Corroboration of Autonomic Dysfunction Assessments

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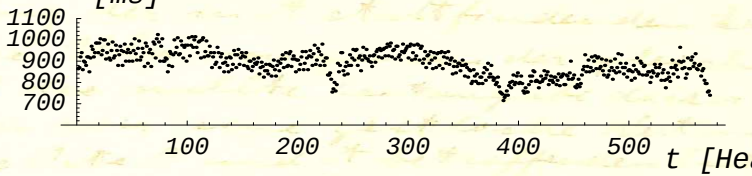
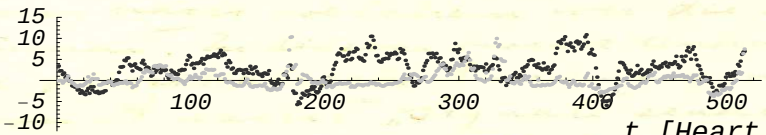
From the time intervals between heart beats to the measure of autonomic dysfunction, via synchronization of indices. Particular diabetic case with no autonomic neuropathy.

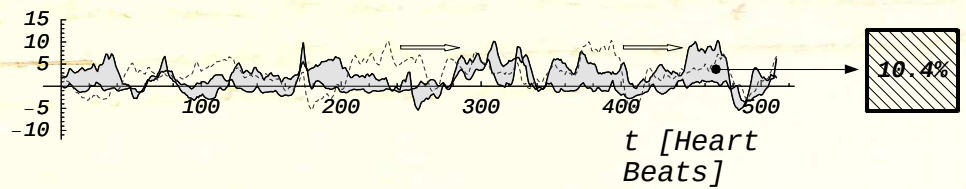
572 RR-intervals
[ms]



512 ANSindices™ (SP/PSP resp. Dark/Light Gray)
[n.u., closed scale -50 to 50]

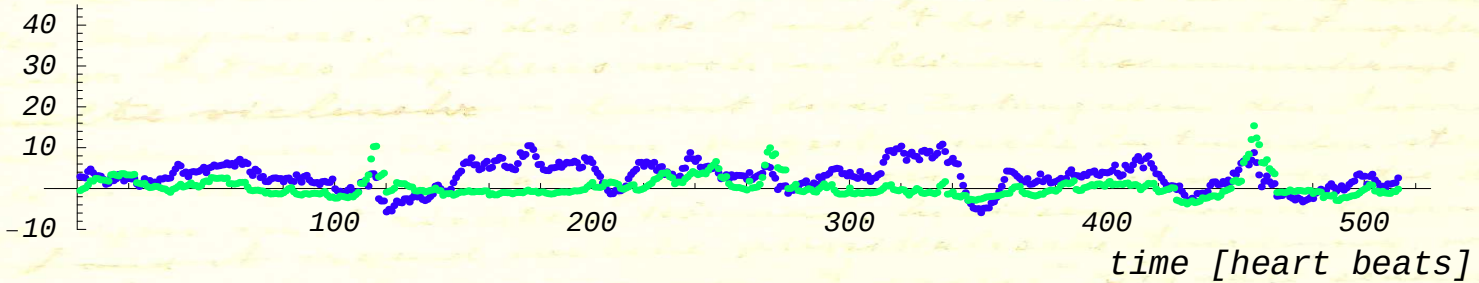


Rephased ANSindices™ with measurement of coupling

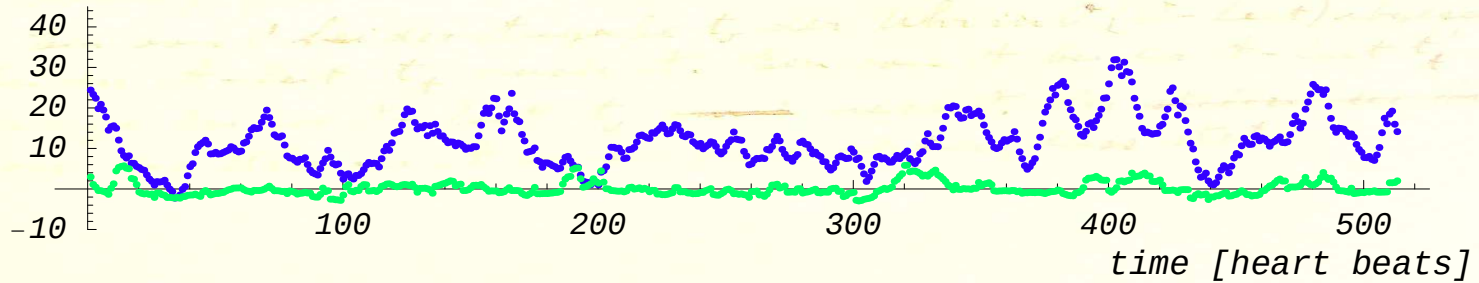


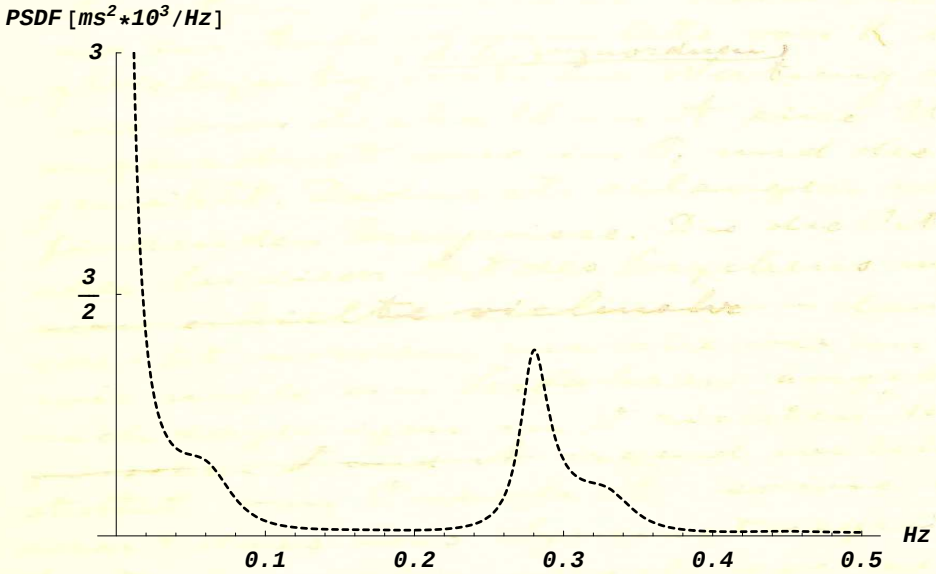
Autonomic dysfunction as % of time with lack of interaction between sympathetic and parasympathetic beat-per-beat "activities".

