Future Innovation of Voice Analysis of Pathophysiology

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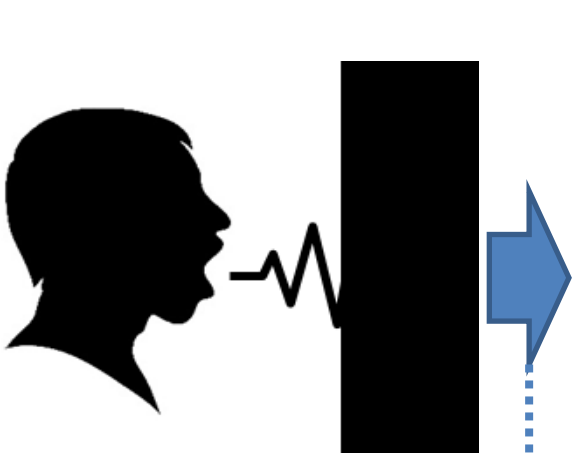
Center of Innovation (COI) Project:Self-Managing Healthy Society

The University of Tokyo

What's New?

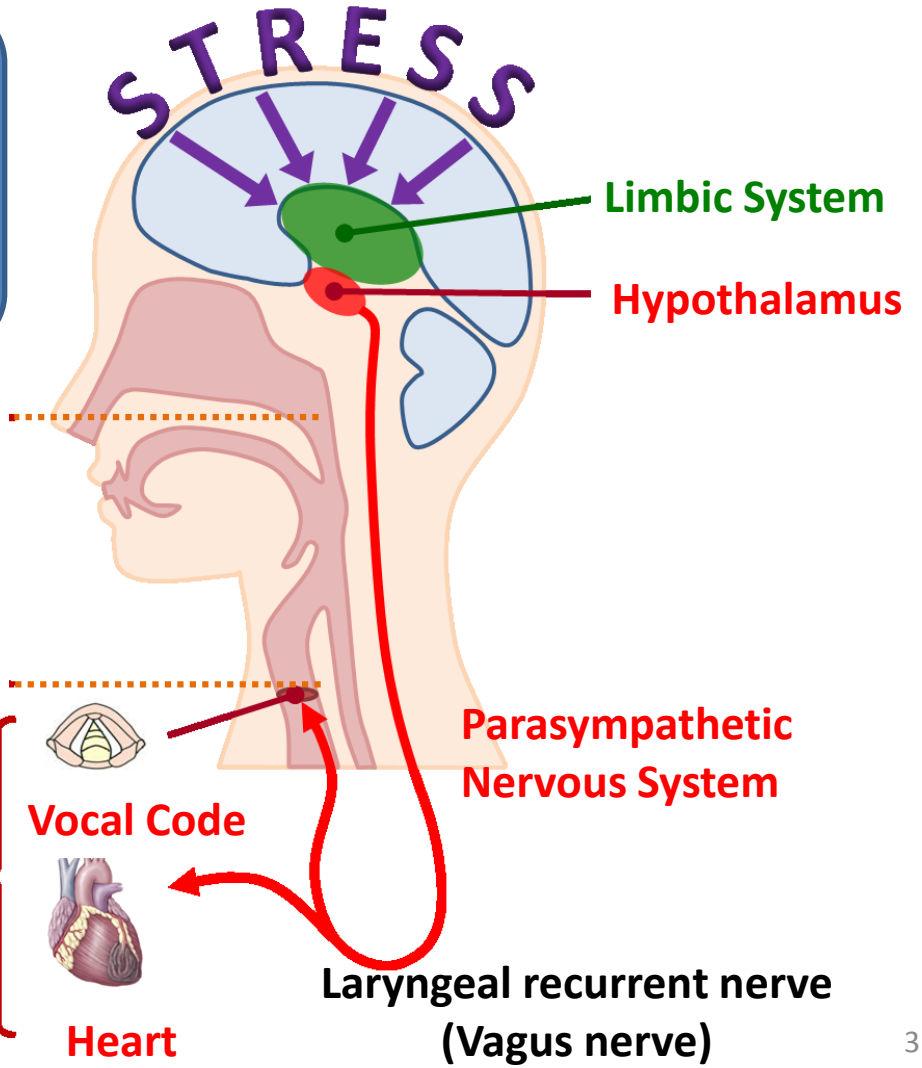


Voice Emotion Recognition

Mind State

Voice and Parasympathetic Nerve

Voice includes not only quantitative but also qualitative information.



