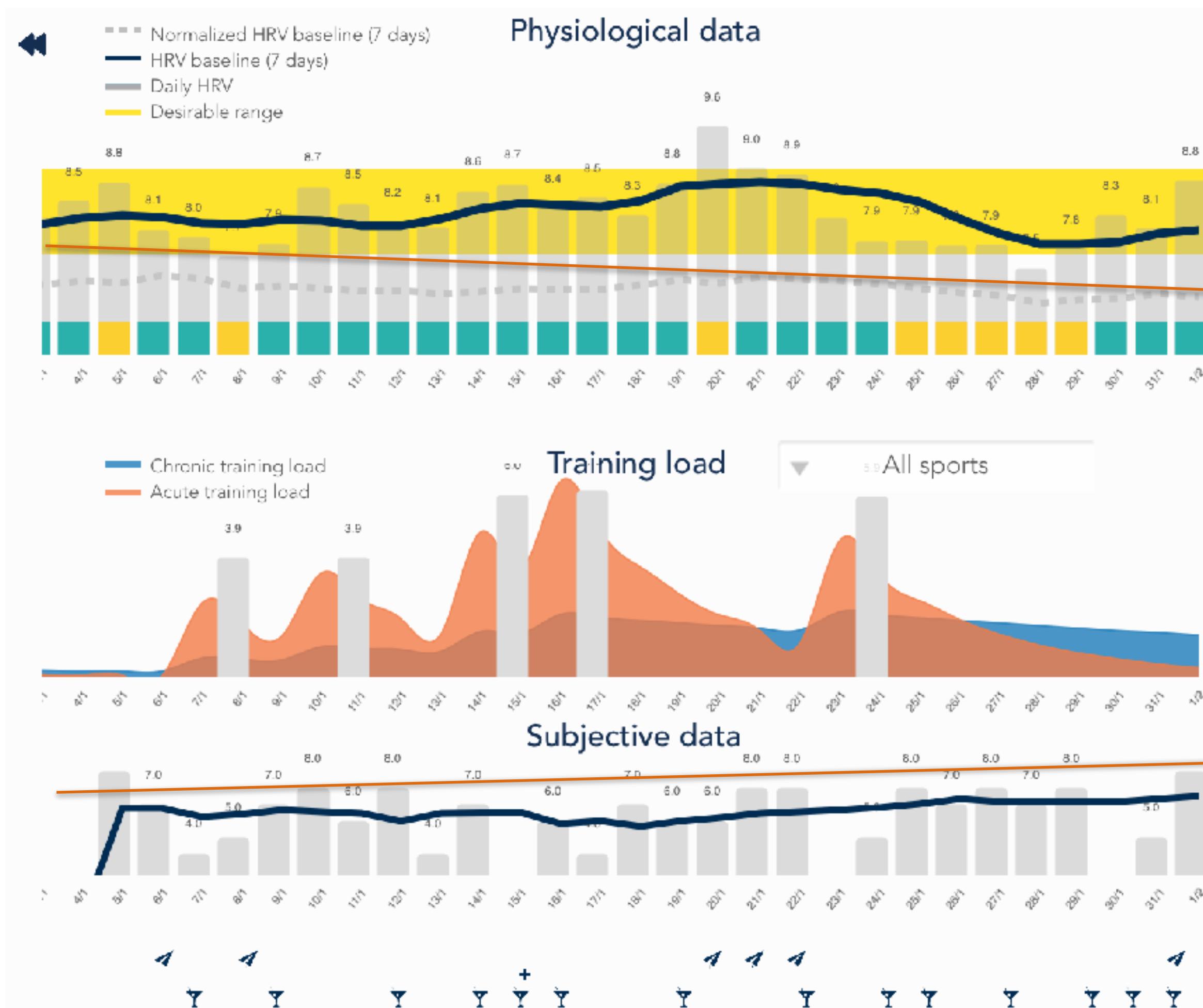
- ✓ HRV baseline increased
- ✓ Fasting and daily average BG decreased
- ✓ Sleep quality improved of 19% ...waking up refreshed!
- ✓ Able to relax during the day
- ✓ Her energy is stable with no dips
- ✓ She prioritises projects
- ✗ NO Supplementation for MTHFR!

