Wearable Wellbeing

Joyce Westerink
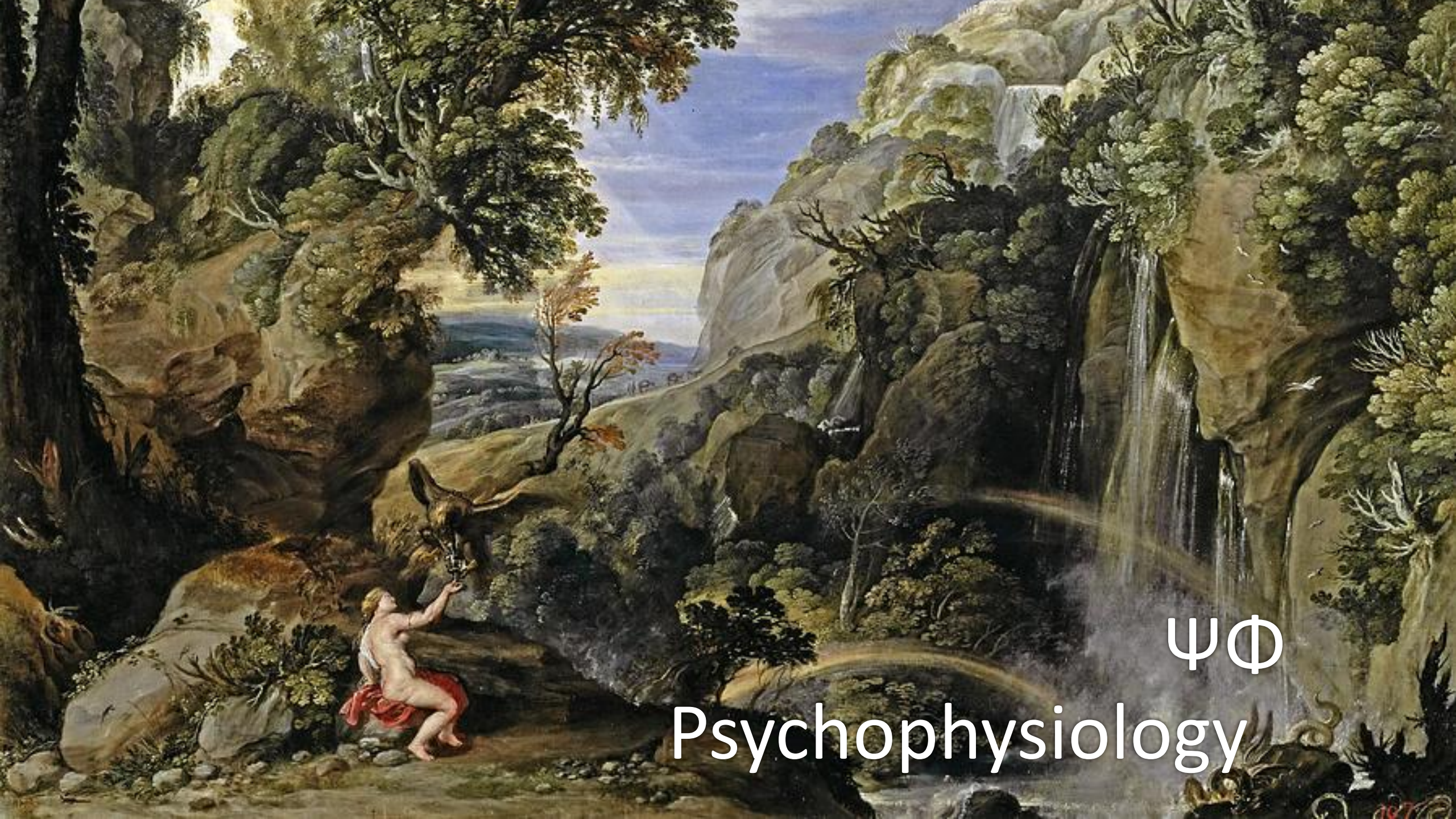