10%



30%

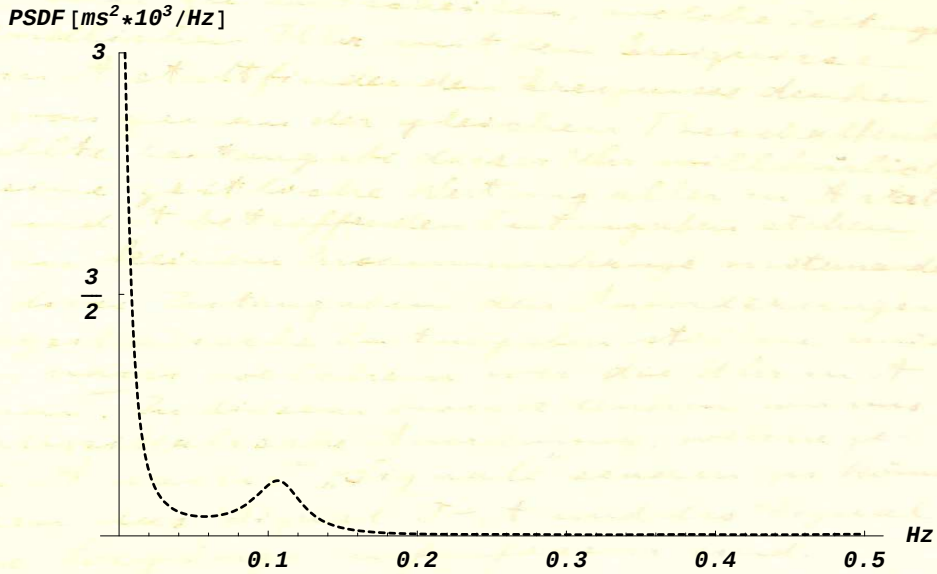




LF: 111 ms²

HF: 340 ms²

Autonomic Dysfunction: 10%



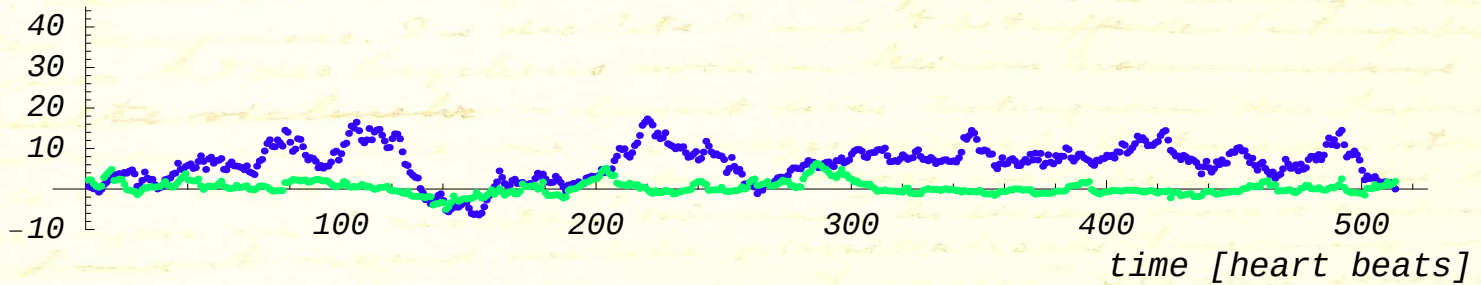
LF: 110 ms²

HF: 16 ms²

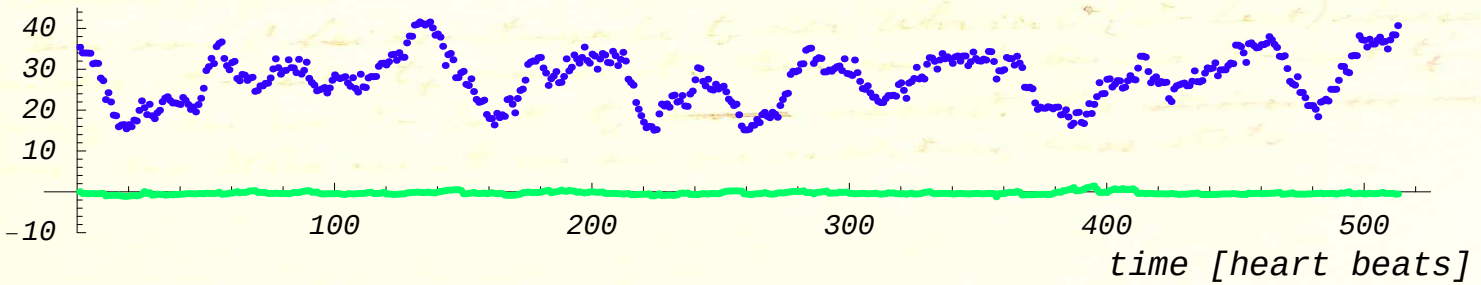
Autonomic Dysfunction: 30%

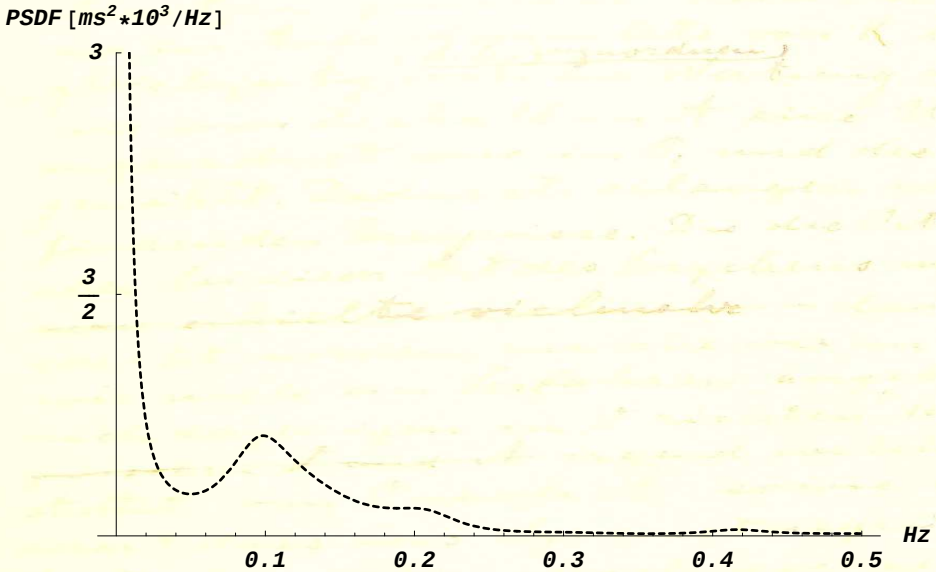
Autonomic dysfunction as % of time with lack of interaction between sympathetic and parasympathetic beat-per-beat "activities".