Small changes, Big Impact -Sleep

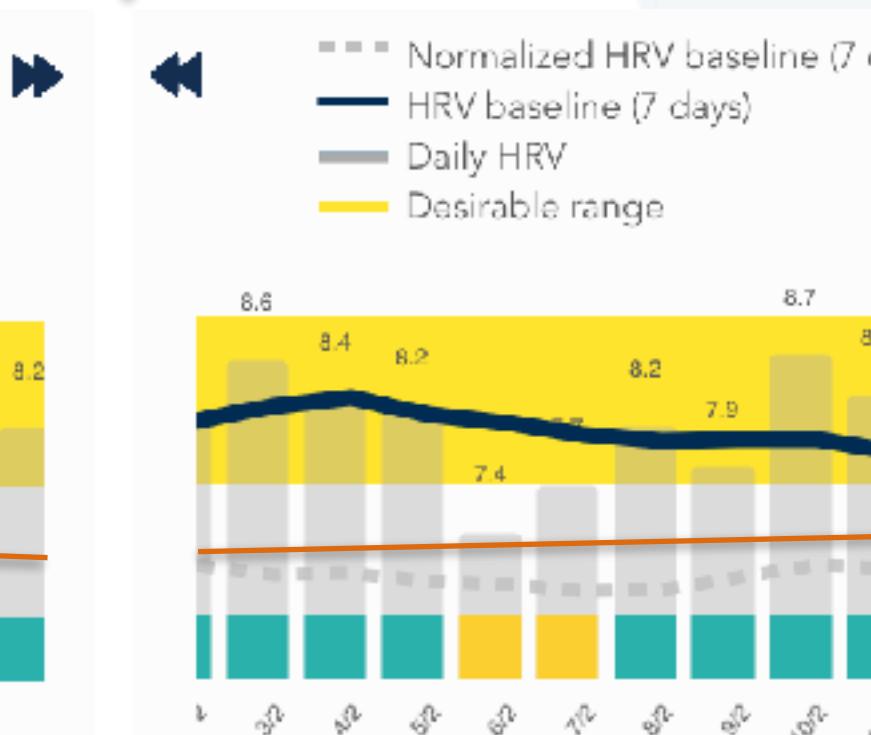


Small changes, Big Impact - Stress

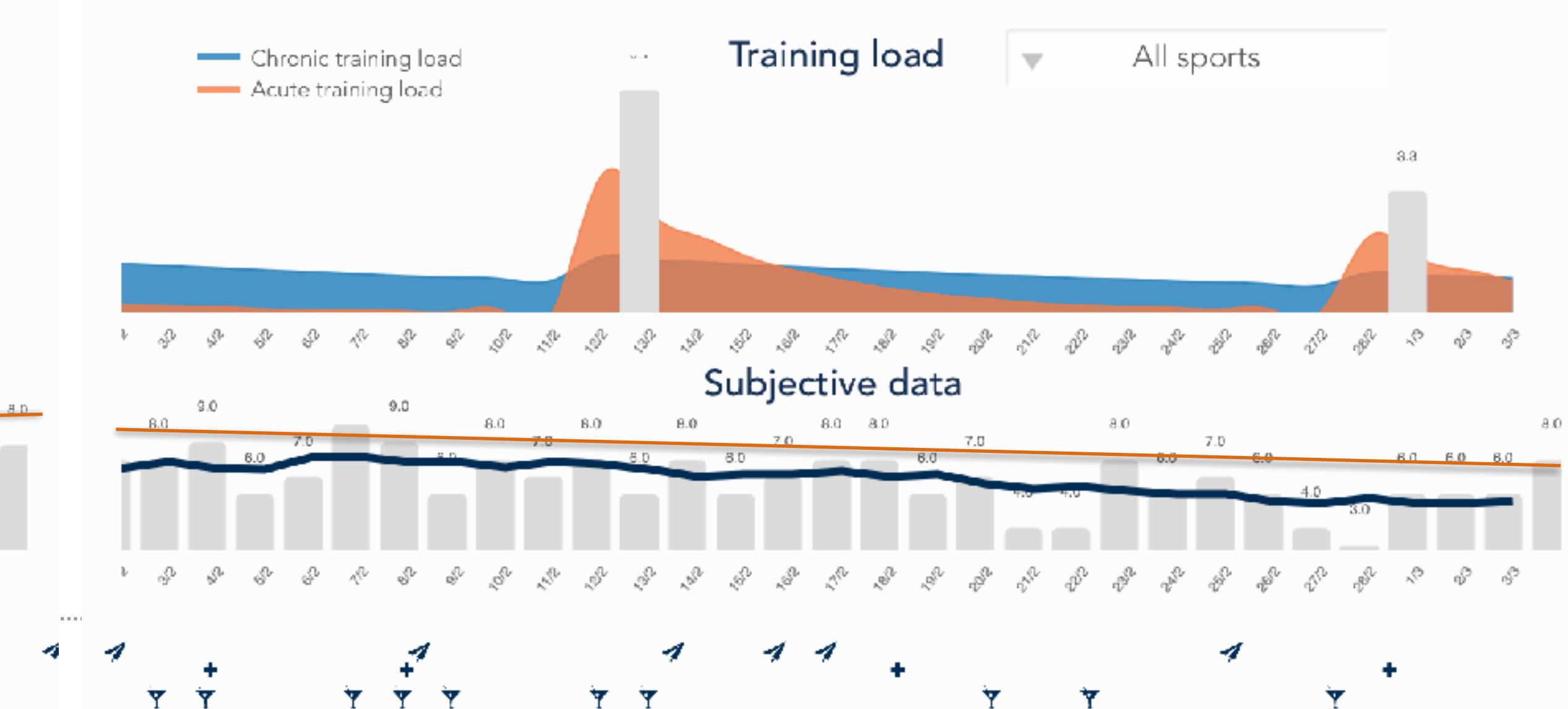
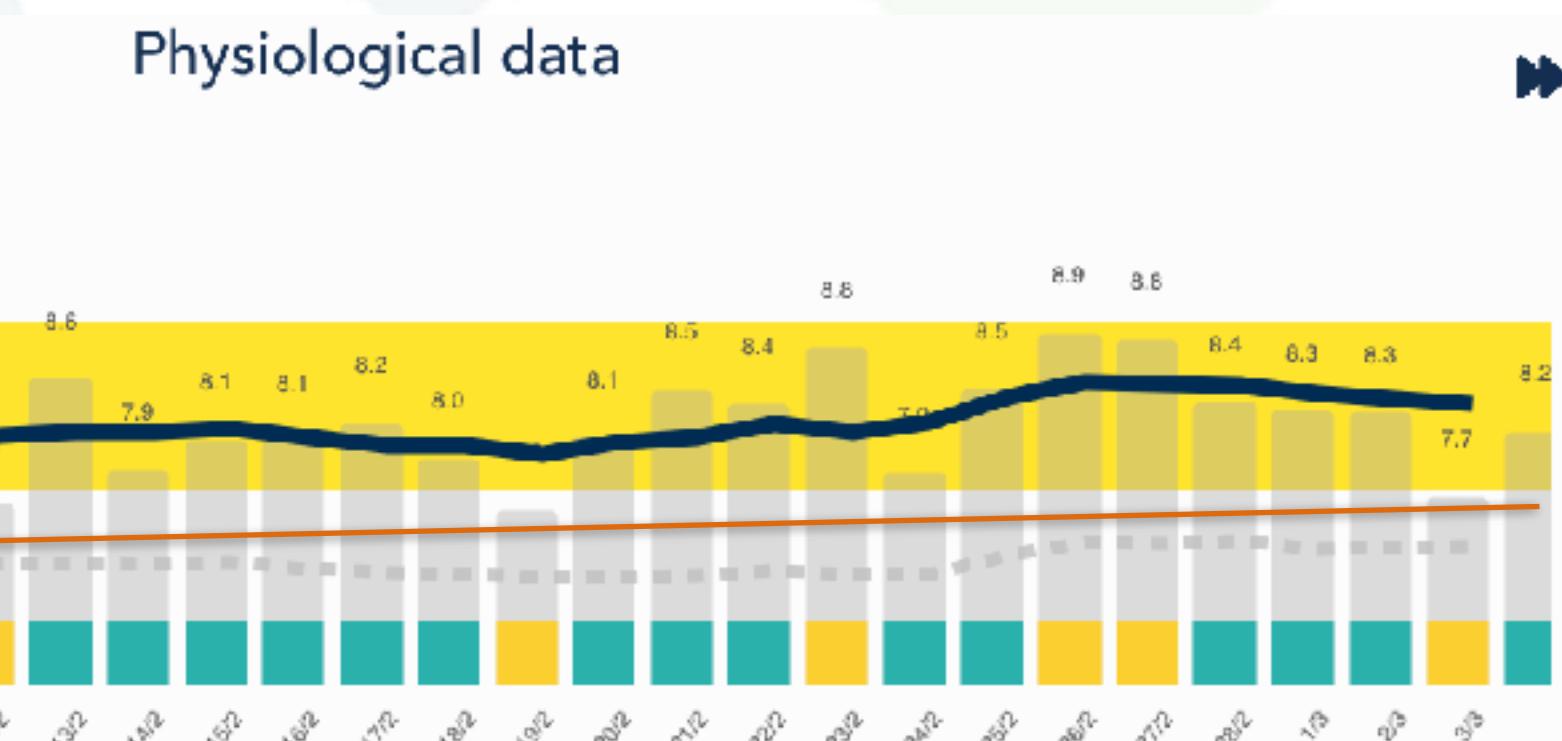
Before



