Current Status and Future Prospects of Voice Biomarkers

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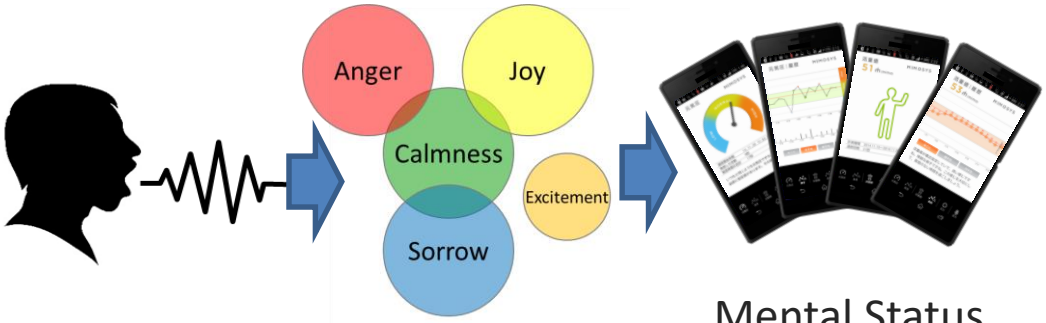
Voice-based Evaluations

The human machine interface has evolved from the keyboard, through the mouse and the touch panel into the voice.



Emotion Recognition

Mental Status Evaluation

Vitality

Mental Status at the time

Mental Activity

Trend of Mental Status during 2 weeks

We have constructed a monitoring system to measure the degree of stress and depression from the voice

Voice-based Evaluations

Non-invasive and Easy

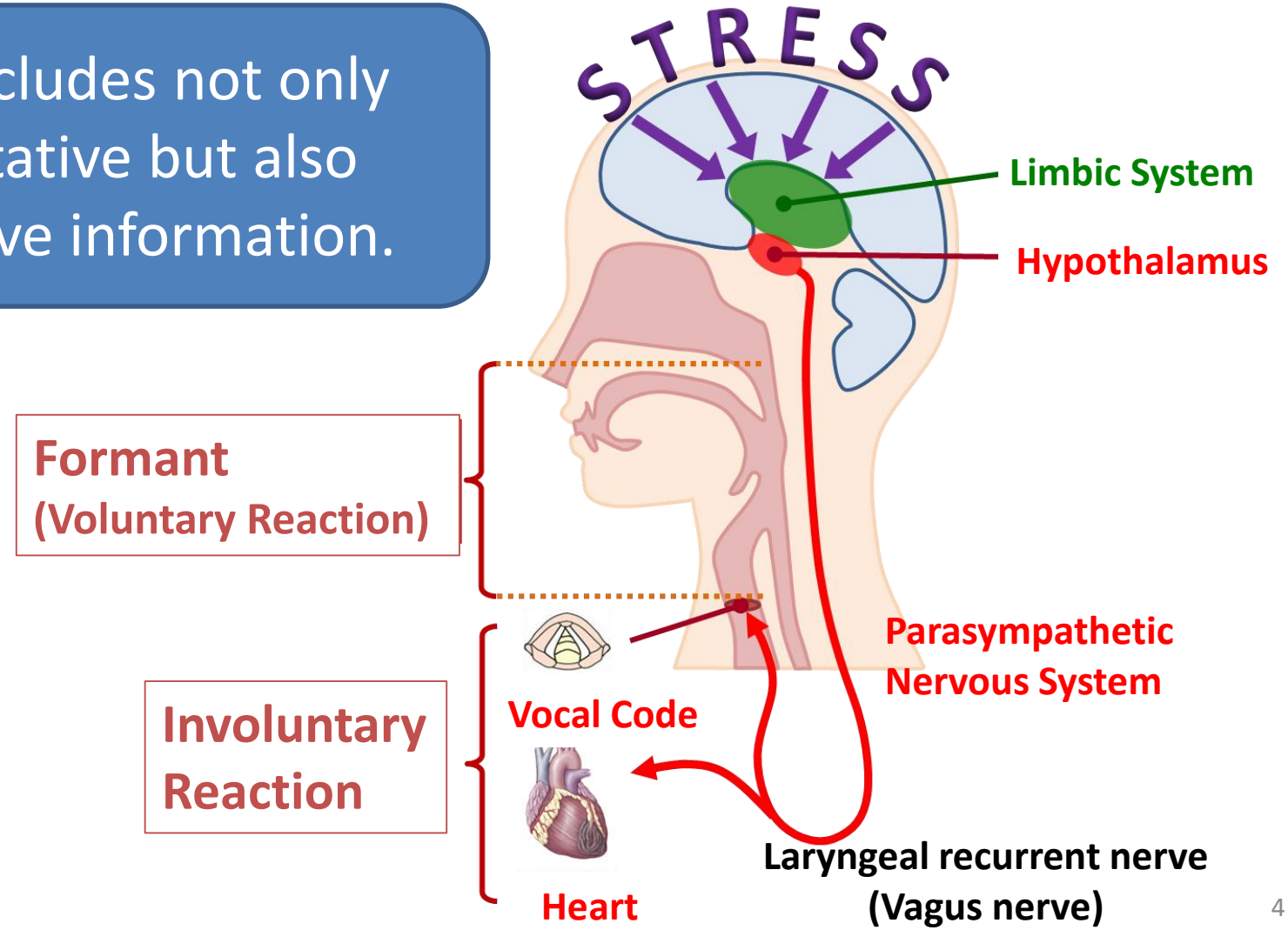
Remote-monitorable

No special devices

Voice Stress Biomarker

Emotion and autonomic nervous

Voice includes not only quantitative but also qualitative information.