16%



58%

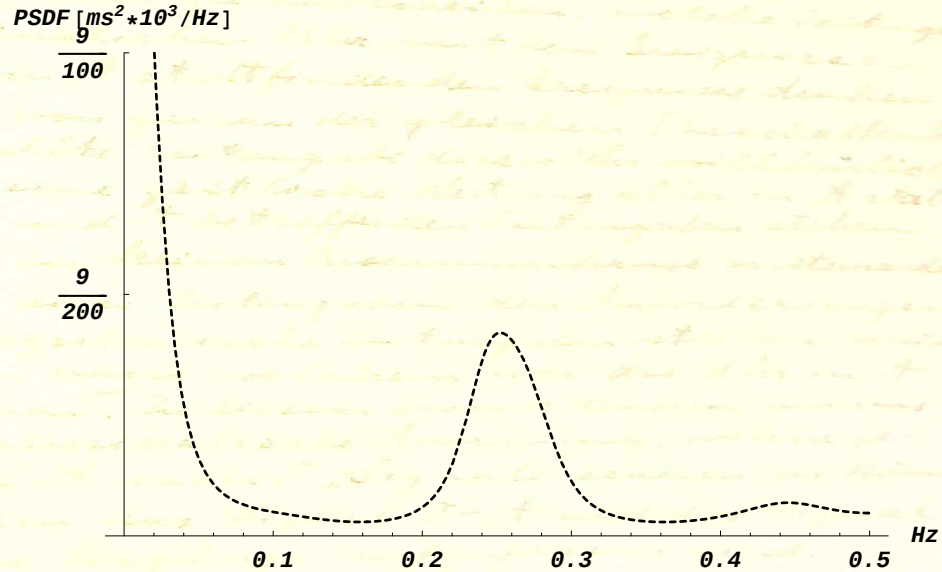




LF: 246 ms²

HF: 69 ms²

Autonomic Dysfunction: 16%



LF: 3 ms²

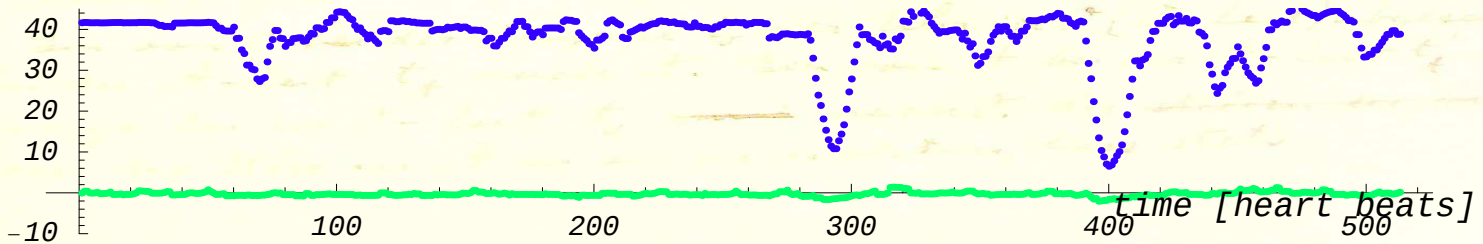
HF: 20 ms²

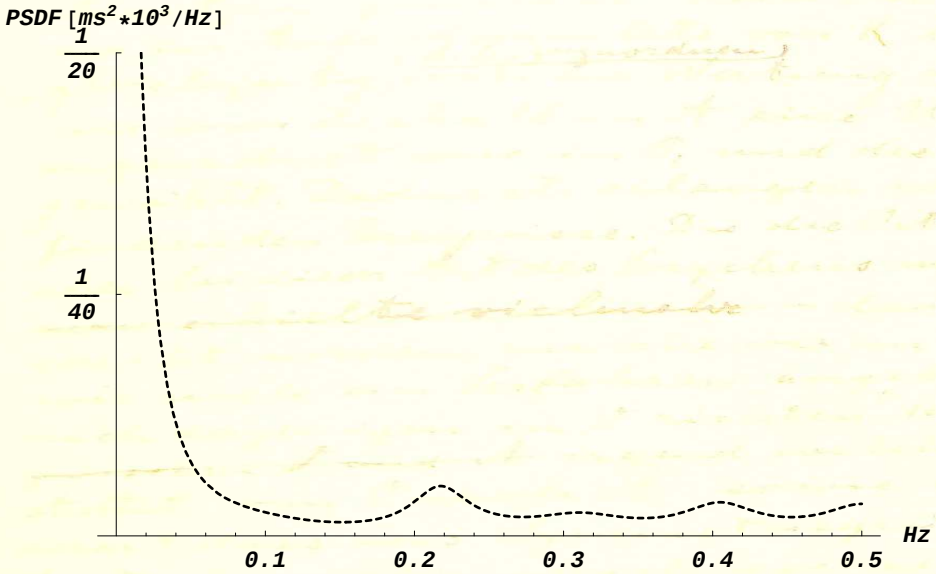
Autonomic Dysfunction: 58%

Autonomic dysfunction as % of time with lack of interaction between sympathetic and parasympathetic beat-per-beat "activities".