Interventio



After



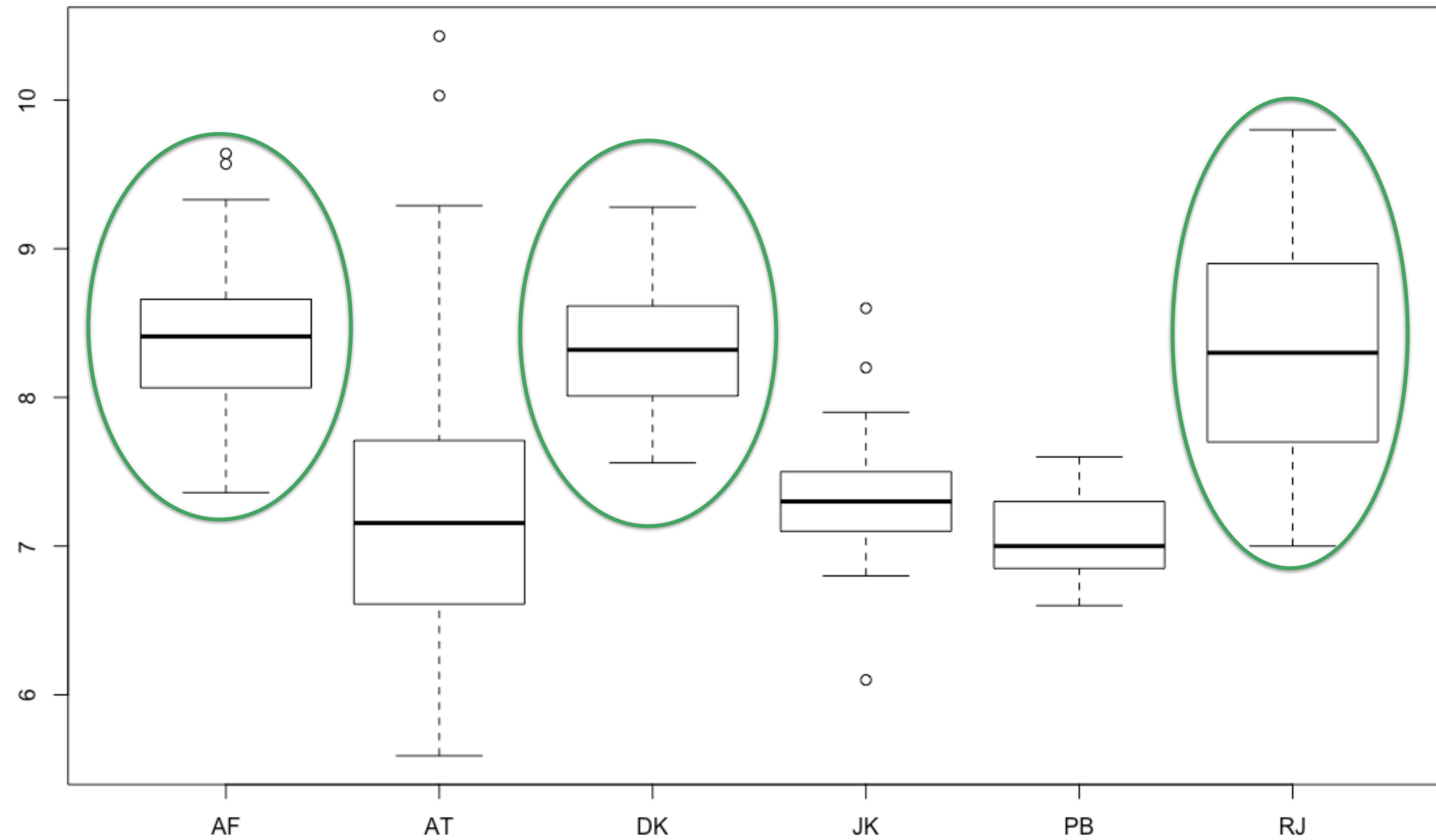
Metabolic Signature

HRV/BG Index

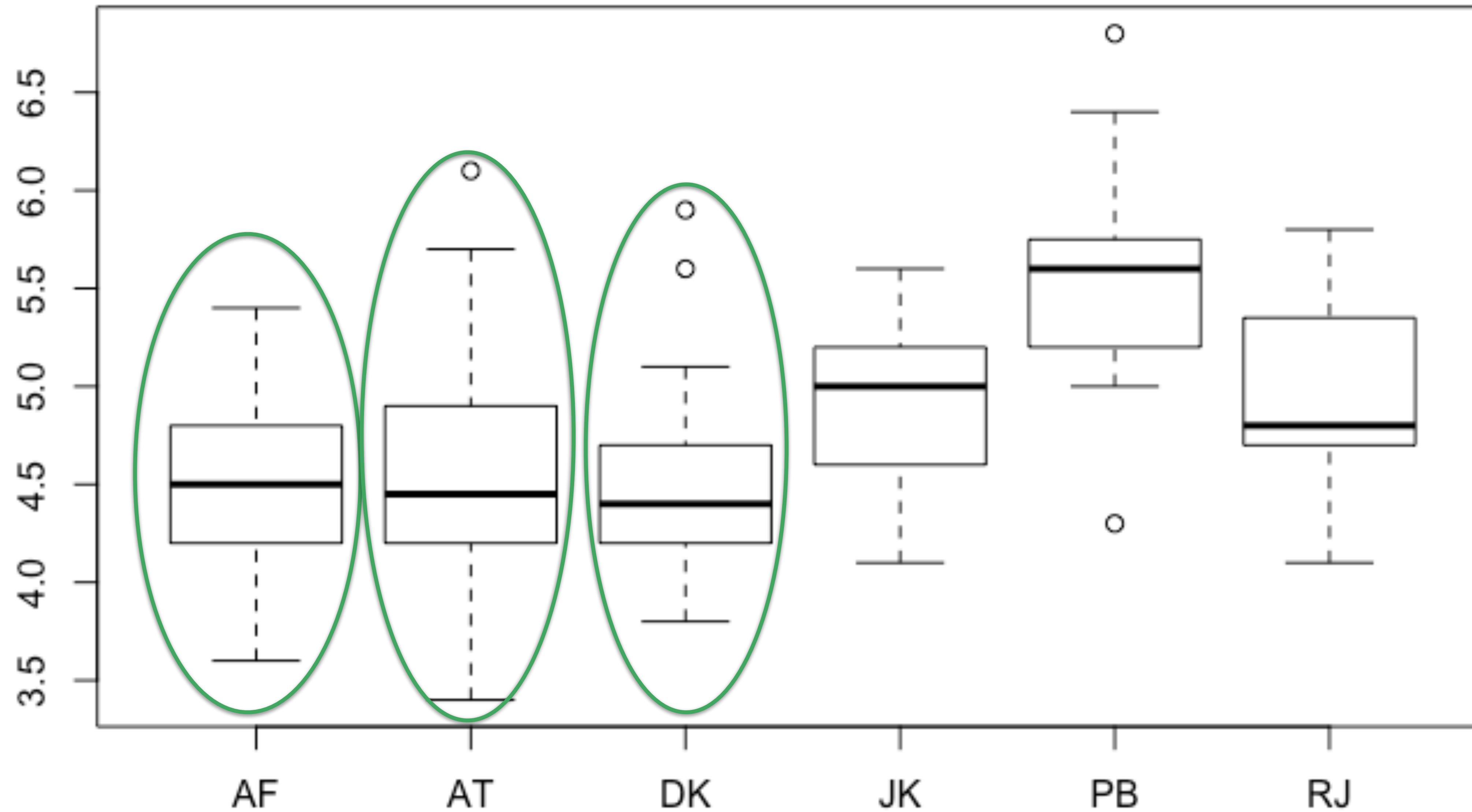
- Two most common and easily tracked variables
- Considers variations in both HRV and BG
- Insight into many aspects of lifestyle/health
- Can spot trends - e.g when one is out of range and the other one is within normal ranges.
- A single result which gives an insight into '**metabolic flexibility**'