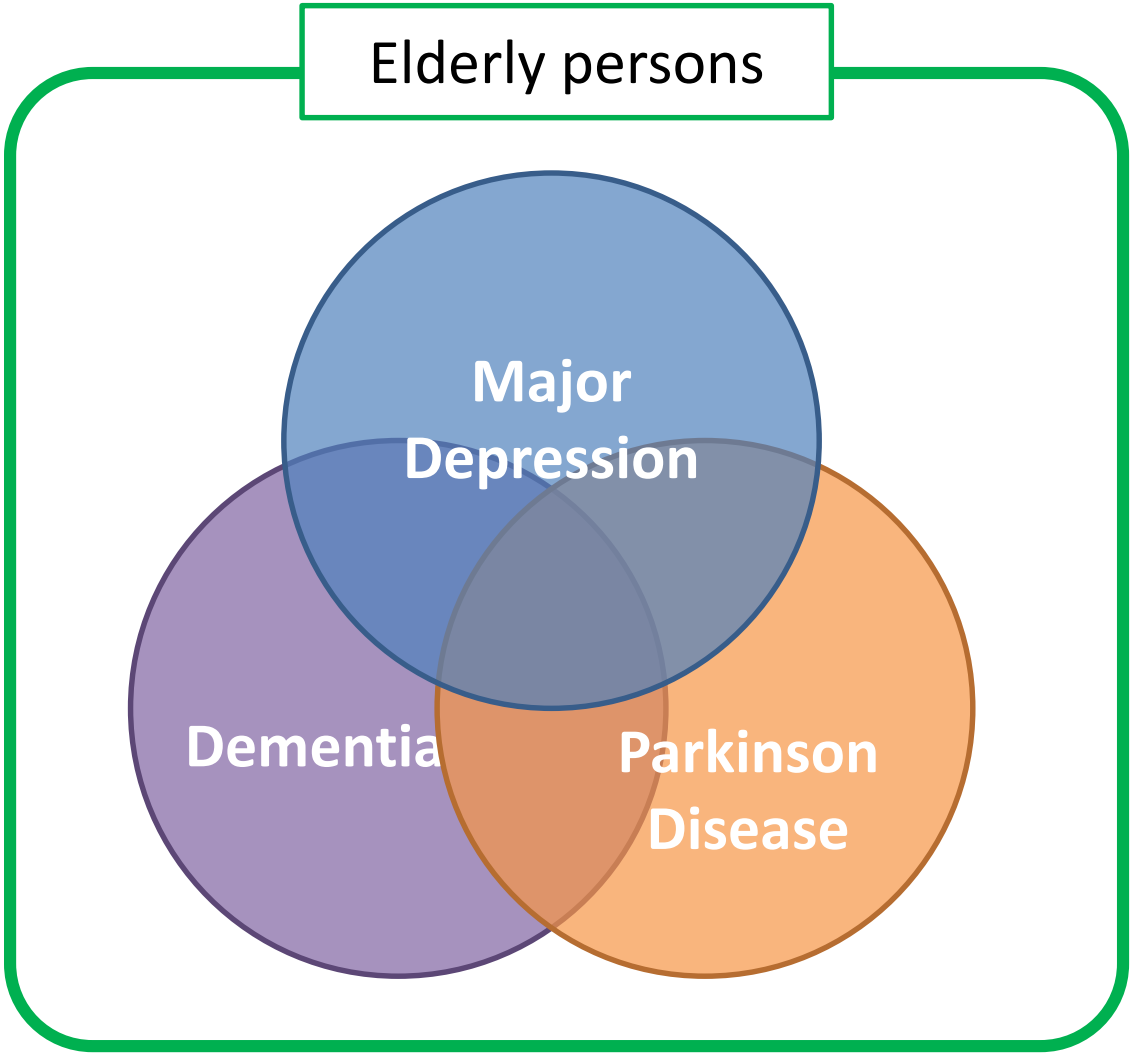


Biomarker requirements

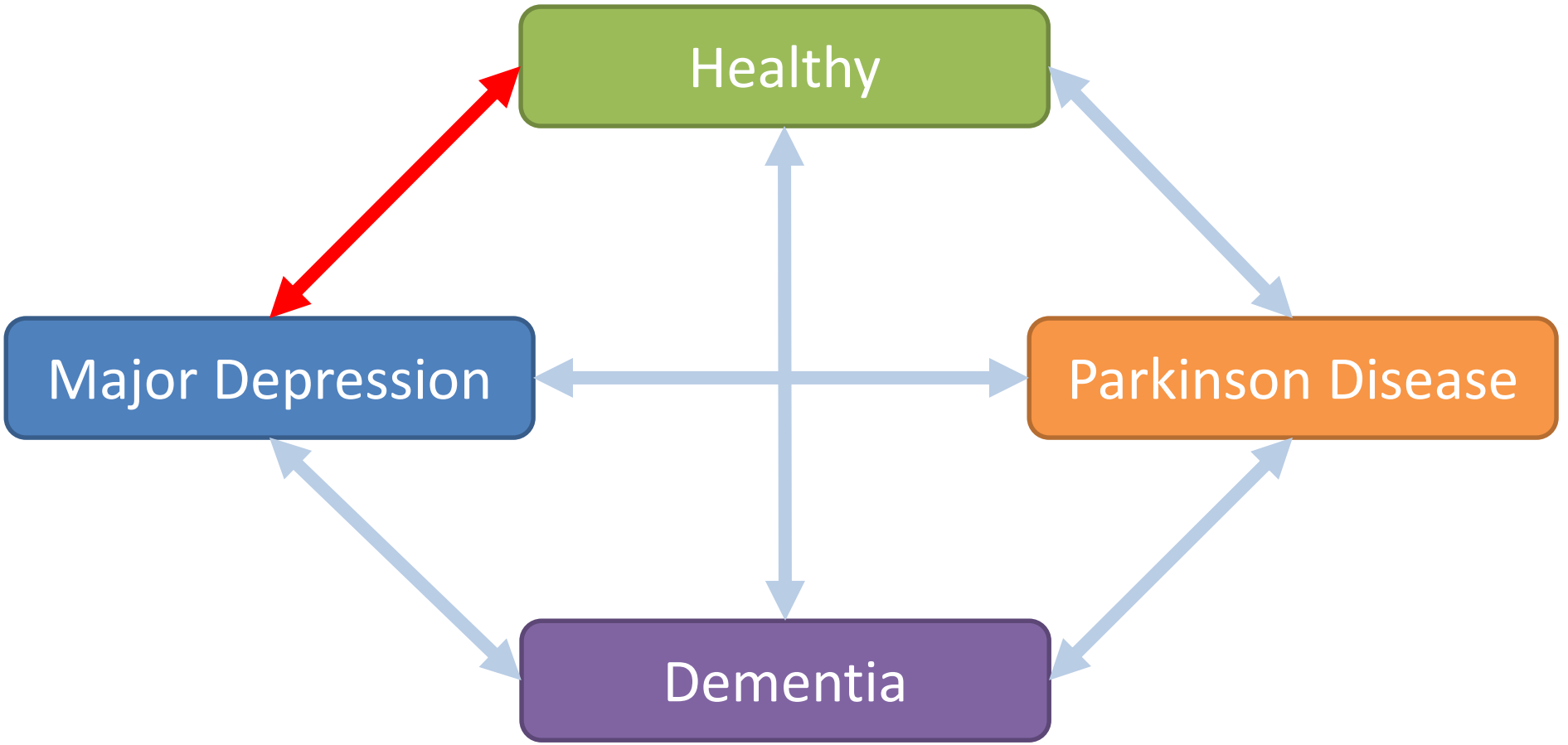
- ✓High Sensitivity
  - High detection rate & low oversight
  - Less false negatives
- ✓High Specificity
  - Fewer false positives
- ✓Discrimination ability
  - High differential diagnostic capabilities

Previous voice biomarker studies have not discussed differential diagnostic capabilities.

Application to other diseases (Disease to be distinguished)