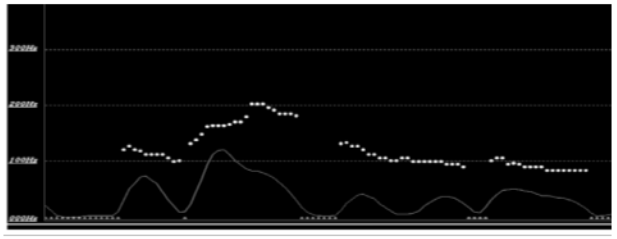
Involuntary Reaction

Voice Emotion Recognition

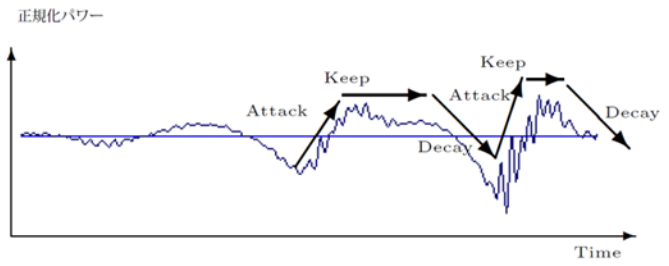
Voice Mental State Analysis

Voice Emotion Recognition

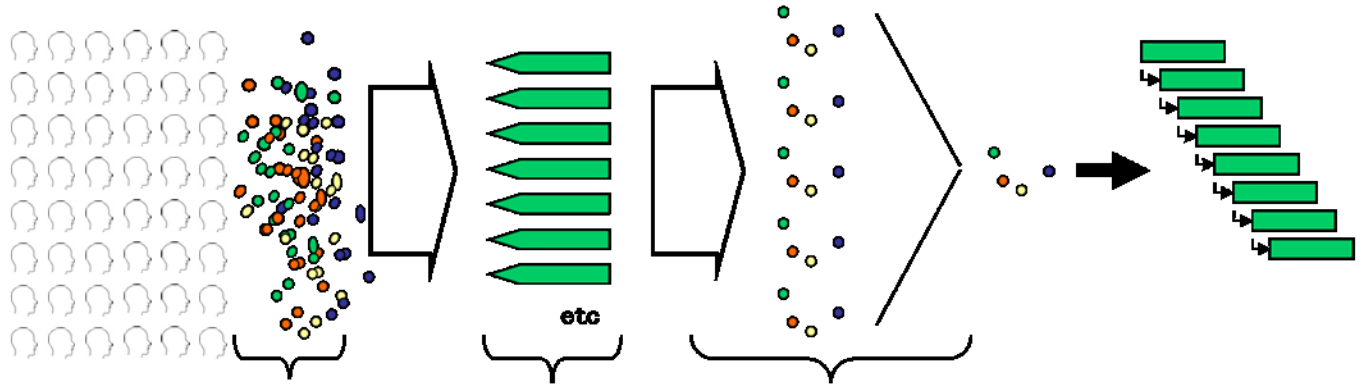
Robust fundamental frequency estimation method



The parameters specific to emotion



Subjective learning data	Analysis parameters	Results	Subjective analysis	Reproduce logic



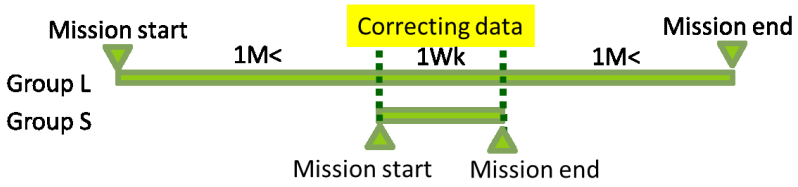
Voice material that was labeled with the subjective.
800 people -> 50000 speech

More than 200 parameters

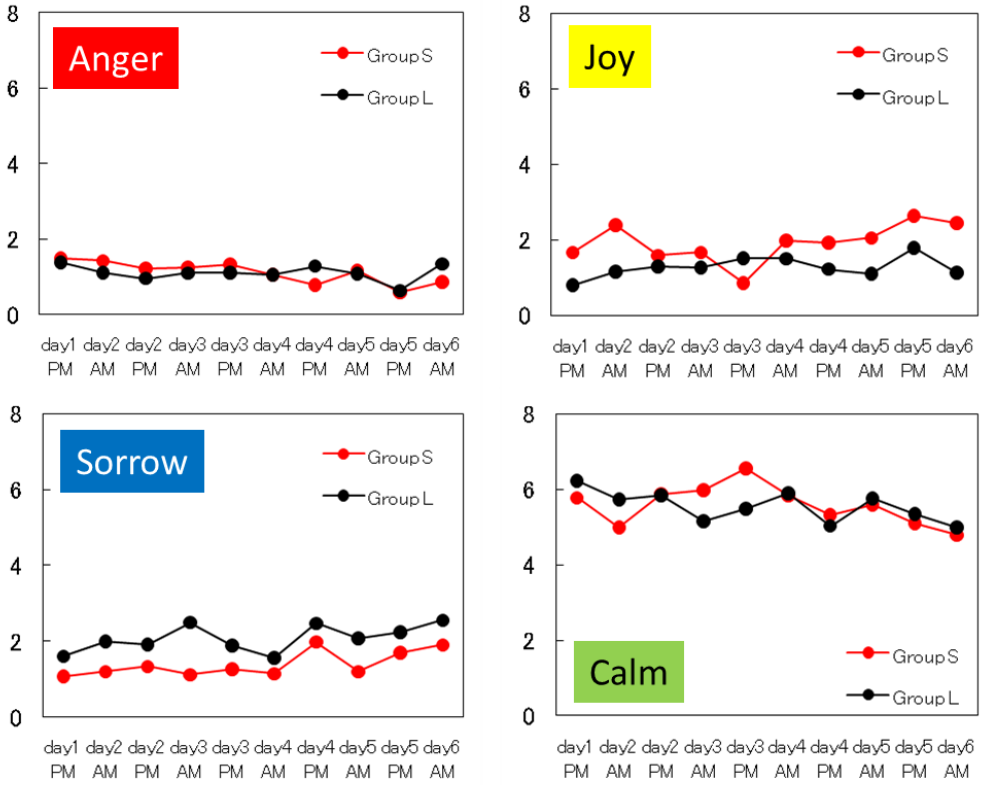
Common subjective analysis rules

Logic rules to determine the subjective

Emotion Change by Stress



Voice data were collected from the personnel of military medical corps participating in a special stressful mission.