77%

76%

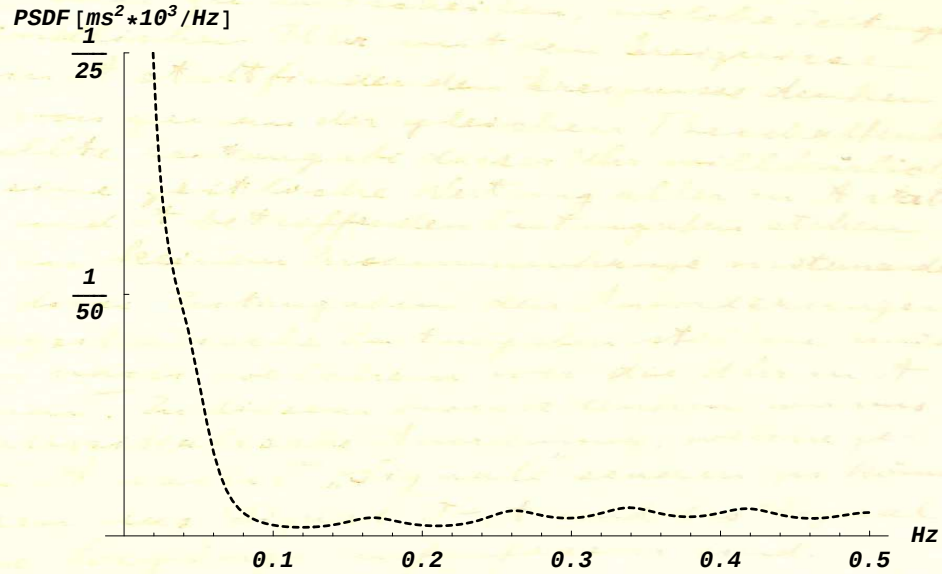




LF: 2 ms²

HF: 5 ms²

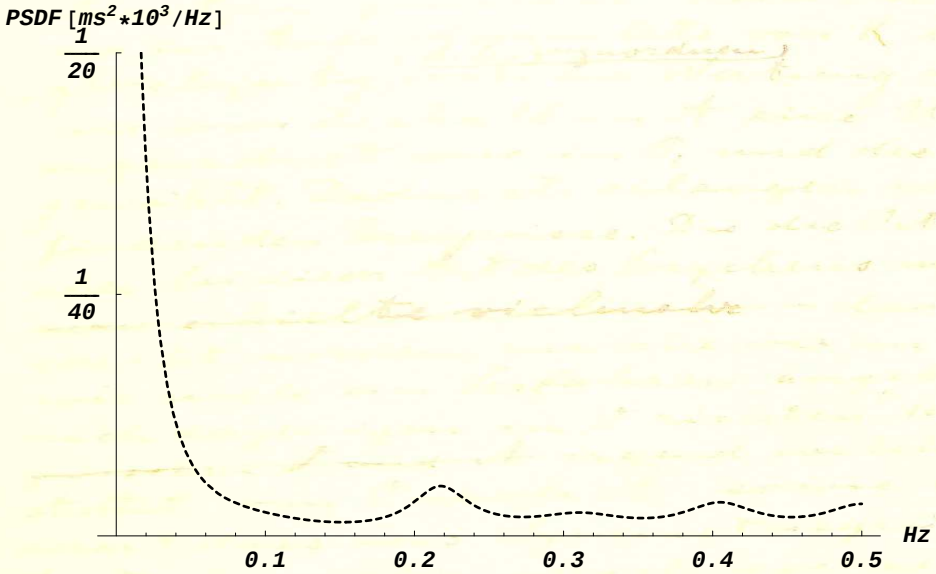
Autonomic Dysfunction: 77%



LF: 2 ms²

HF: 3 ms²

Autonomic Dysfunction: 76%



LF: 2 ms²

HF: 5 ms²

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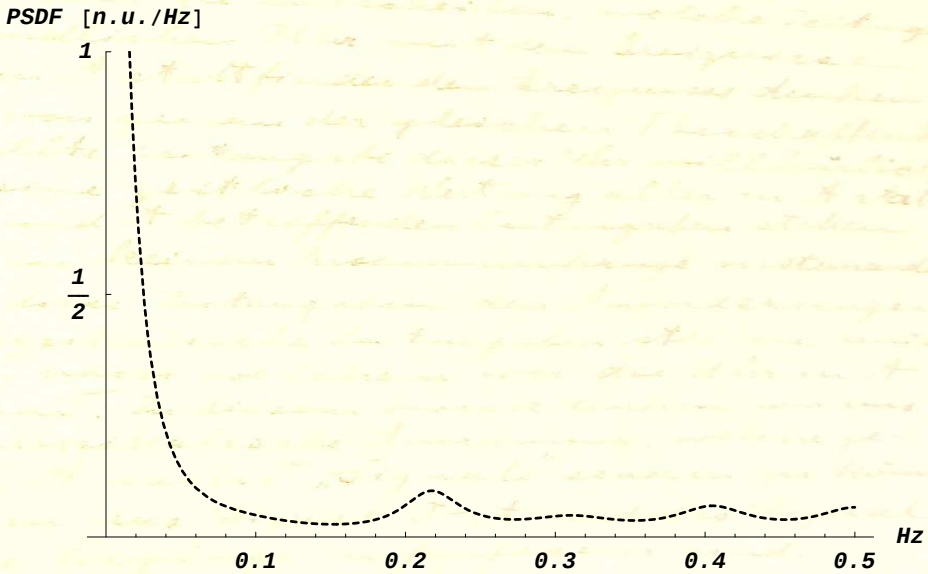
from non-standardized RRs



LF: 0.033 n.u.

HF: 0.093 n.u.