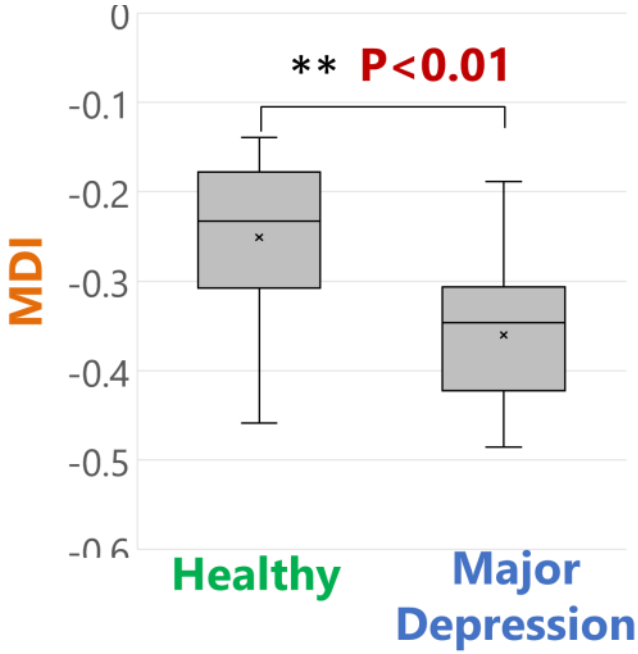


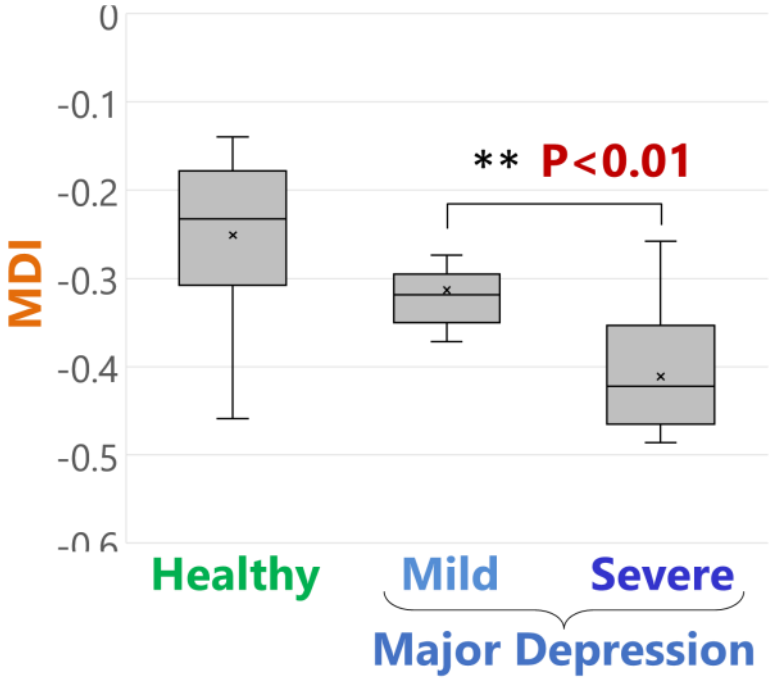
Development of new analytical methods
Differential diagnosis



Search for characteristic parameters for each disease

Major Depression





Discrimination Type	AUC	Sensitivity	Specificity
Healthy - Major Depression	**0.85**	0.88	0.74
Mild MD - Severe MD	**0.88**	1.00	0.75

Neuroscience 2017

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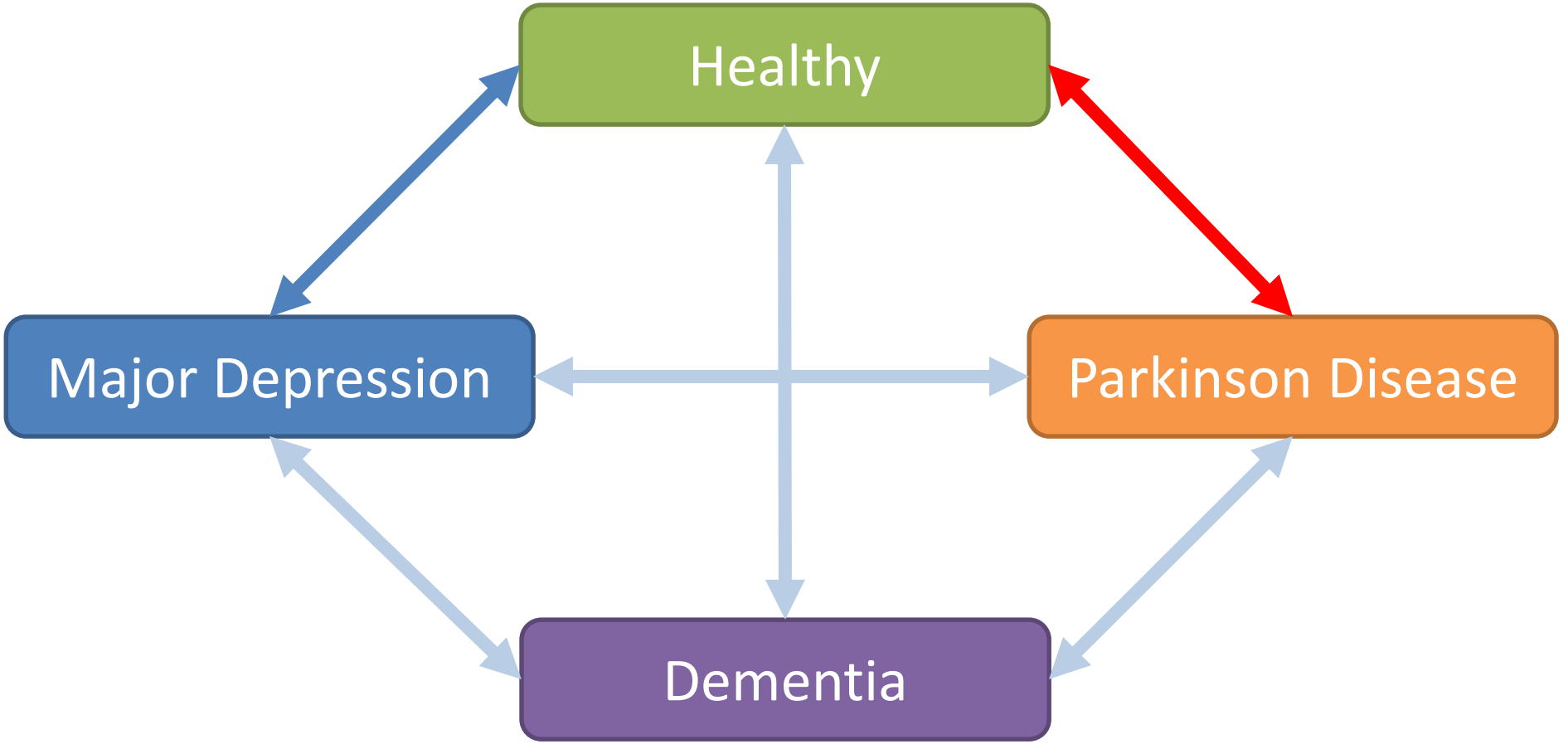