From Emotion Recognition to Mind Monitoring

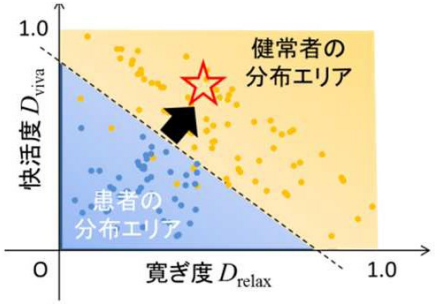
Emotion Recognition

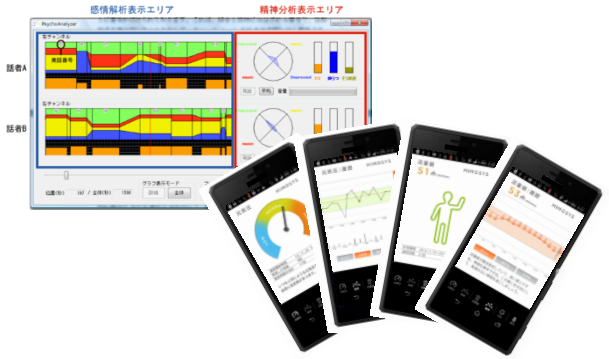
Joy
Anger
Sorrow
Calm
Excitement

Vivacity
Relax

Mind Monitoring

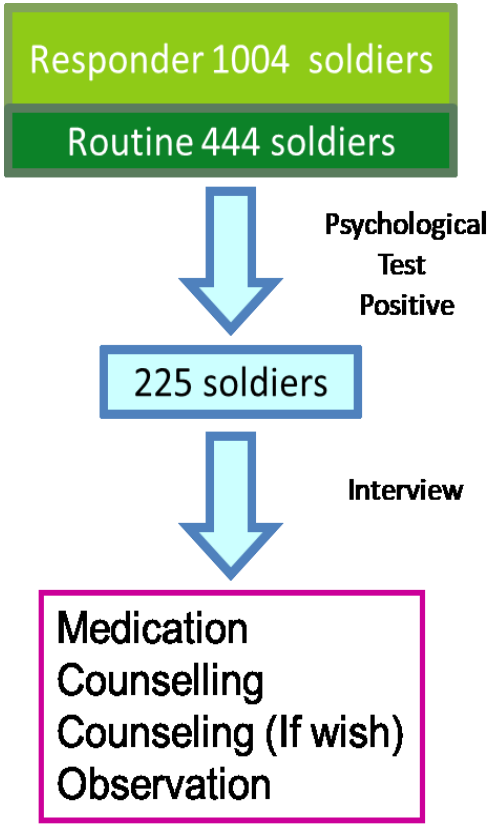
Vitality
Mental Activity





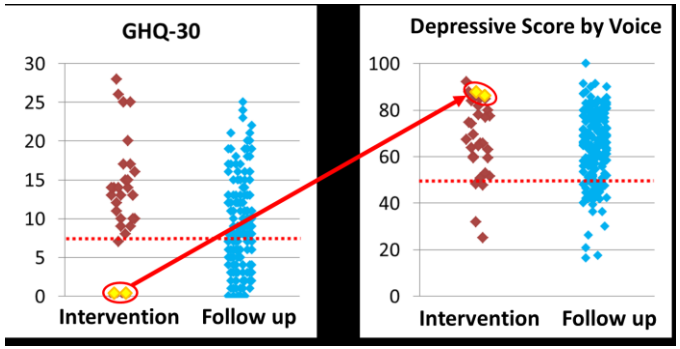
Research on the Great East Japan Earthquake

The subject is 1004 soldiers dispatched to the Great East Japan Earthquake and 444 soldiers to do a routine mission in Japan Ground Self Defense Forces. All of them had taken the stress analysis by voice and psychological testing by questionnaire. The evaluation by interviewing was carried out for 225 soldiers who showed an abnormal psychological testing, and obtained the consent.