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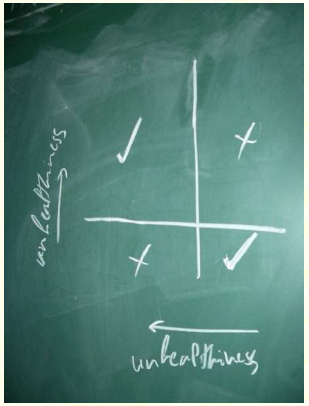
from standardized RRs

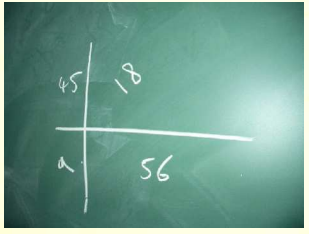
- Corroboration of assessments by correlation of rankings
  - Ranking subjects according to reduction of spectral powers
  - Ranking subjects according to percentage of autonomic dysf.

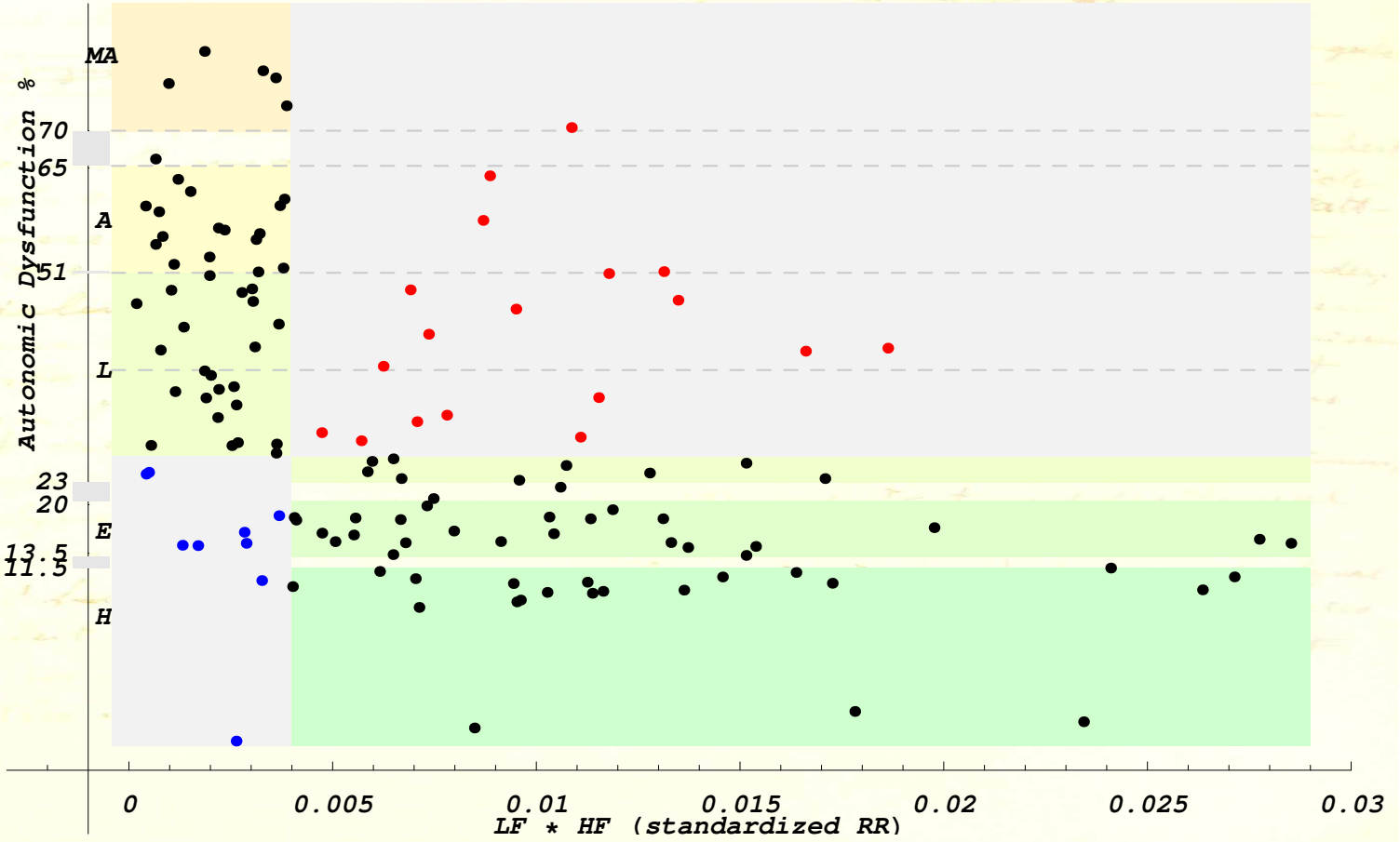
- RR intervals were <u>standardized</u>

Rank Correlation Spearman's coefficient	*LF inversed rank*	*HF inversed rank*	*LF/HF inversed rank*	*LF*HF inversed rank*
Autonomic dysfunction % rank	0.45	0.29	0.015	0.52
Correlation significance	*p*-value= $1.54\ 10^{-4}$ **~ 10^{-4}**	*p*-value= 0.012 **< 0.05**	*p*-value= 0.44 **> 0.05**	*p*-value= $1.86\ 10^{-5}$ **~ 10^{-5}**
	Autonomic dysfunction percentage & LF reduction give correlated classifications	It is unlikely that autonomic dysfunction percentage &LF reduction would not be correlated	Reduction in LF/HF does not corroborate autonomic dysfunction percentage	**Reduction in LF*HF is correlated with autonomic dysfunction percentage, beyond that of LF**