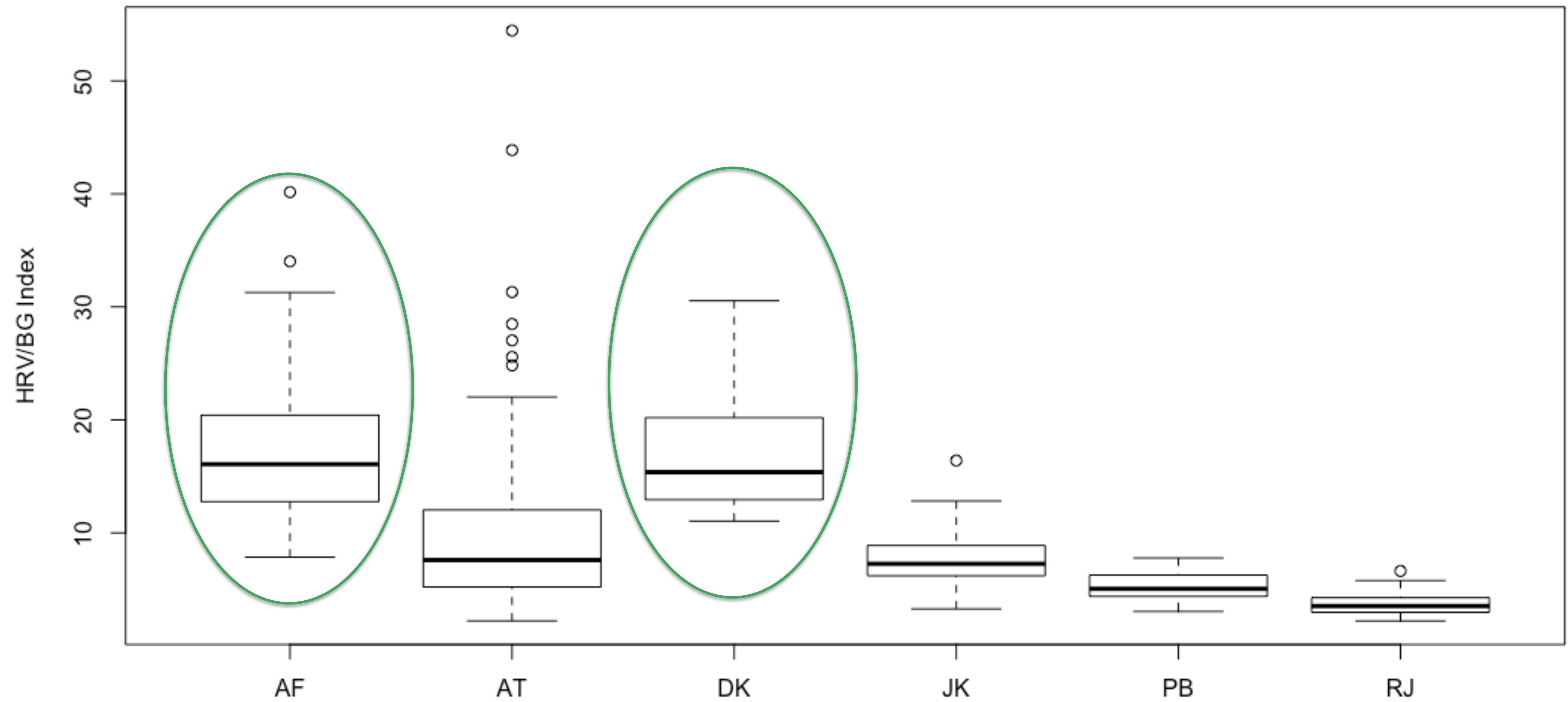
HRV Plot Variation



BG Plot Variation

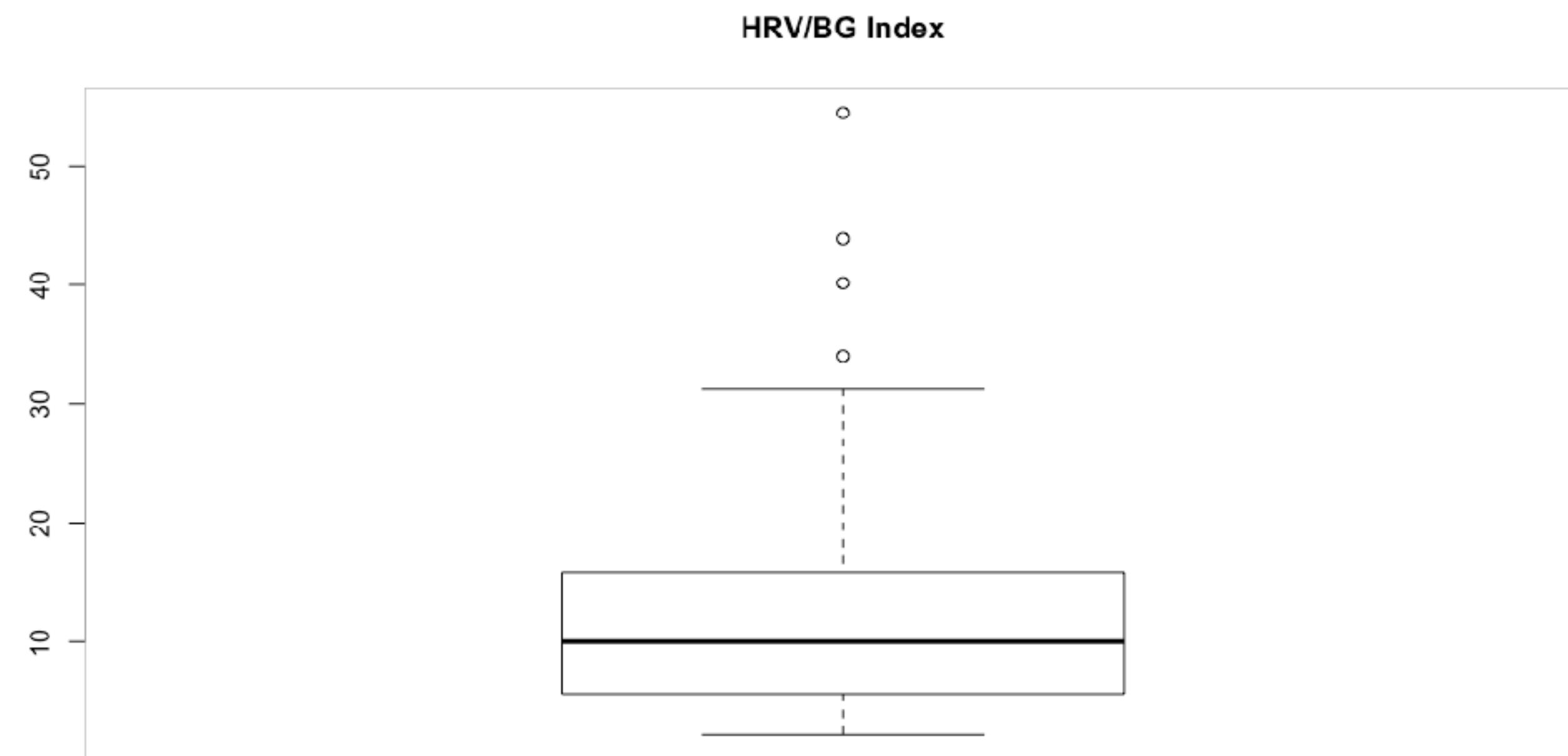


HRV/BG Index

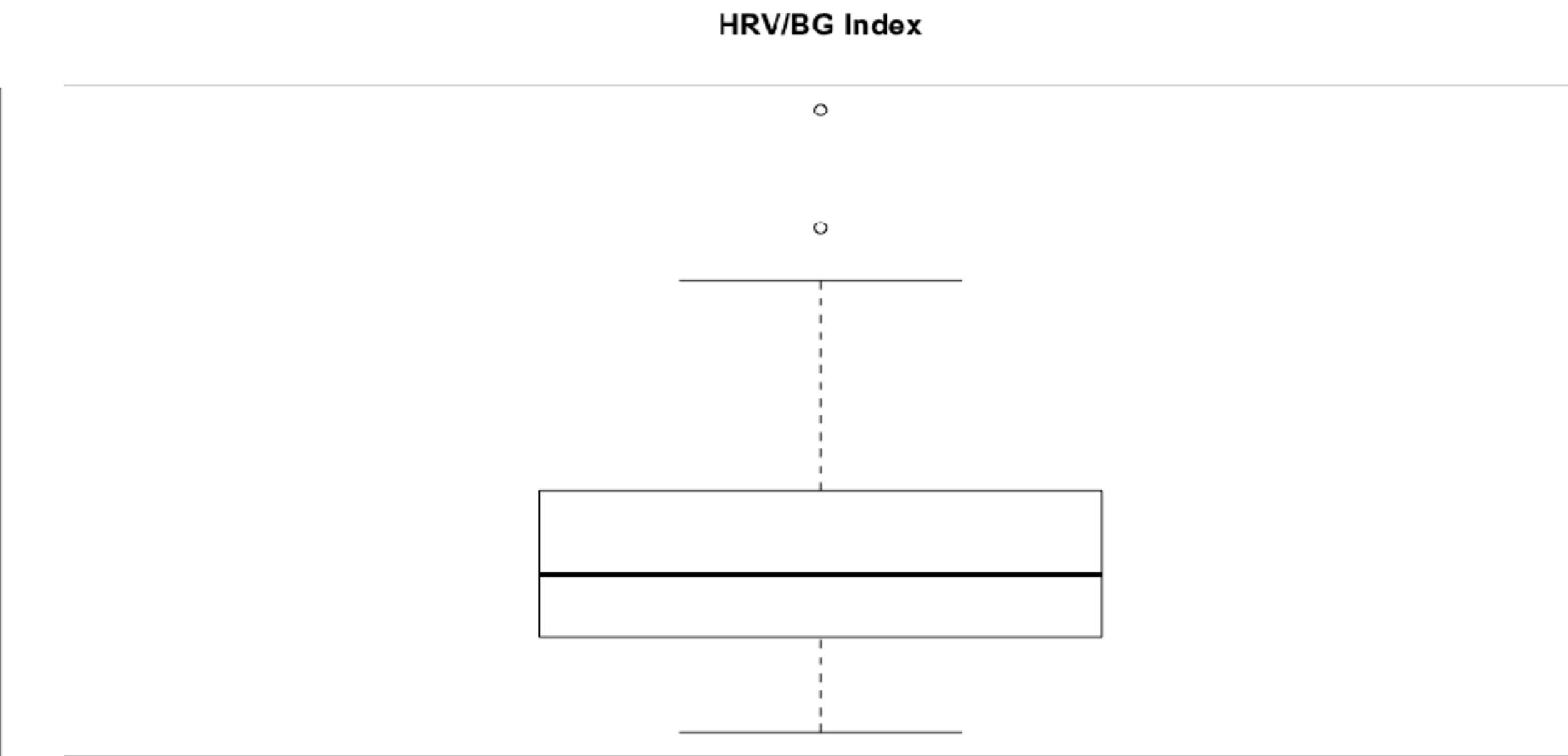


KT HRV/BG Index

Before



After



Conclusions

- Back to the basics - The Big Five!
- Each of us is different
- Tracking:
 - Helps to guide your protocol.
 - Choice of markers is essential.
 - Client awareness, motivation & compliance
 - Remote monitoring of clients.