High sensitivity

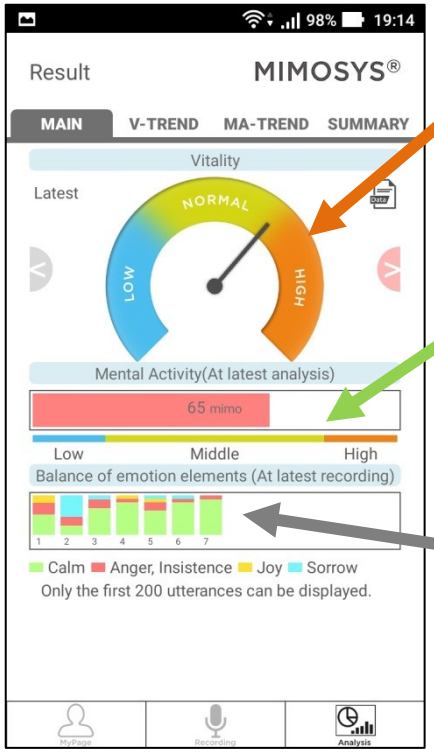
16th World Congress of Psychiatry



Overcoming of reporting bias

MIMOSYS

Mind Monitoring System



Vitality

Mental state at the time

Mental Actibity

Metal state trend for 2 wks

Emotion

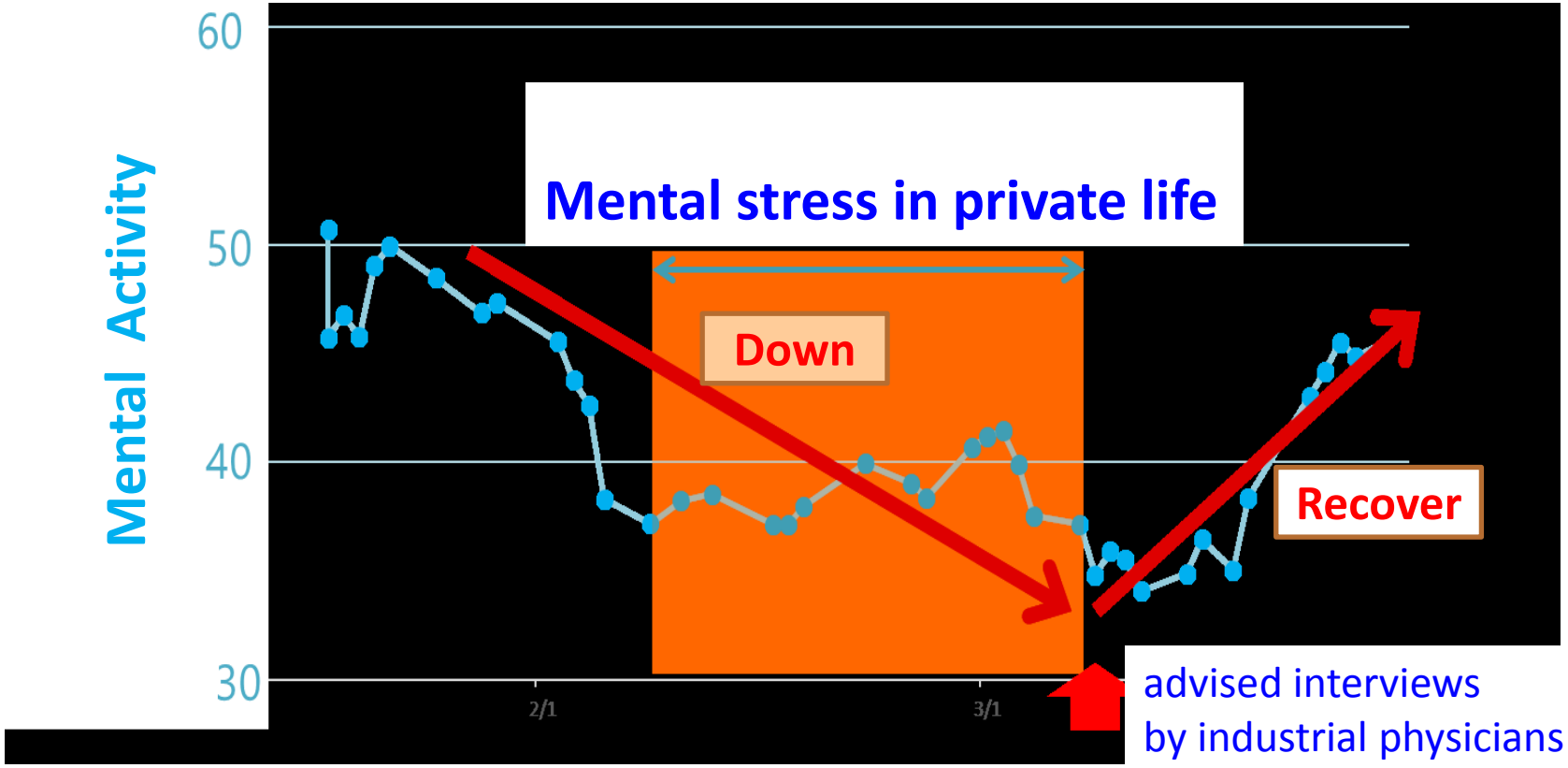
Emotions used for calculation

3 ways to use

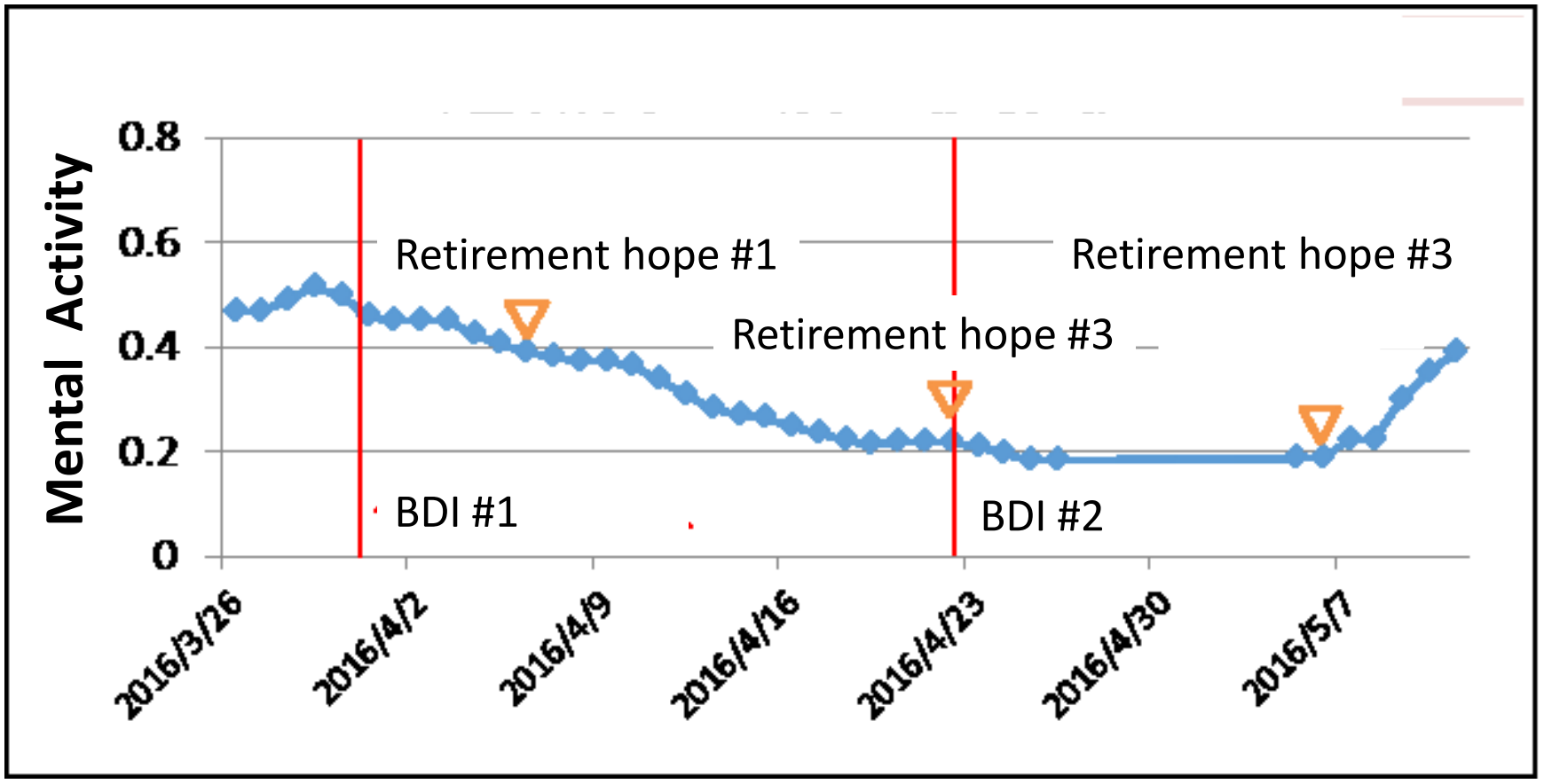
1. Automatic analysis after call
2. Fixed phrase recording
3. Free speech recording

Verified with over 7,000 subjects in various situations so far.