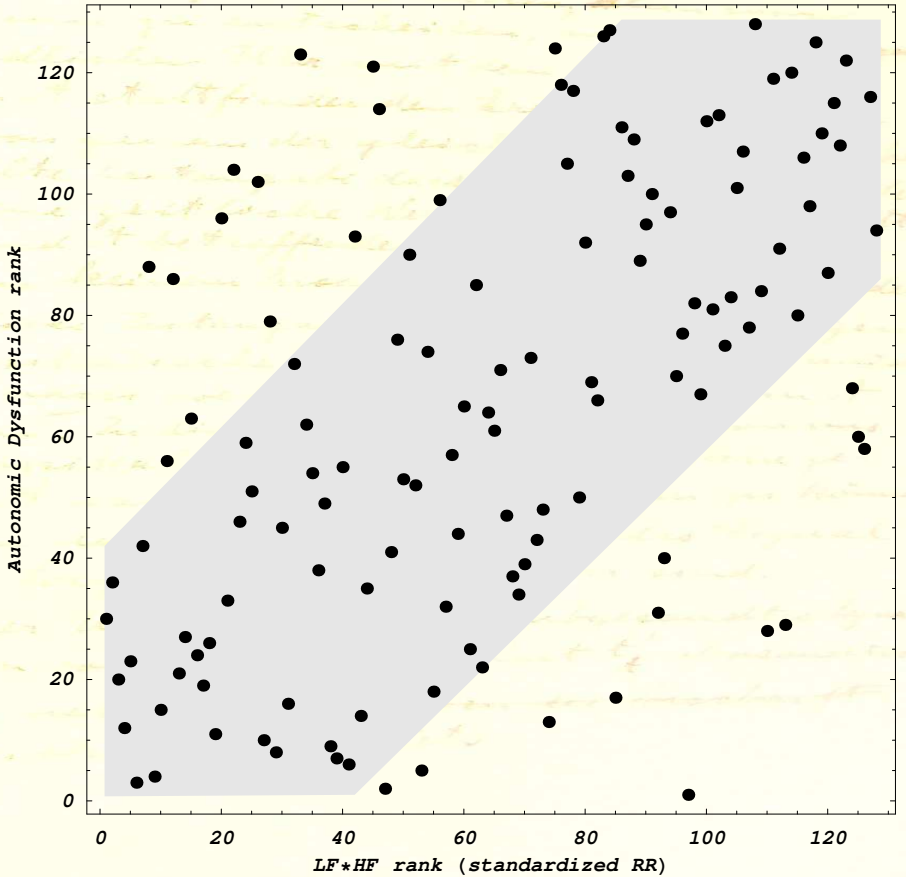


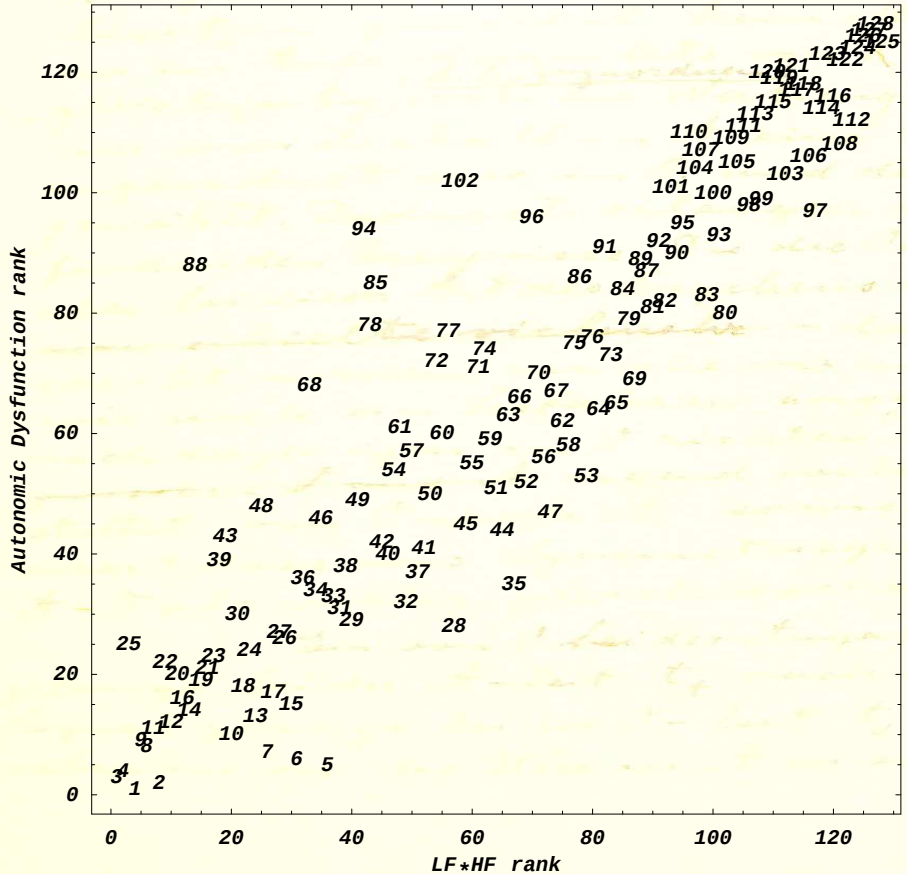
Thresholding



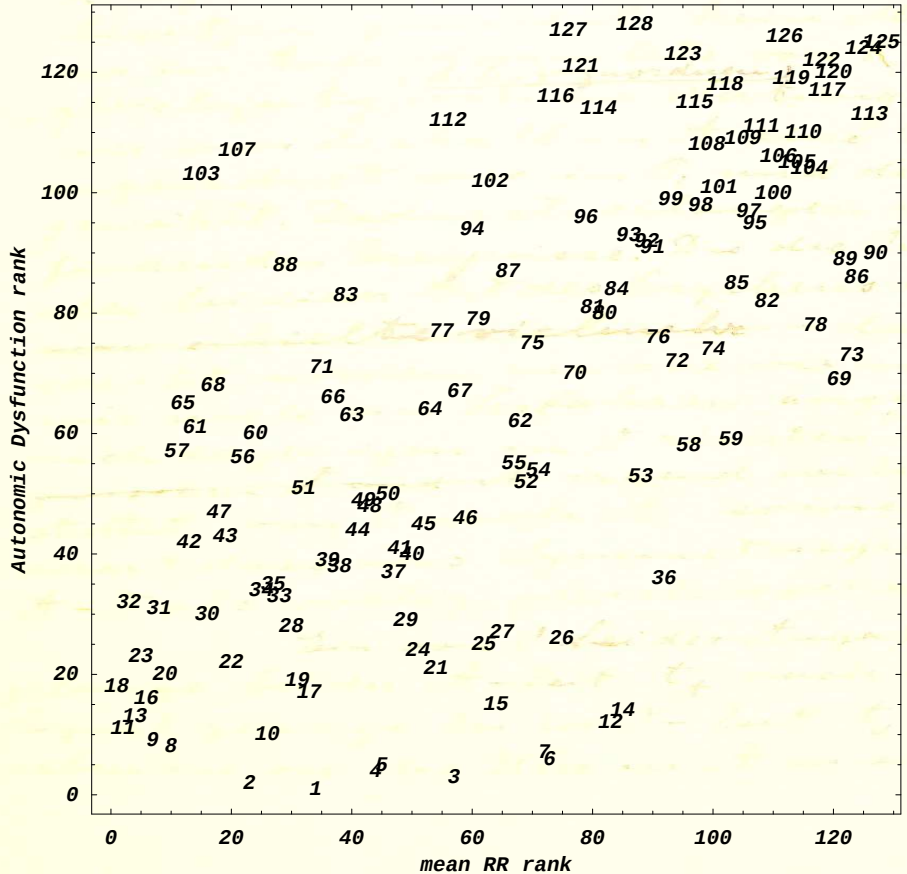


Thresholds of agreement
but without a strong correlation





Strong correlation between subjects as ordered by two different assessments of autonomic dysfunction



High HR → Low RRs → autonomic dysfunction may be expected

Low HR → High RRs → autonomic dysfunction is not expected

This, by itself, cannot explain the strong correlation which we obtained previously

Rank Correlation Spearman's coefficient	*mean HR rank*	*LF inversed rank*	*HF inversed rank*	*LF/HF inversed rank*	*LF*HF inversed rank*	*LF+HF inversed rank*