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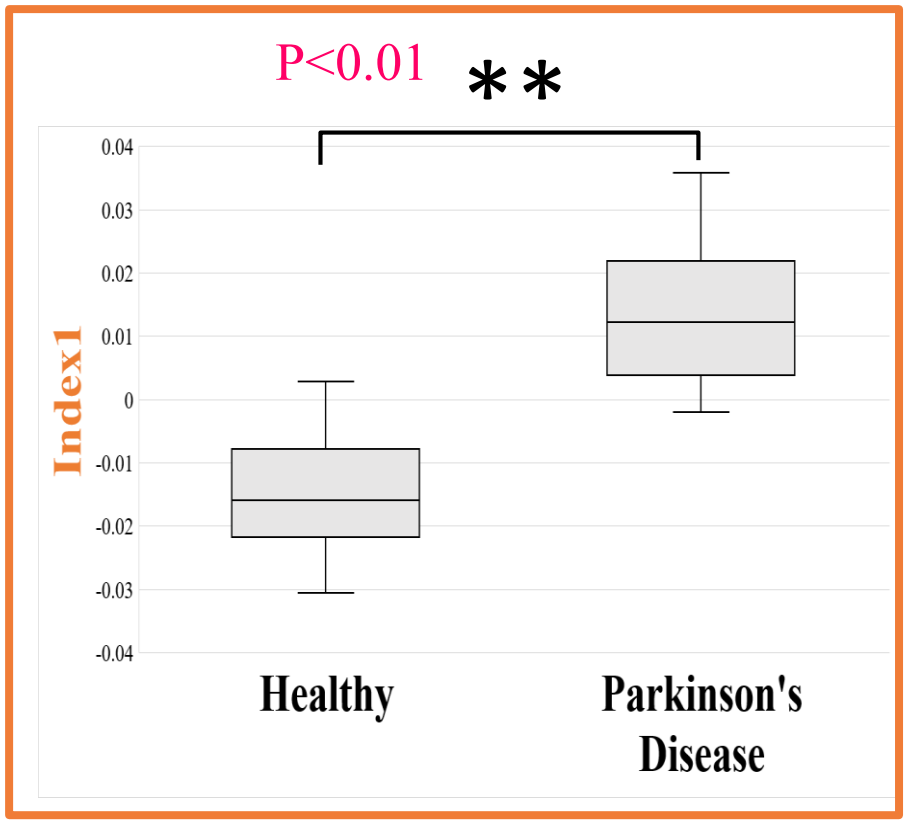
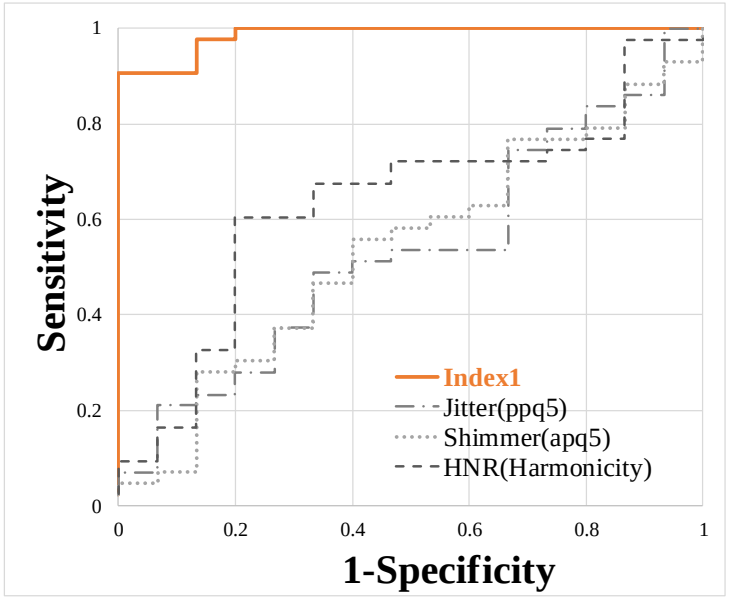
Parkinson Disease





Index	AUC	Sensitivity	Specificity
Jitter	0.533	0.488	0.667
Shimmer	0.536	0.558	0.600
HNR	0.632	0.604	0.800
Index1	**0.986**	**0.907**	**1.0**