Crisis detecting

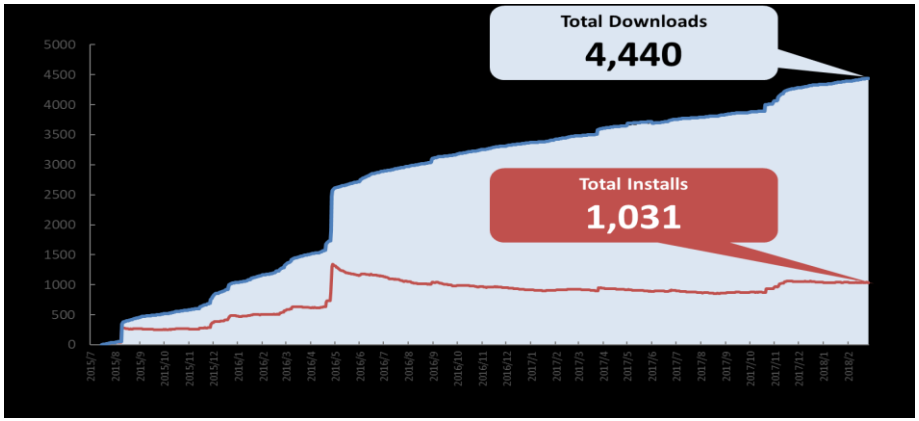


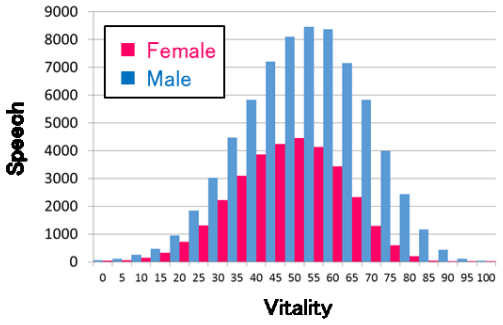
Crisis Detecting
Early Retirement

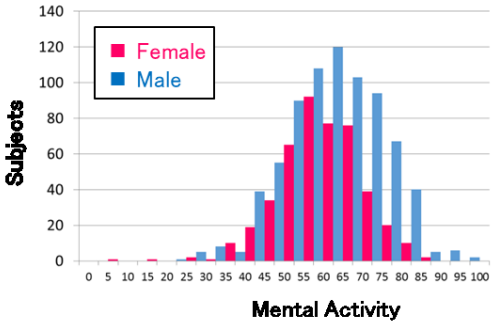


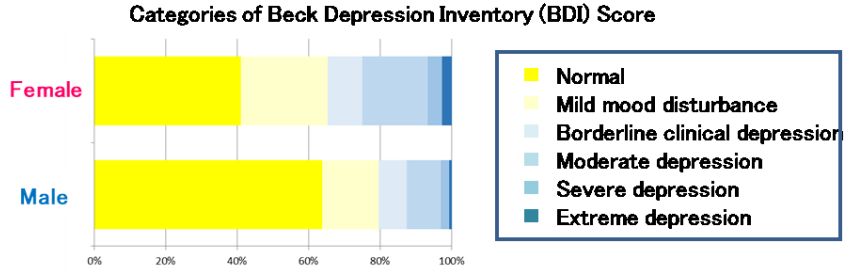
□BDI : #1 2 (normal) ⇒ **#2 22** (moderate depression)

Prospective public research



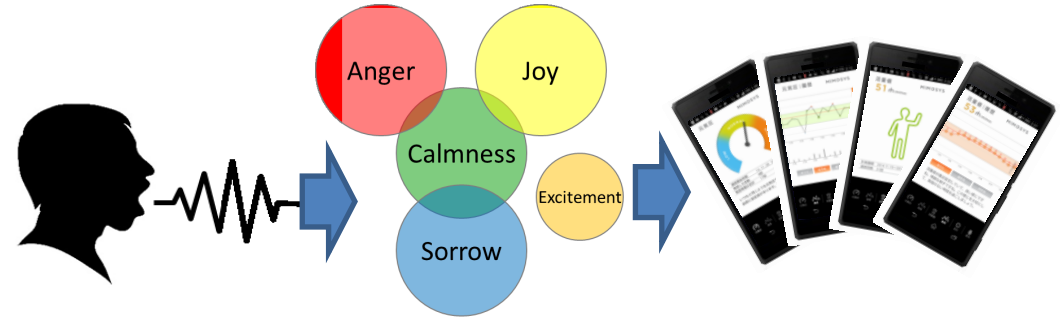






Neuroscience 2016

Future Development



Emotion Recognition MIMOSYS

Vitality

Screening

Mental Activity

Monitoring

Multi Language

Differe gorithm AI

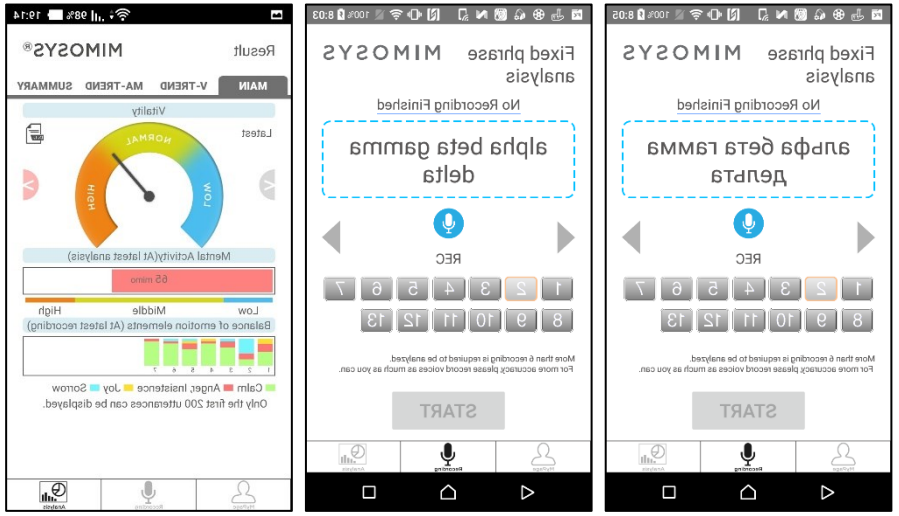
- **Major Depression**
- **Bipolar Disorder**
- **Parkinson Disease**
- **Dementia**
- **Sleep Apnea Syndrome**