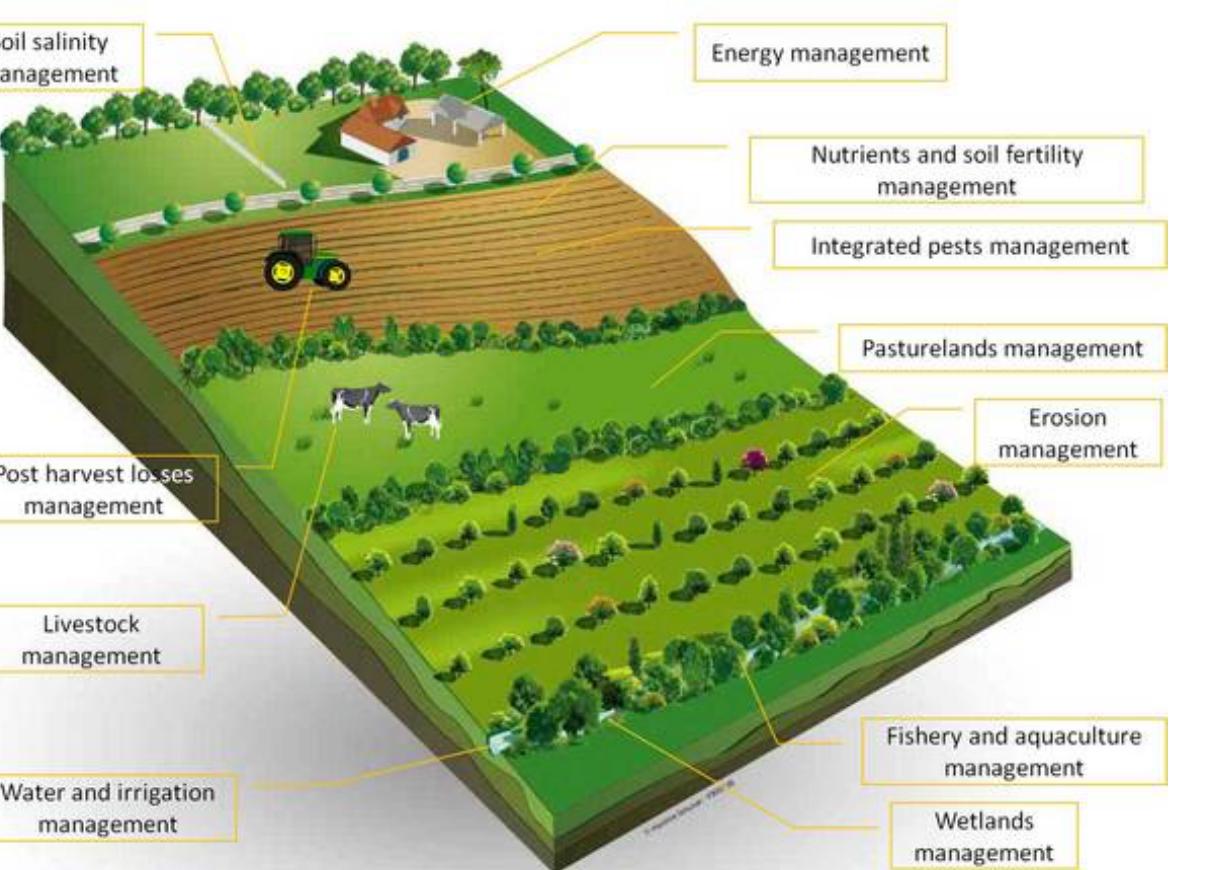
The Big Five



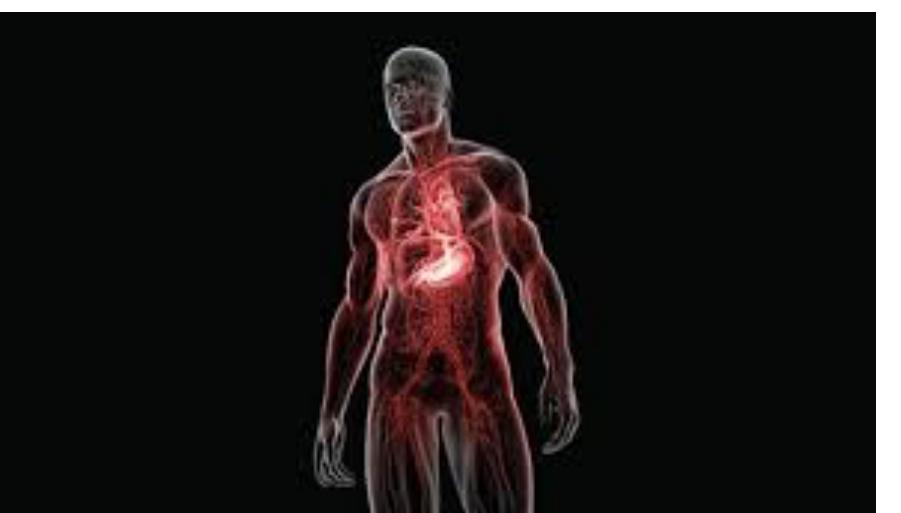
Life-Load



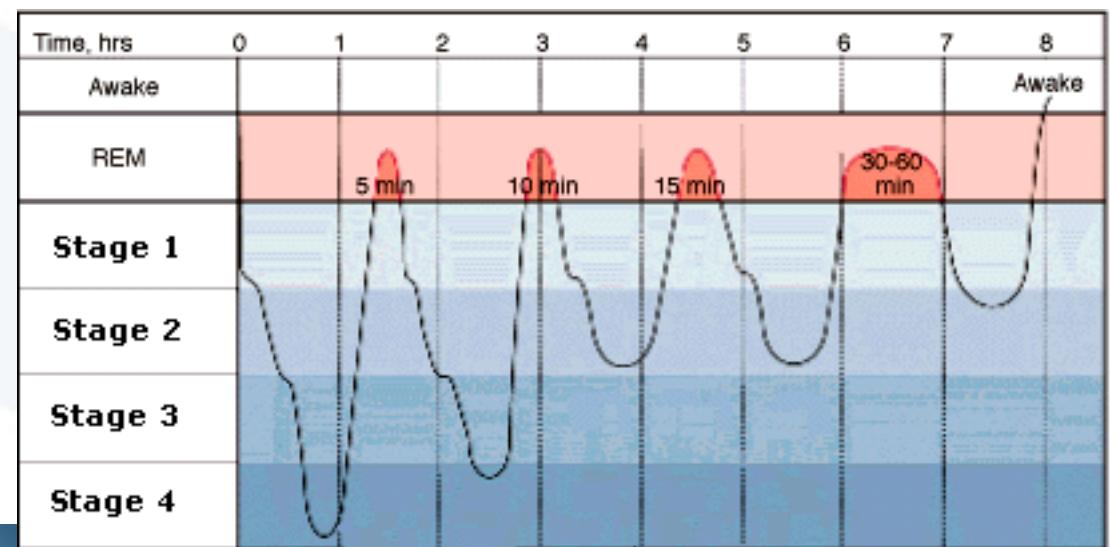
Diet



Inflammation



Physical Activity



Sleep

Appendix

Things to Watch for



Diet

Type

- CHO: Removal of refined CHO? Lower the total amounts?
- Protein: Are protein levels sufficient or too high for the person's requirements?
- Fats: Are there refined/altered fats in the diet? In good proportions and quantity?

Quality

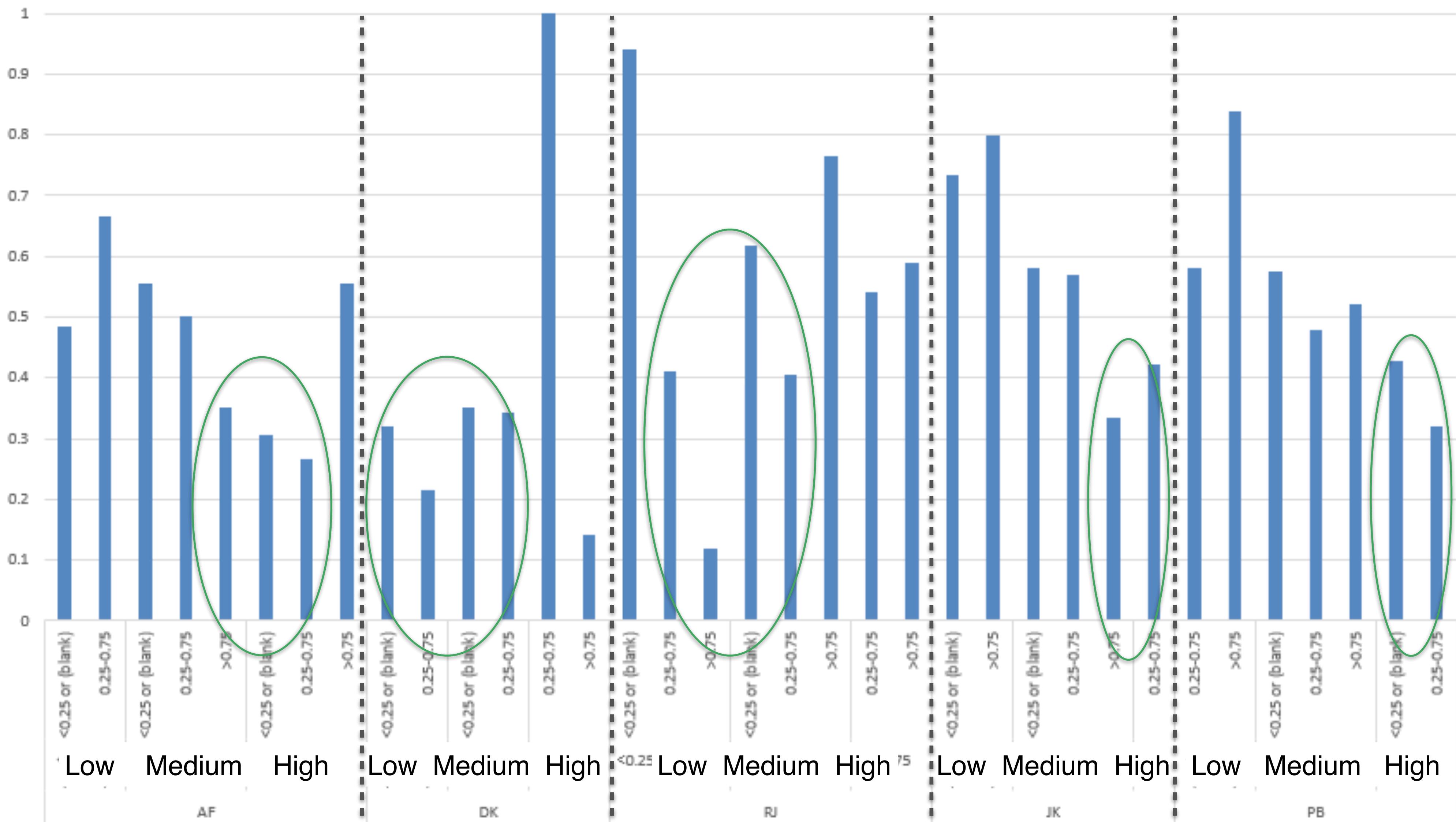
- How close to nature the food is? Frankenstein food?
- Does your Grandma know and can she pronounce the ingredients? Is it really fresh?

Timing

- Are they eating all the time? Are they TRF? Are they eating too late? Are they skipping breakfast and having to revert to stress hormones to sustain energy demands?



Carbs+Fats and BG Fasting (following day)



Sleep

Length

- Are they sleeping enough? Is sleep disturbed?

Phases

- Are they having enough of each sleep phase?

Type and timing

- Is it restorative? How do they wake up?
- What time do they retire?



LifeLoad

Length

- Are they always on the go?

Intensity

- How intense is their life-load? Is it sustainable? acute or chronic?
- What is their perception of their life-load?

Recovery

- Do they allow time to recover?
- What time do they retire?



Physical Activity

Length

- Are they moving enough? at all? Are they over exerting?

Intensity

- Are they exercising at too low or too high intensity?

Type and timing

- When do they exercise? How often?



Inflammation

Length

- Do they have any inflammatory condition?

Intensity and Length

- Is the inflammation acute? Chronic?

Recovery

- Is there any time for the immune response to perform it's action and come to a resolution?