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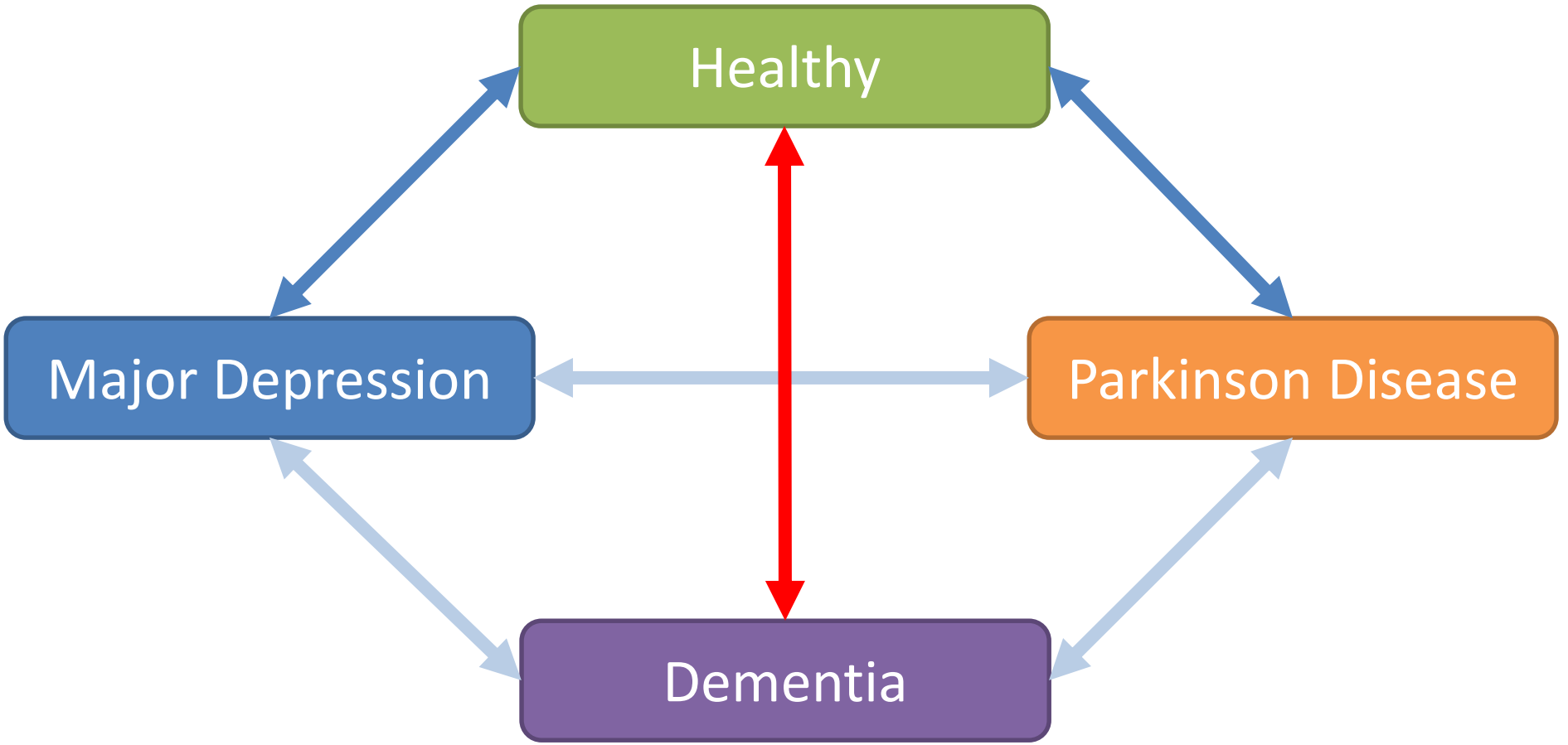
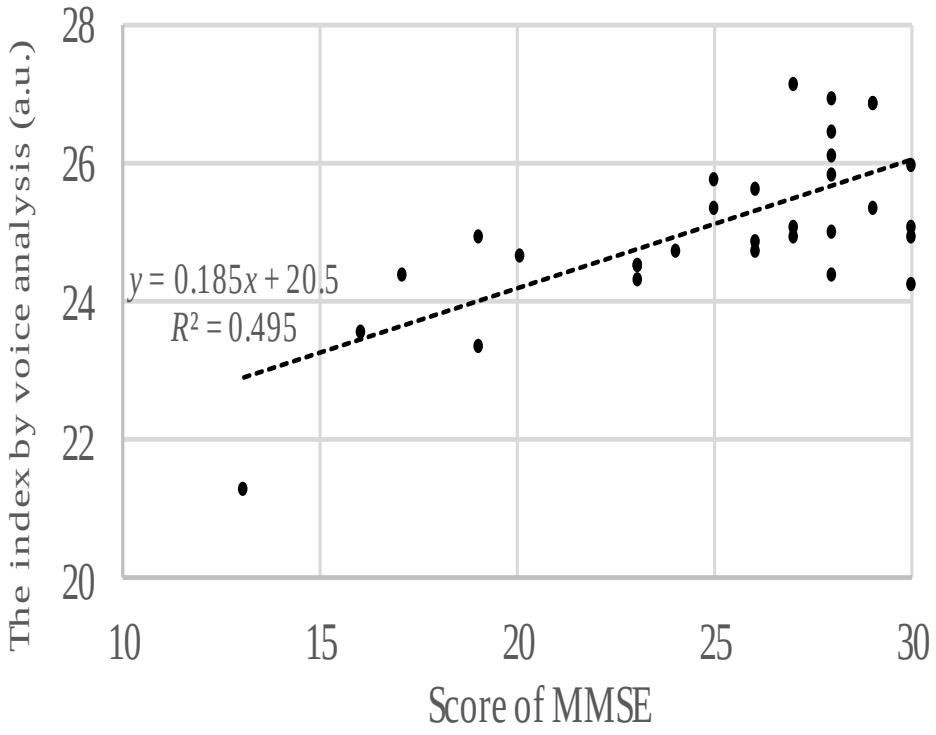
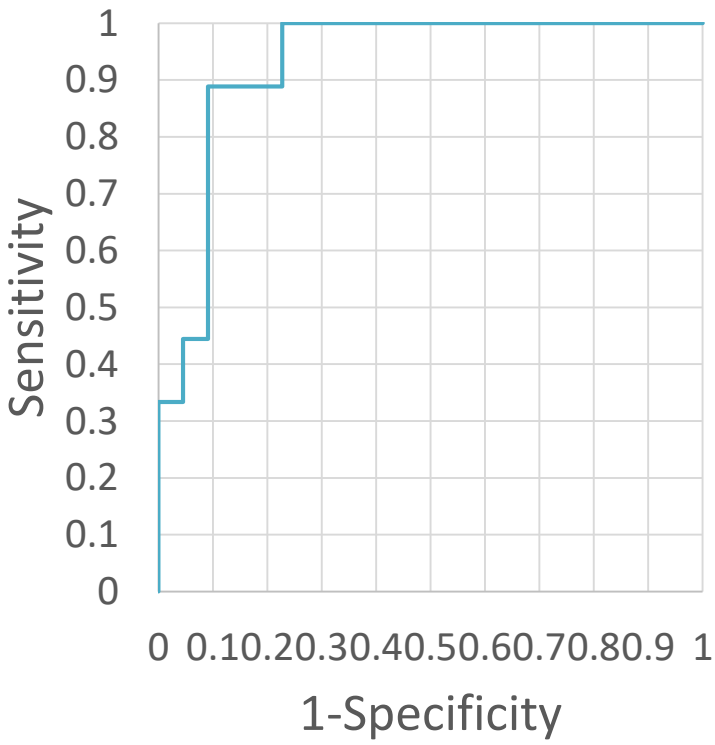