Multi Disease

Multilingual

MIMOSYS Ver2（Multi Lunguage）

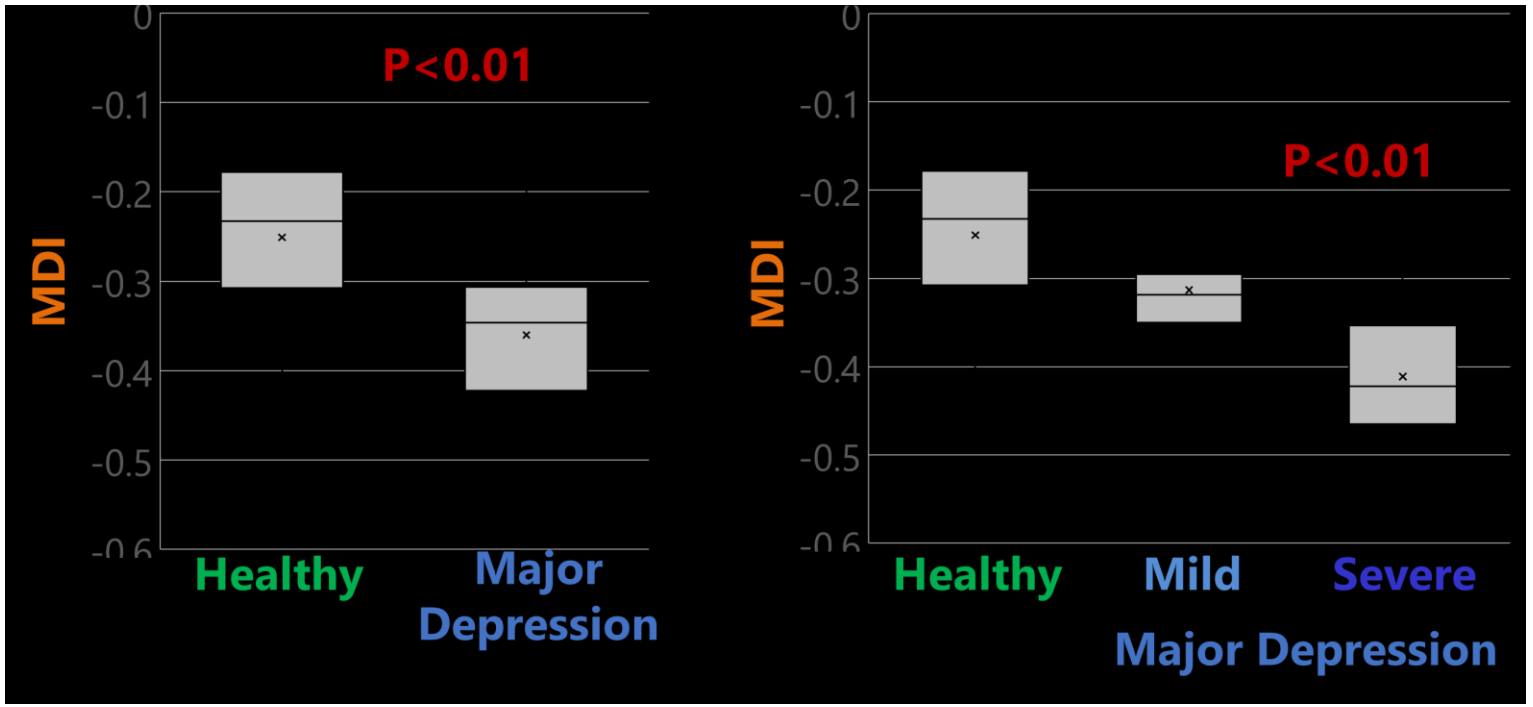
- Release in April 2018
- 3 types of analysis mode
  Automatic analysis after telephone
  Fixed form recording
  Free speech recording
- Template recording mode is
  Corresponds to Japanese, English, German, Romanian, Russian, Spanish, Hungarian
  (Interface is Japanese / English)



Other multilingual support

- Validation at Pitisti University, Romania (to be announced in July 2018)
- Verification at the University of Transylvania in Romania (ongoing)

Major Depression

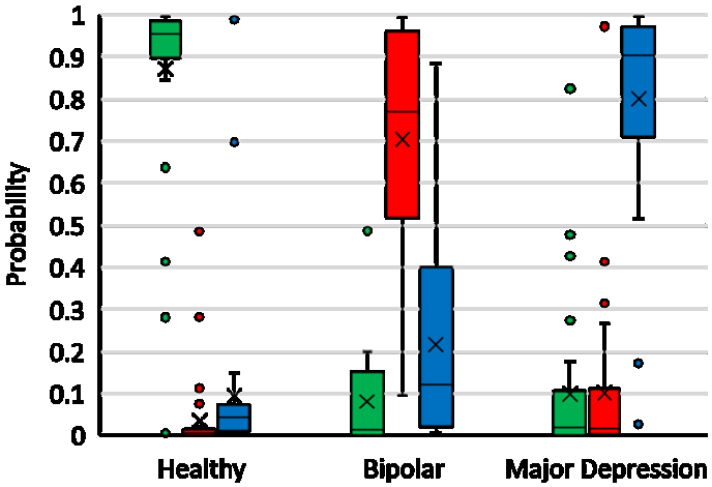


Discrimination Type	AUC	Sensitivity	Specificity
Healthy-Depression	0.85	0.88	0.74
Mild-Severe	0.88	1.00	0.75

Bipolar Disorder

		Predicted			
		HE	BP	MD	Recall
Actual	HE	29	1	2	90.6%
	BP	1	12	1	85.7%
	MD	1	1	28	93.3%
	Precision	93.5%	85.7%	90.3%	**90.8%**