Autonomic dysfunction % rank	0.66	0.85 (p~0)	0.83 (p~0)	0.08 (p=0.3)	**0.91 (p~0)**	0.9 (p~0)
LF/HF inversed rank	• **Autonomic dysfunction percentage & LF reduction (or HF reduction) give strongly correlated classifications** • **Reduction in LF/HF does not corroborate autonomic dysfunction percentage**			1	0.1 (p=0.2)	
*LF*HF inversed rank*					1	0.99

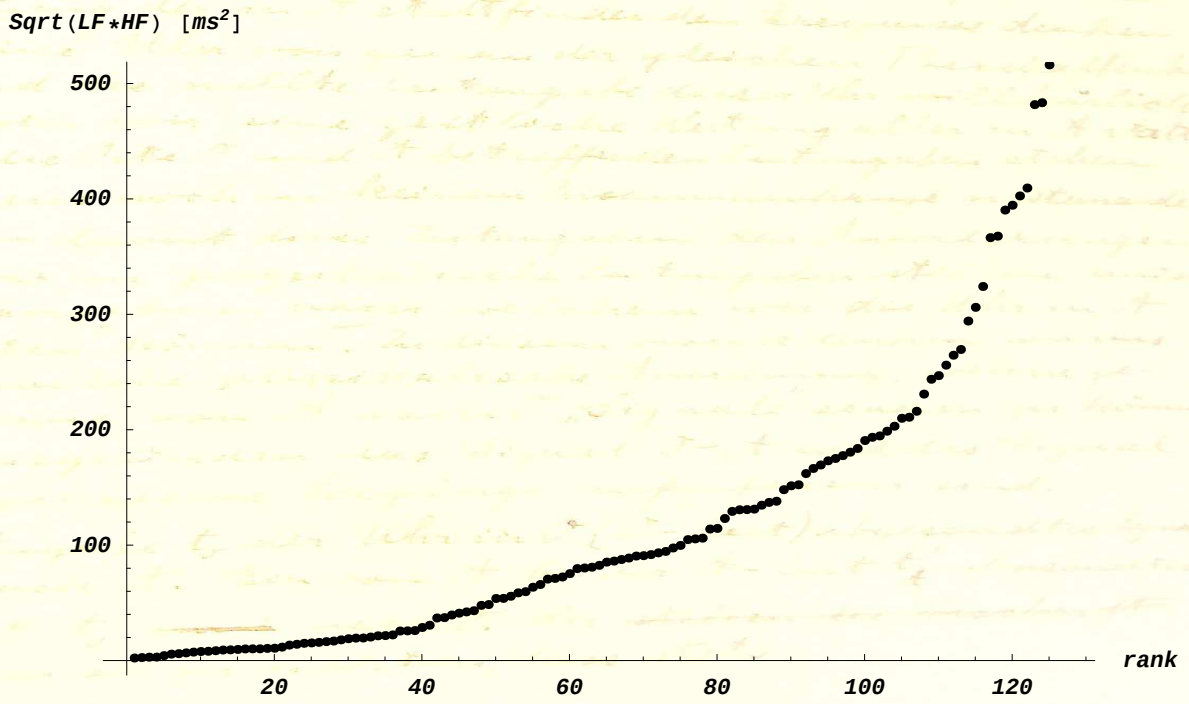
- **Reduction in LF*HF is strongly correlated with autonomic dysfunction percentage, beyond that of LF & HF**
- **What are we talking about? Total spectral power beyond sole involvement of HR level**