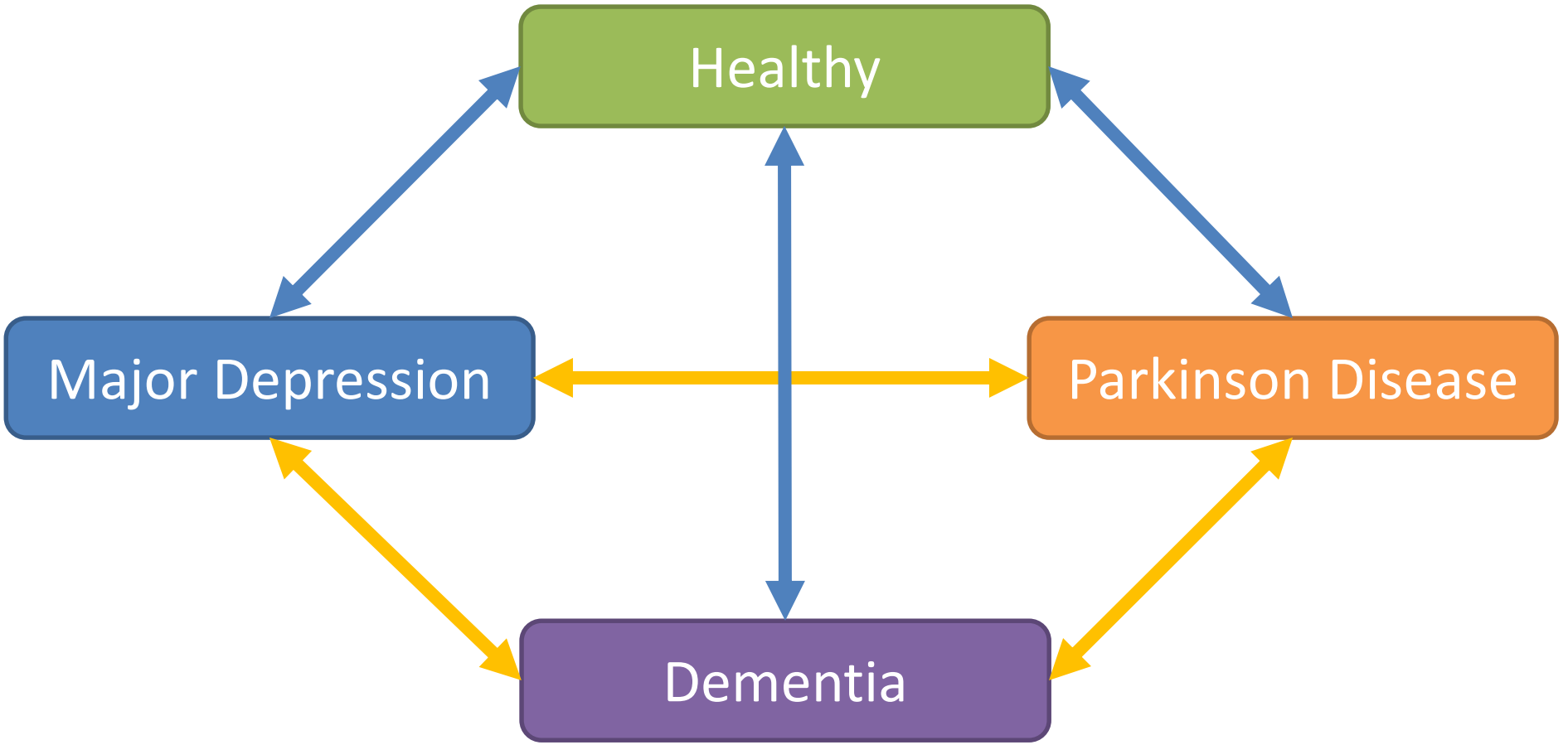
Search for characteristic parameters for each disease