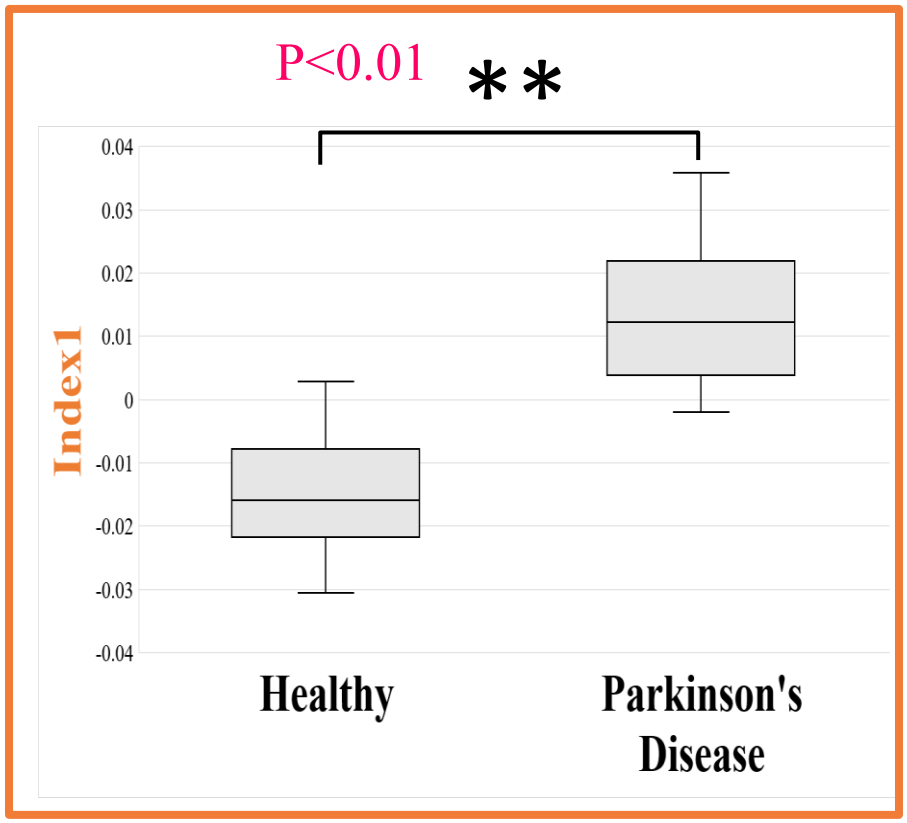
accuracy

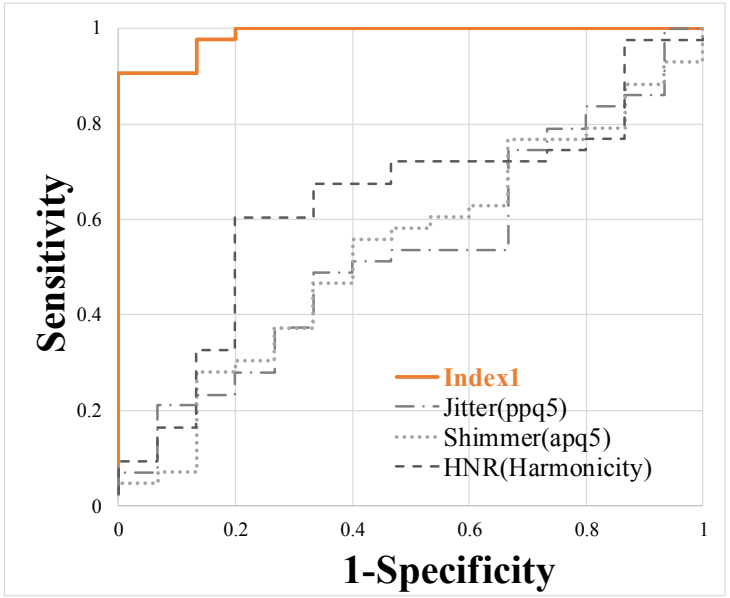


P_{HE}
P_{BP}
P_{MD}

Probability distribution of each subject being identified in each group

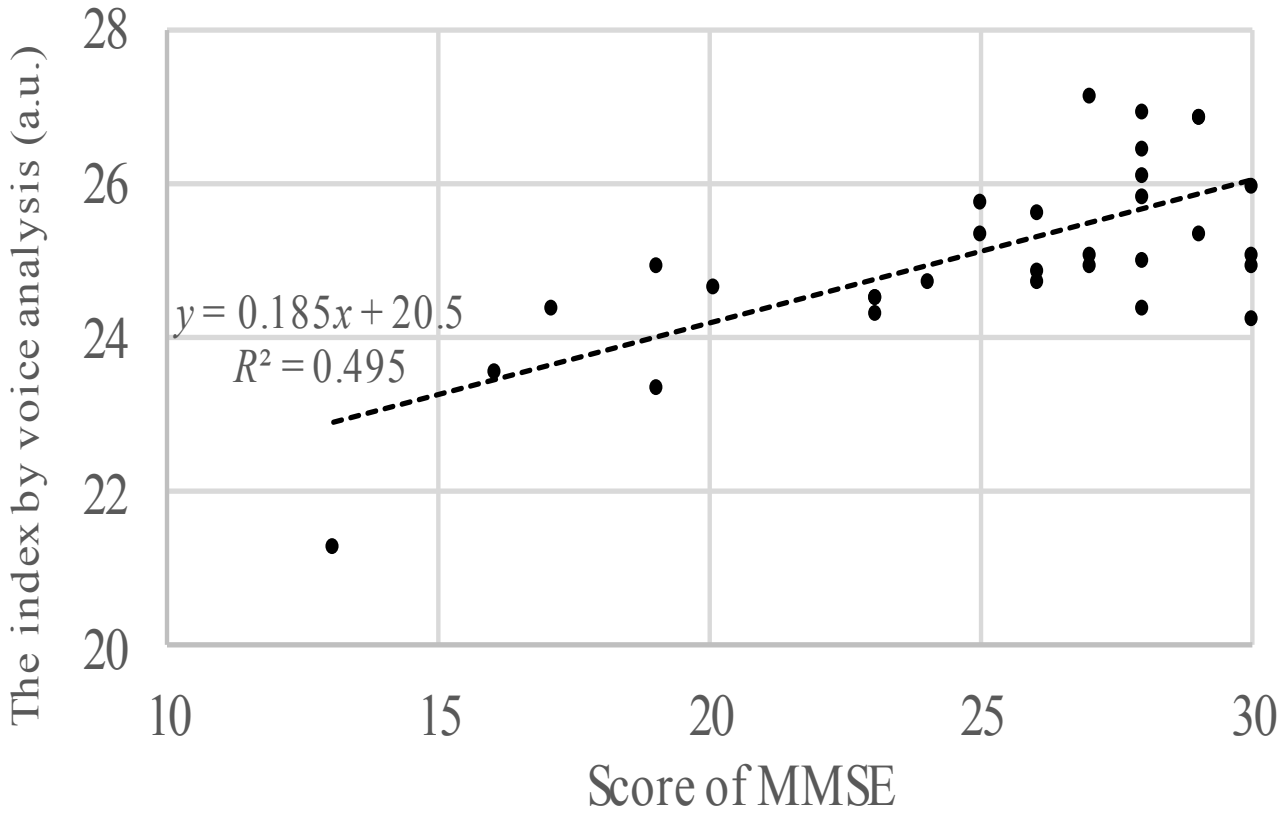
Parkinson's Disease



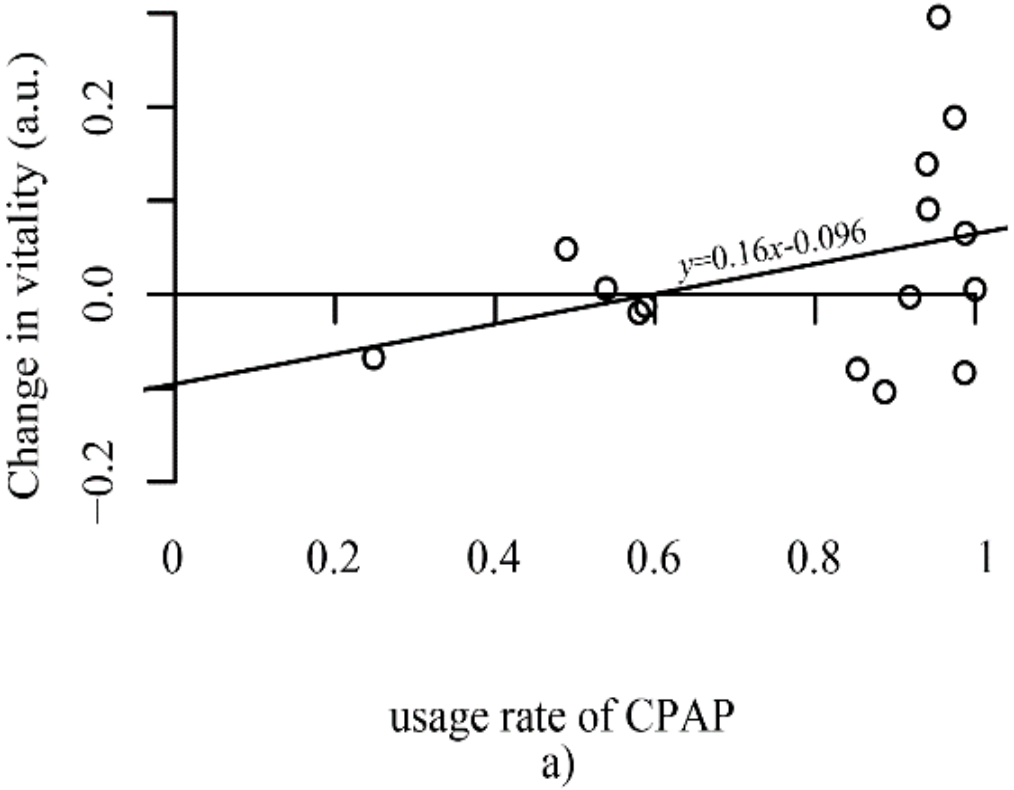


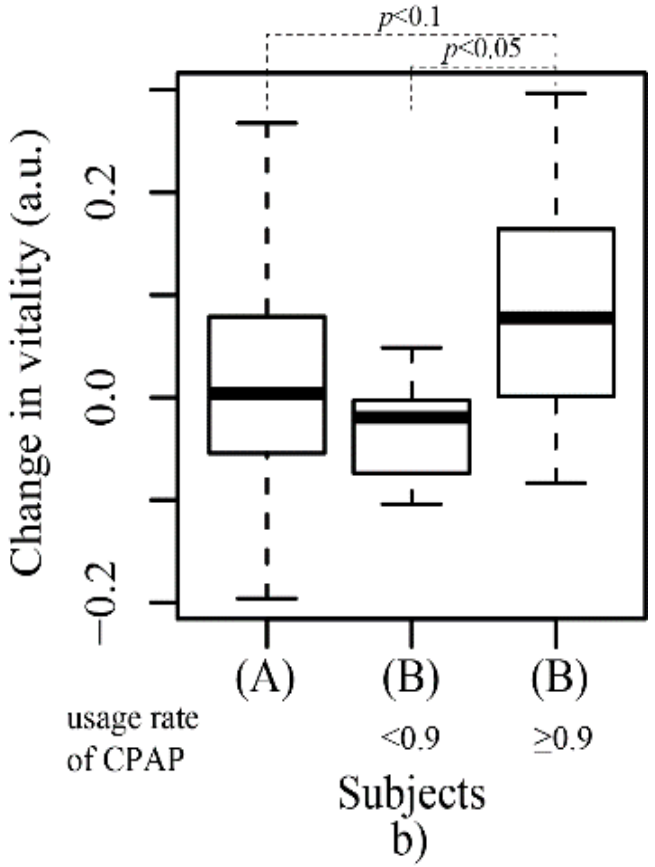
Index	AUC	Sensitivity	Specificity
Jitter	0.533	0.488	0.667
Shimmer	0.536	0.558	0.600
HNR	0.632	0.604	0.800
Index1	**0.986**	**0.907**	**1.0**

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

Sleep Apnea Syndrome





MIMOSYS

- Non-invasive and easy
- Remote-monitorable
- Low Cost (No special devices)
- No reporting bias
- Based on medical evidence
- Verification in multilingual
- Development for other diseases


Thank you for your attention
MIMOSYS is open to the public as the social implementation research.
We are waiting for everyone's participation.
https://play.google.com/store/apps/details?id=com.medical_pst.mimosys_release2