Ψ
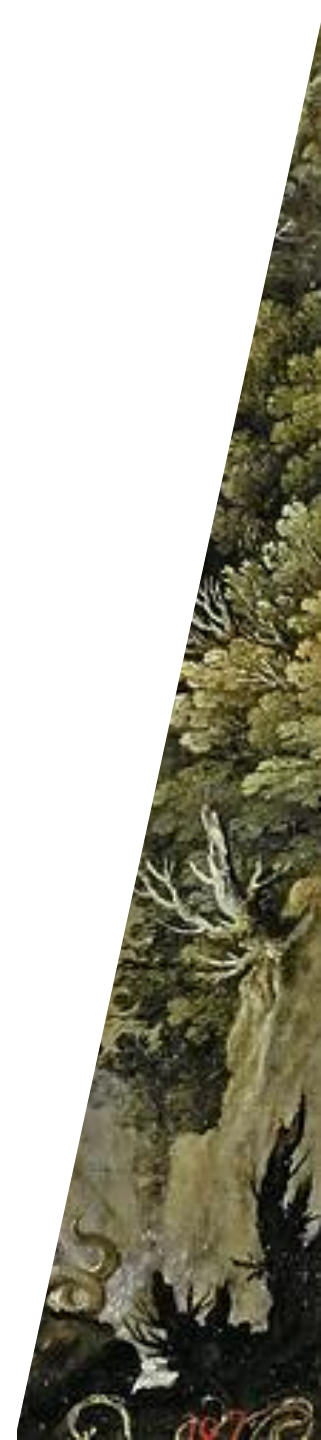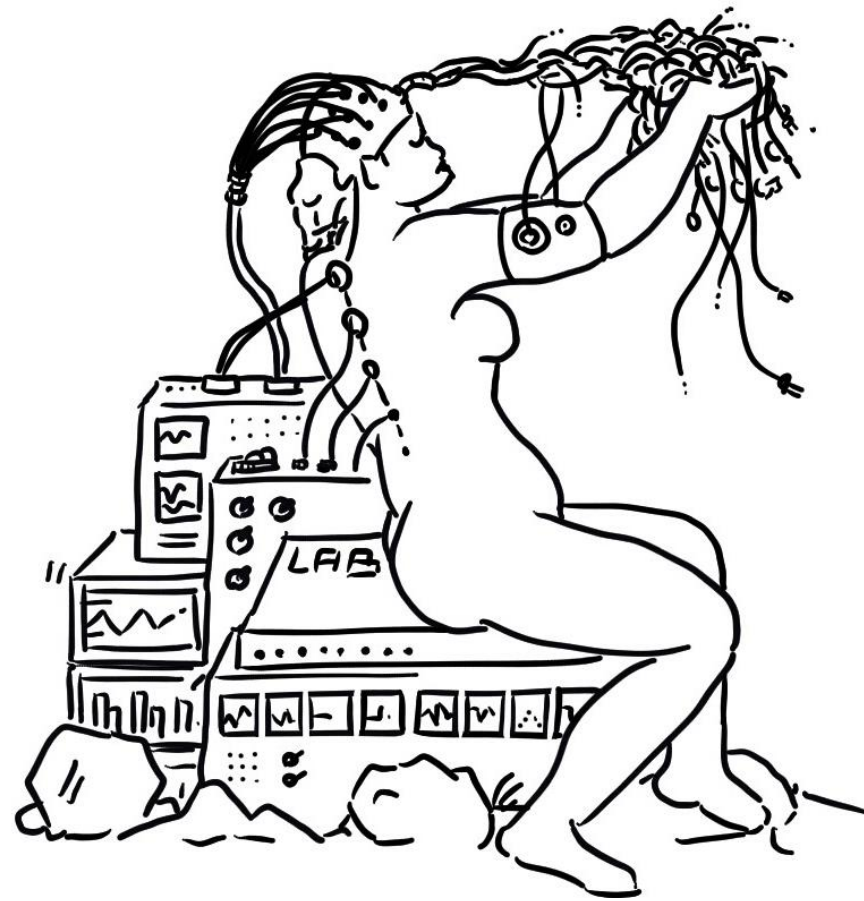