Dementia


The index by voice analysis (a.u.)
28
26
24
22
20
10
15
20
25
30
Score of MMSE
y = 0.185x + 20.5
R² = 0.495


Sensitivity
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 0.10.20.30.40.50.60.70.80.9 1
1-Specificity

Development of new analytical methods
Differential diagnosis



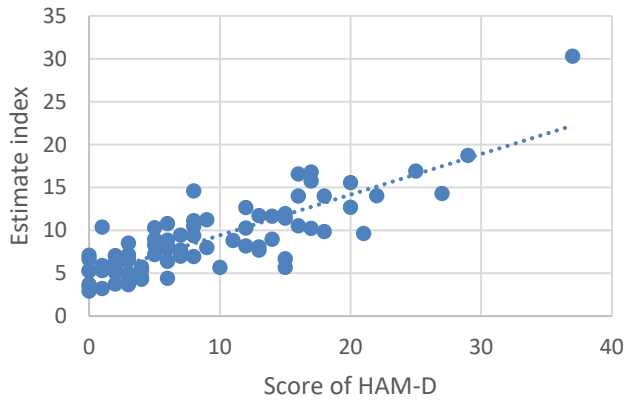
Search for characteristic parameters for each disease

Development of new analytical methods
Differential diagnosis

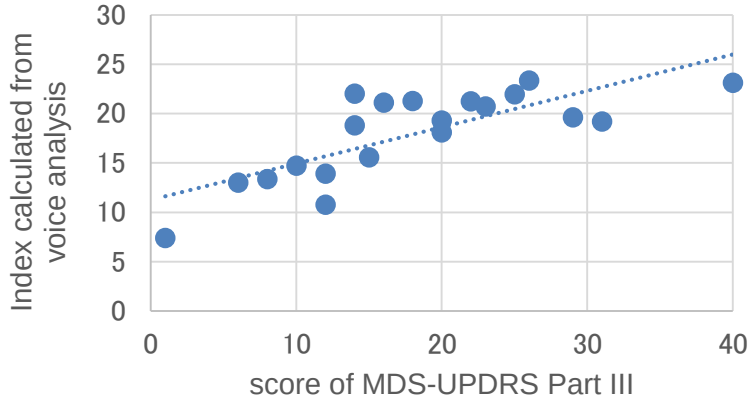
Although detailed data can not be shown before submission of the paper, sufficient discrimination ability was obtained in the group of 3 diseases + healthy with multiple methods.

Development of new analytical methods
Differential diagnosis

Appendix: Discrimination by multiple linear regression analysis



IEEE BIBM 2018



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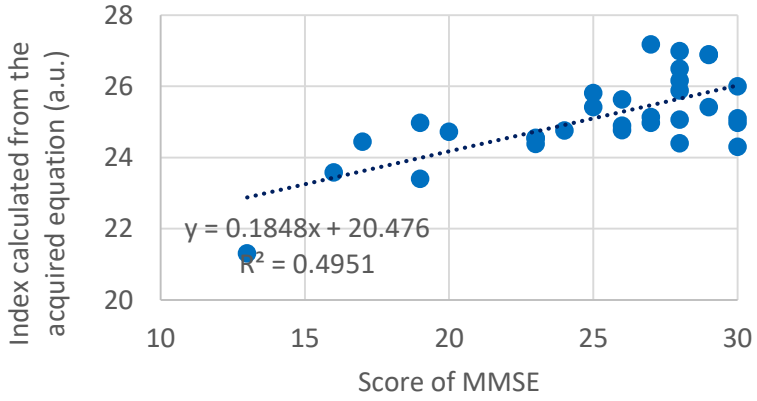

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