Tool-Kit

- **Glucose measurements:**
 - FreeStyle Optium (Precision Xtra US), Accu-chek (blood)
- **Ketone measurements:**
 - FreeStyle Optium (blood),
 - Ketonix (breath)
 - Ketosticks (urine)

Significance of Heart Rate Variability

- HRV is a marker that provides a good indication of **Sympathetic activation** (High Life-load and/or inflammation)
- Regular HRV measurements identify changes between **sympathetic** (fight or flight) and **parasympathetic** (rest and recovery) nervous systems
- Useful means to **identify individual stressors** and recovery

See References

HRV Ref Ranges (General Guidelines)

Age Range	Gender	Mean NN (ms)	rMSSD (ms)	In(rMSSD) (ms)	SDNN (ms)	PNN50 (%)	LF (Hz)	HF (Hz)	LF/HF	SD1/SD2
25 - 34	Male (330)	939 ± 129	39.7 ± 19.9	3.68	50.0 ± 20.9	20 ± 17	242 ± 325	133 ± 174	2.79 ± 3.20	0.44 ± 0.12
	Female (208)	900 ± 116	42.9 ± 22.8	3.76	48.7 ± 19.0	23 ± 20	184 ± 199	161 ± 167	1.75 ± 1.78	0.49 ± 0.16
35 - 44	Male (292)	925 ± 138	32.0 ± 16.5	3.47	44.6 ± 16.8	13 ± 15	191 ± 206	89 ± 118	3.62 ± 3.73	0.39 ± 0.13
	Female (259)	903 ± 122	35.4 ± 18.5	3.57	45.4 ± 20.5	16 ± 17	161 ± 177	121 ± 145	2.21 ± 2.16	0.43 ± 0.15
45 - 54	Male (235)	923 ± 134	23.0 ± 10.9	3.14	36.8 ± 14.6	6 ± 8	113 ± 141	41 ± 49	4.10 ± 3.48	0.34 ± 0.13
	Female (158)	903 ± 109	26.3 ± 13.6	3.27	36.9 ± 13.8	8 ± 12	107 ± 136	62 ± 83	2.43 ± 1.99	0.39 ± 0.13
55 - 64	Male (183)	904 ± 123	19.9 ± 11.1	2.99	32.8 ± 14.7	4 ± 7	80 ± 103	29 ± 38	4.17 ± 3.60	0.32 ± 0.11
	Female (95)	868 ± 118	21.4 ± 11.9	3.06	30.6 ± 12.4	5 ± 8	57 ± 59	35 ± 53	2.87 ± 3.32	0.38 ± 0.16
65 - 74	Male (84)	906 ± 123	19.1 ± 10.7	2.95	29.6 ± 13.2	4 ± 7	70 ± 112	22 ± 29	4.77 ± 5.34	0.36 ± 0.19
	Female (62)	873 ± 110	19.1 ± 11.8	2.95	27.8 ± 11.8	4 ± 6	45 ± 56	29 ± 38	2.97 ± 3.18	0.36 ± 0.15

Source: Voss A et al., 2015

N = 1906 healthy subjects age 25-74 years (excluded 2201 subjects from study due to cardiac arrhythmia, diseases, medication, and pregnancy)

Short term 5 minute duration measurements using ECG

HRV Ref Ranges (Active & Sport)

HRV Metric	Male Athletes	Male Active	Female Athletes	Female Active
In(RMSSD) (ms)	4.34	4.02	4.5	3.93
RMSSD (ms)	76.83 ± 36.53	55.85 ± 31.96	89.6 ± 40.46	50.7 ± 28.67
Mean NN (ms)	993.47 ± 134.01	905.9 ± 117.38	977.3 ± 129.35	874.67 ± 118.49
SDNN (ms)	101.19 ± 37.38	83.07 ± 31.68	106.62 ± 38.15	71.78 ± 24.48
pNN50 (%)	18.80 ± 7.71	12.81 ± 8.29	22.68 ± 6.85	11.55 ± 8.85
HF (ms ²)	2592.32 ± 2392.00	1508.07 ± 1876.68	3269.53 ± 3087.71	1216.55 ± 1504.64
LF (ms ²)	2534.91 ± 2036.84	1728.43 ± 1552.67	2327.63 ± 1678.84	1158.79 ± 780.92
LF/HF Ratio*	0.977853814	1.146120538	0.71191578	0.952521475
SD1 (ms)	57.01 ± 25.32	42.05 ± 21.97	65.39 ± 28.15	38.79 ± 19.51
SD2 (ms)	134.13 ± 46.82	111.07 ± 39.62	140.6 ± 51.34	95.39 ± 29.82
SD2/SD1 Ratio	2.49 ± 0.56	2.84 ± 0.71	2.30 ± 0.92	2.70 ± 0.78

Source: Corrales M et al., 2012.

N = 200: Male Athletes = 50, Male Active = 50, Female Athletes = 50, Female Active = 50

30 minute duration measurements at rest; *calculated LF/HF different from study

HRV apps and devices

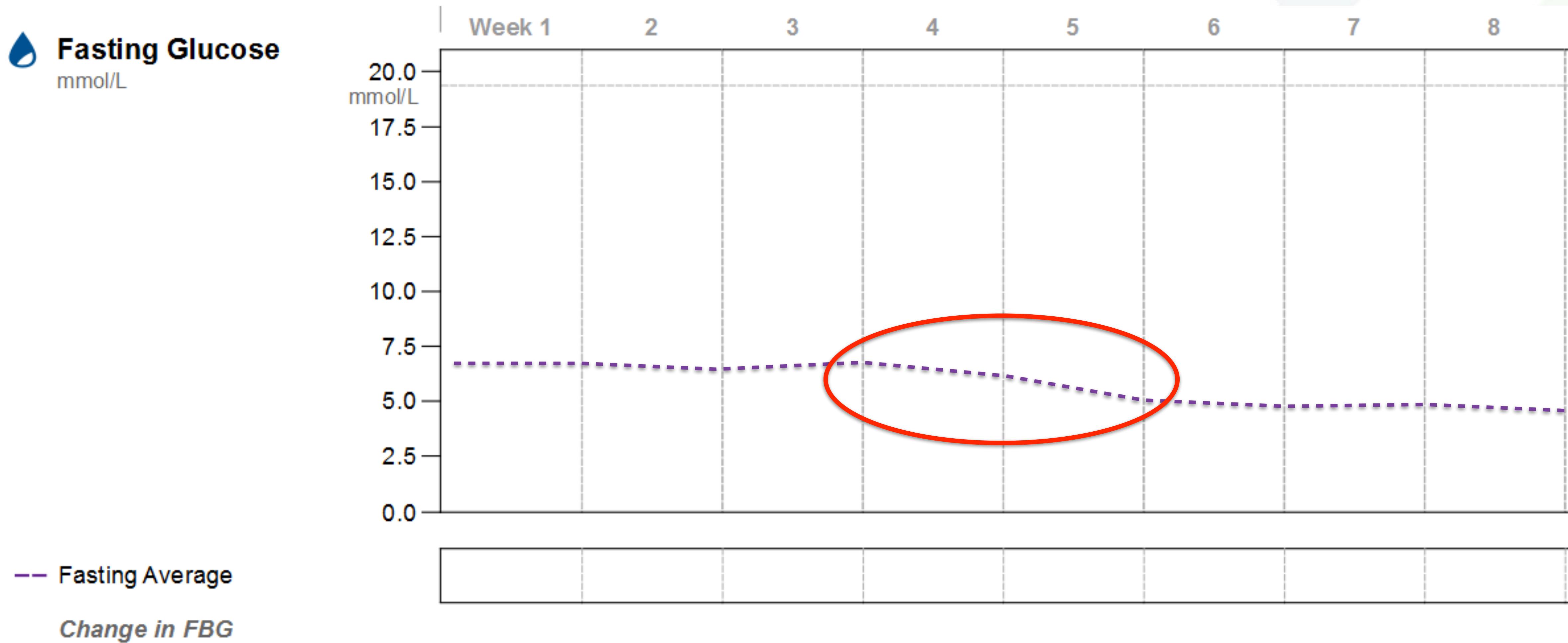
- HR, HRV Monitor (Polar H7 or H10, Armour, FirstBeat).
- Camera Optical Lens (PPG) on fingertips (phones) or finger (OURA)-
 - Caution: Optical **wrist** monitors PPG due to the motion of site of measuring seem not to be as reliable but still able to provide some estimate
- HRV app (HRV4Training -sport, iThlete, EliteHRV -general, HeartMath System with Monitor).
- Sleep monitor app (Oura Ring (with Ring), 'Sleep Cycle', 'Sleep Time', Beddit)