Psyche
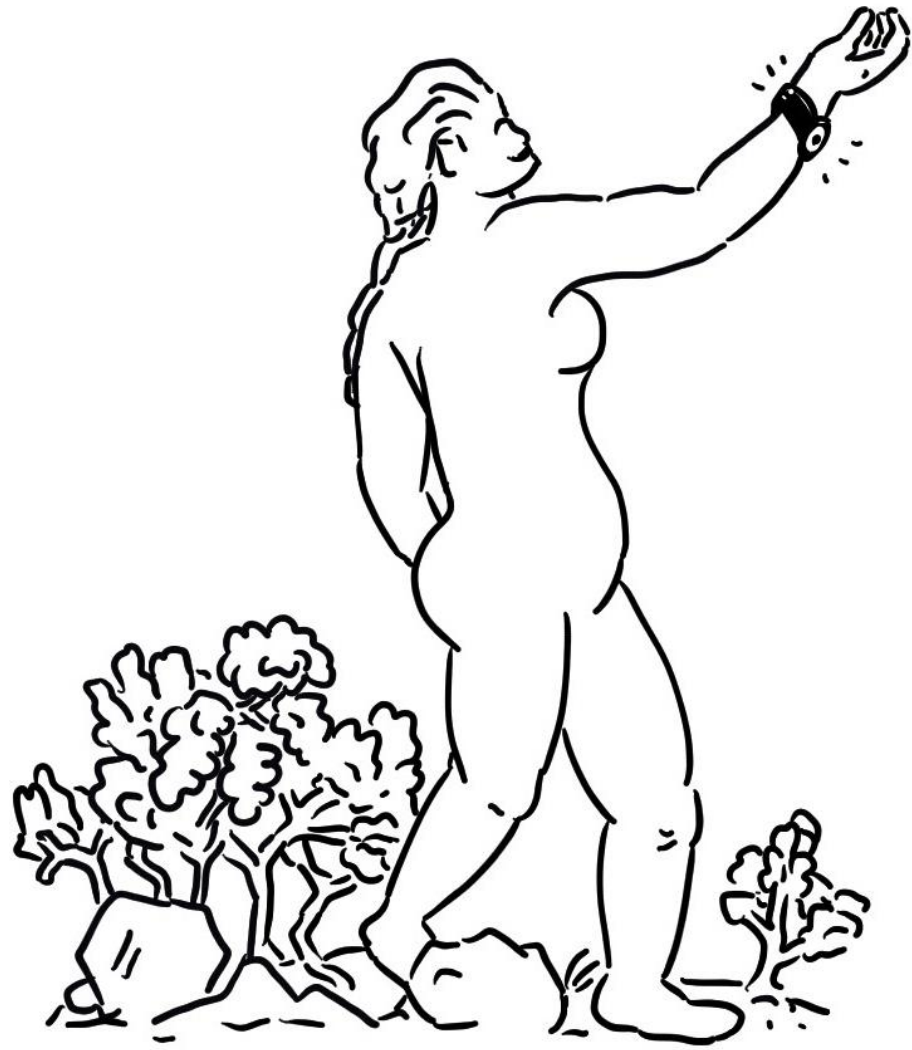
Φ