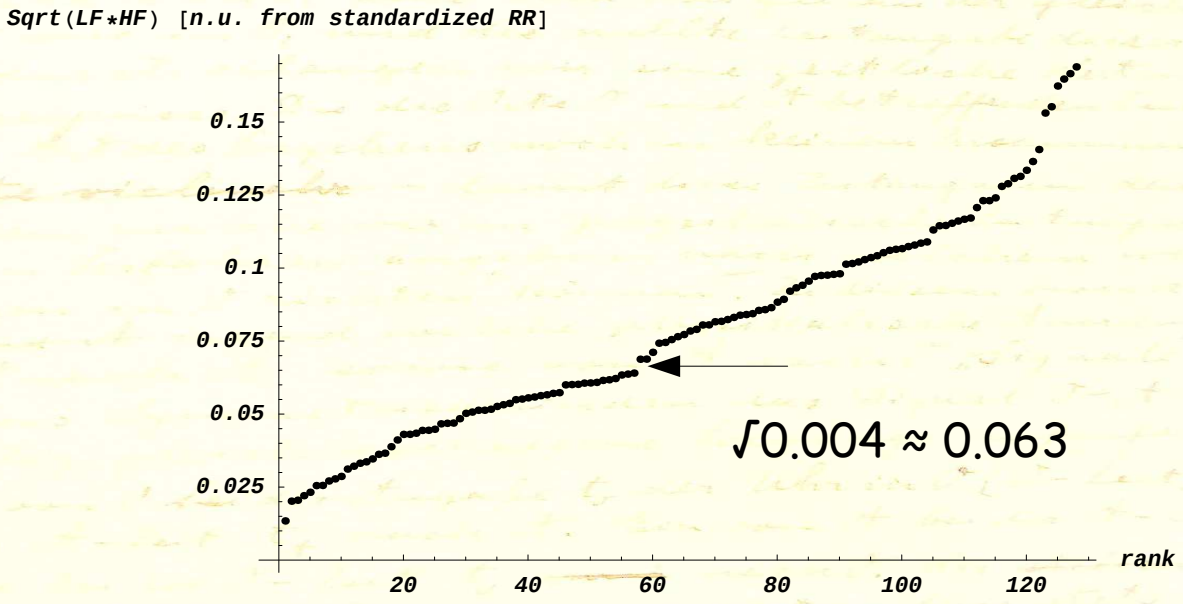
Here, RR intervals were not standardized

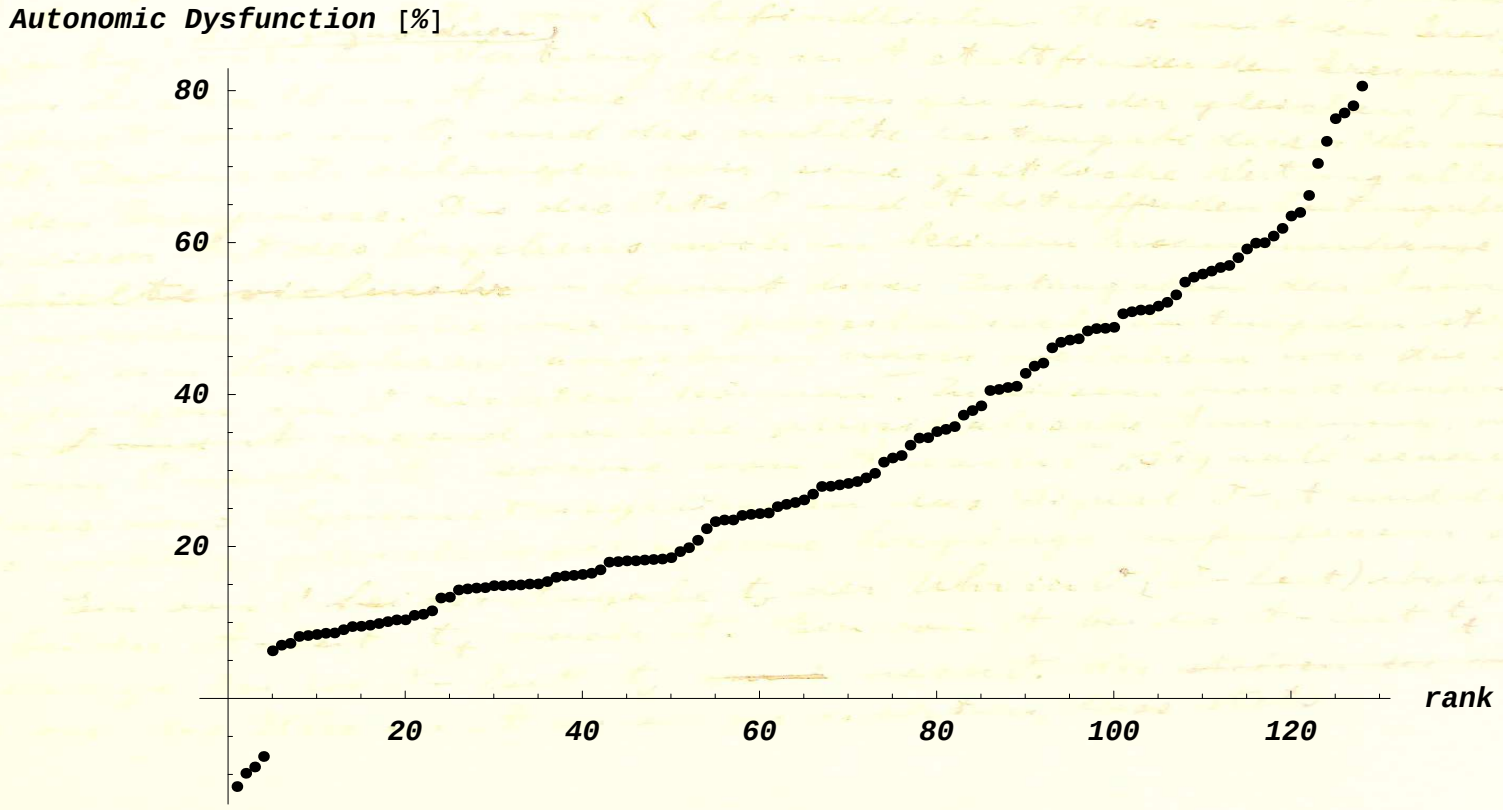
Corroboration of assessments?

- with standardized data, thresholds exist from which healthy/unhealthy agreement is found
- with non-standardized data (conventional case), classifications correlate strongly
- ...

Thank you
for your attention




Sqrt(LF*HF) [n.u. from standardized RR]
0.15
0.125
0.1
0.075
0.05
0.025
20
40
60
80
100
120
rank
√0.004 ≈ 0.063


Autonomic Dysfunction [%]
80
60
40
20
20
40
60
80
100
120
rank