HRV Apps

- Biocom Technologies
- Biofeedback Stone
- Bioforce HRV
- BLE Heart Rate & HRV Recorder
- Breathe Sync™
- CardioMood HRV Expert
- **Elite HRV**
- emWave2 and emWave PRO
- **Firstbeat Technologies**
- FitPal
- Health Reviser
- **HRV4Training**
- Inner Balance
- iRelief
- iThlete
- MyCalmBeat
- OPzone Connect
- Somatic Vision Alive
- SweetBeat
- Vitness Rx

Examples of tool kit in a patient (Ongoing measurements of HRV, Blood Glucose)

Blood Glucose - Abbott FreeStyle NEO



HRV - FirstBeat BodyGuard 2

PHYSICAL WORKLOAD REPORT

Measurement date
28.10.2015

PHYSICAL WORKLOAD INDEXES

Heart rate parameters

	Average	Range
Heart rate (bpm)	87	63 - 76
Heart rate (%HRmax)	46 %	33 % - 40 %
%HRR	26 %	9 % - 19 %

Other

	Average	Range
Energy expenditure (kcal/min)	3	1 - 4
Ventilation (l/min)	14	4 - 20
Respiration rate (breaths/min)	18	9 - 24

Oxygen consumption

	Average	Range
VO2 (ml/kg/min)	8.8	3.3 - 11
%VO2max	19 %	7 % - 24 %

MET

HEART RATE VARIABILITY INDEX

RMSD (RootMean Square of Successive Differences in R-R Intervals) reflects the function of the parasympathetic nervous system. The index can be used to determine recovery from physical workload. High index values are related to increased activity of the parasympathetic system, and low values indicate poor recovery from physical work.

LIFESTYLE ASSESSMENT SUMMARY

Person: alessandro ferretti	Age: 45	Activity Class: 7.0 (Good)
Height (cm)	175	Resting heart rate: 50
Weight (kg)	75	Max. heart rate: 190
Body Mass Index	24.5	

Assessment: 21.10.2015 - 28.10.2015
Additional information:
Missing heart rate: Wed 28th (88%)

BODY RESOURCES

STRESS AND RECOVERY

STRESS AND RECOVERY BALANCE:

... Your average:
Good (8h 30min)

In your age group
average is 7h 32min.

SLEEP

LENGTH OF SLEEP:

... Your average:
Good (8h 30min)

In your age group
average is 7h 32min.

% OF RECOVERY:

... Your average:
Moderate (20%)

In your age group
average is 25%.

PHYSICAL ACTIVITY

PHYSICAL ACTIVITY INDEX:

... Your average:
Good (100)

You did not reach the
recommended level of
health-promoting
physical activity.

The measurement included one workout with a fitness-improving
Training Effect.

ENERGY EXPENDITURE

ENERGY EXPENDITURE (kcal):

... Other expenditure

Daily physical activity

Physical activity

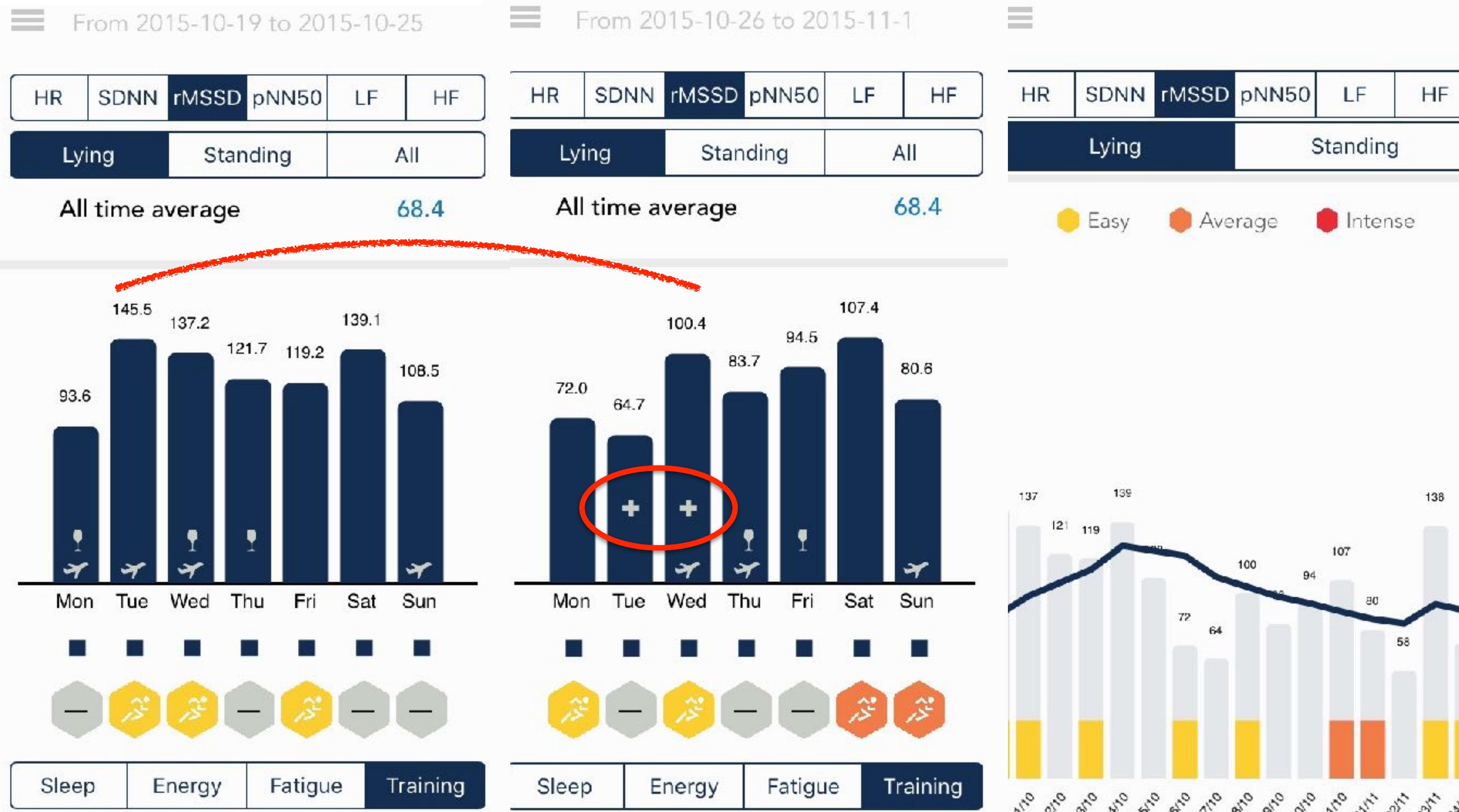
equilibria
harmonizing health

28.10.2015 13:39
www.firstbeat.com/work-well-being

equilibria
harmonizing health

28.10.2015 13:39
www.firstbeat.com/work-well-being

HRV - HRV4Training



Common Markers for Tracking

- Food
 - Specific data from apps myfitnesspal, Senza, Chronometer
 - Photos
- Glucose/Ketones
 - Glucose monitors like Freestyle Precision (or others)
- Sleep
 - Apps, Oura Ring, BeddIt, FitBit,
- Life-Load
 - Self reported data via apps, HRV ongoing monitoring devices like FirstBeat BodyGuard 2, HeartMath system (HRV), Meditation devices like Muse
- Activity
 - steps, exercise
 - pain
- Morphometrics
- HRV/HR
- Temperature

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