Physis

ΨΦ
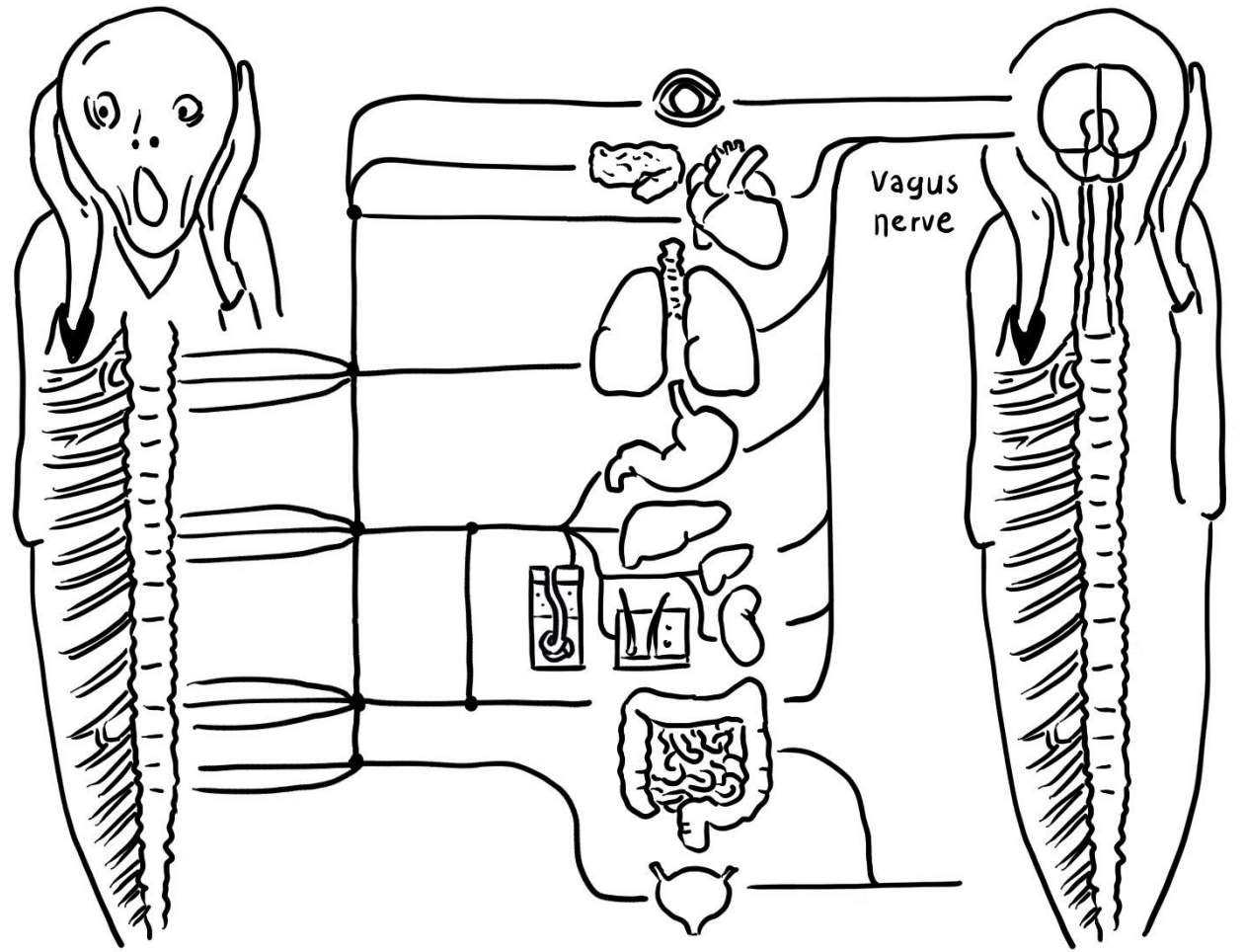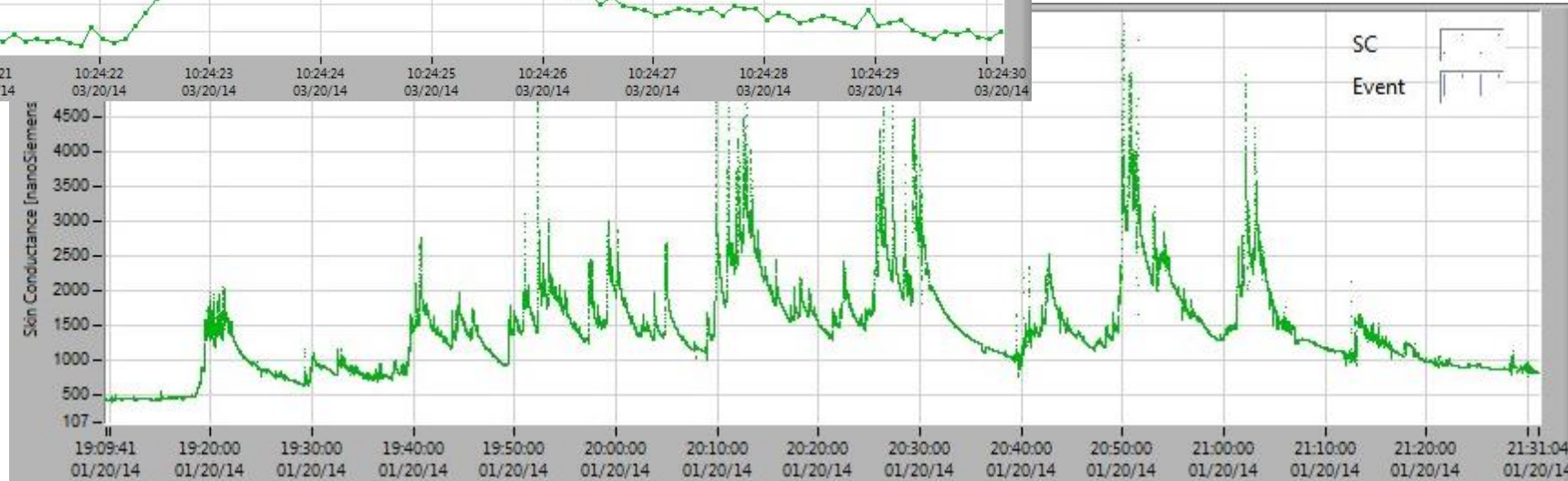Psychophysiology

stress awareness
through monitoring

Vagus nerve
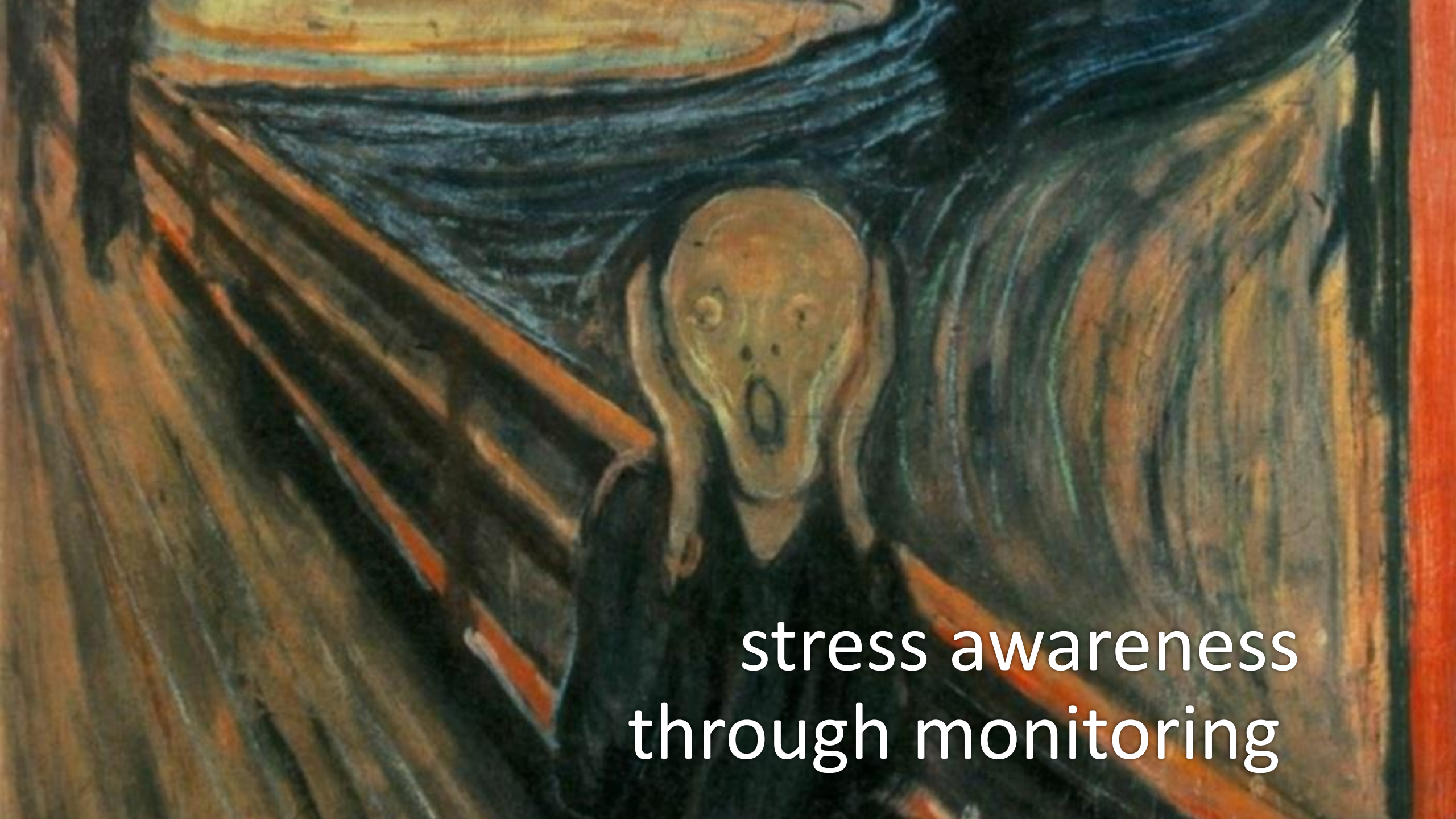
Sympathetic System

Parasympathetic System

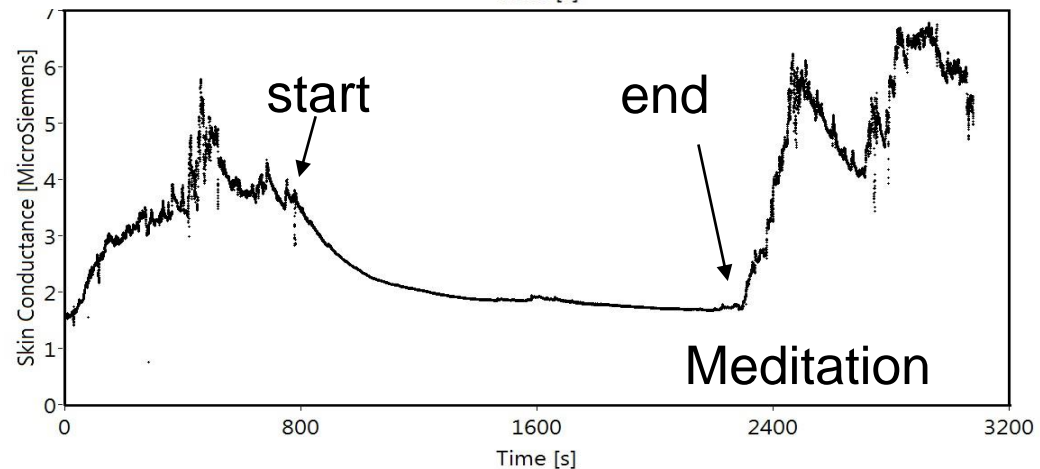# Skin Conductance

- Skin Conductance Response (SCR)
- non-specific SC response
- Skin Conductance Level (SCL)
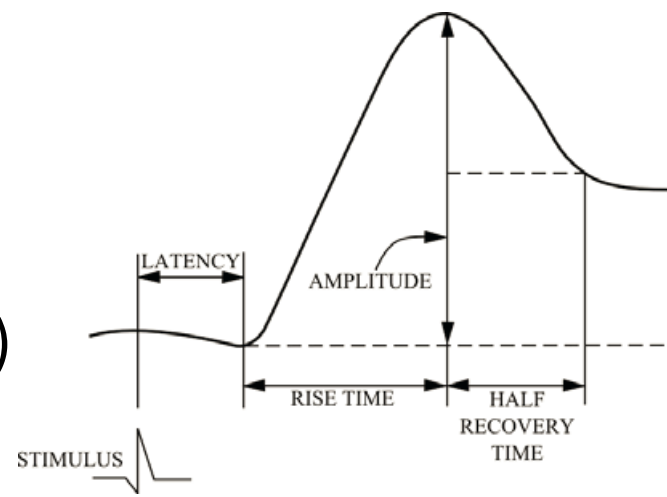
DTI-2

Discreet Tension Indicator, measures SCL:
- arousal and relaxation visible
- events can be clearly detected
- base level is influenced by more factors than stress only
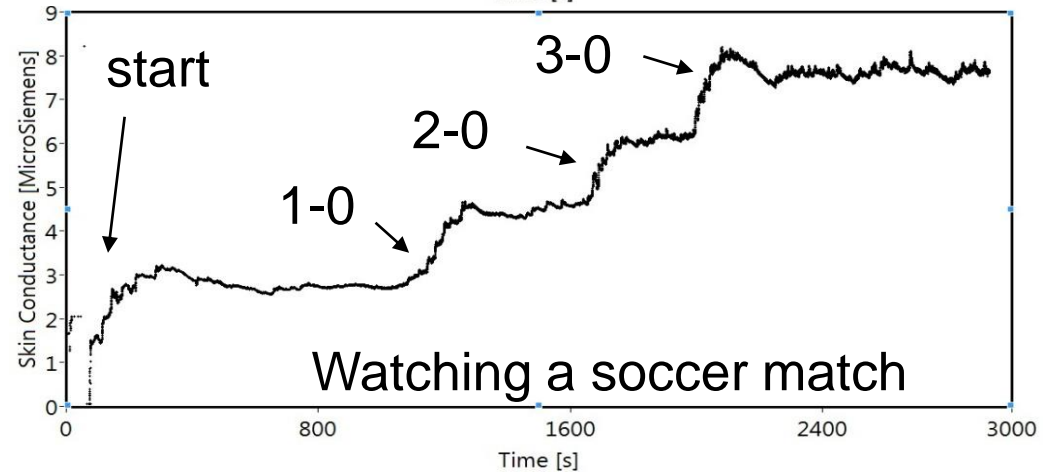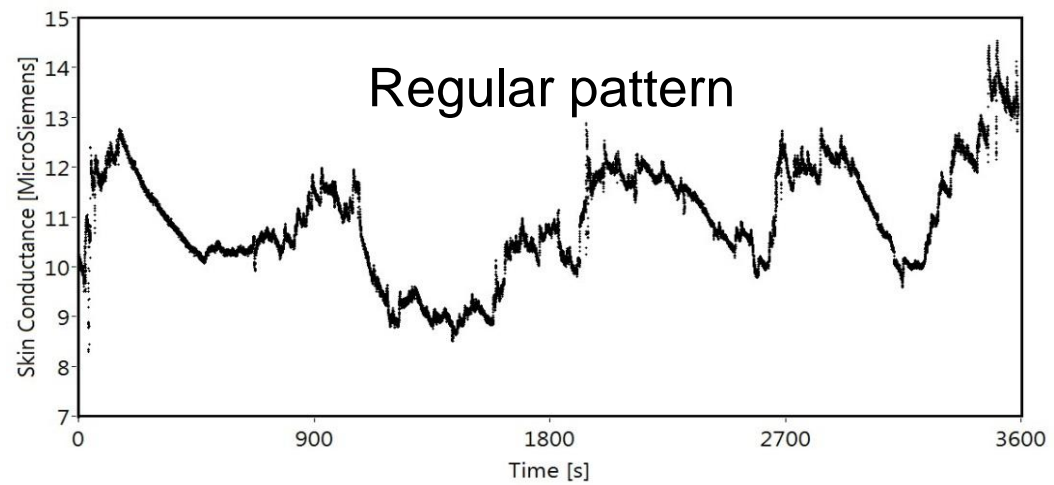
Regular pattern

start

1-0

2-0

3-0

Watching a soccer match

start

end

Meditation

Tracking your day
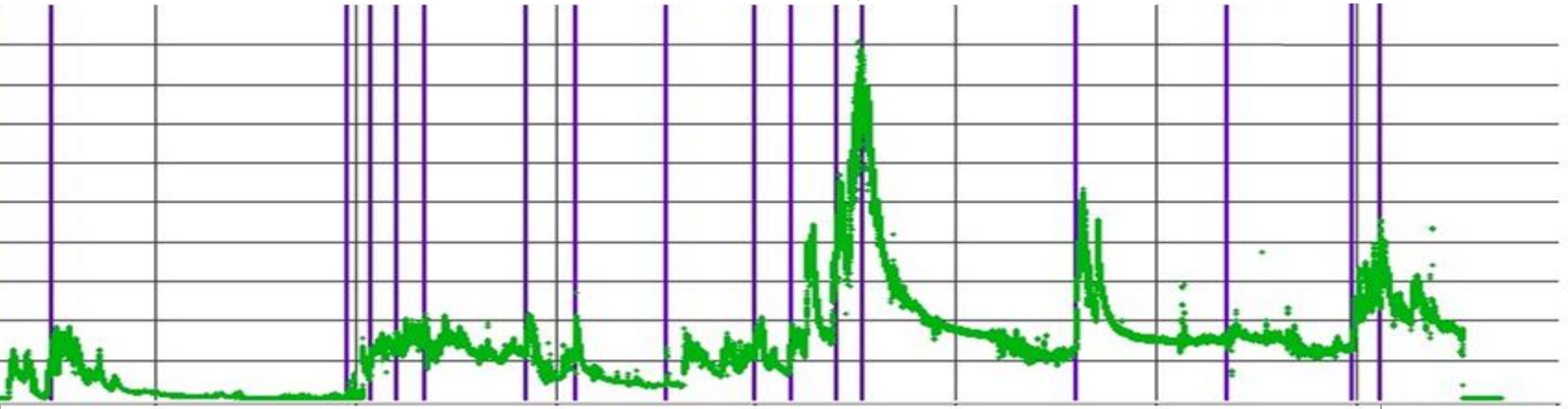
Stress@Work for teachers

- daytime measurement of arousal
- linked to teaching schedule & calendar
- working towards stress monitoring application

SCL processing

Raw GSR

Filtering & smoothing

Filtered & smoothed GSR

Aggregating

Discretizing into arousal labels

Histogram over all measurements

GSR with arousal labels

Group visualization

Group visualization

Individual data

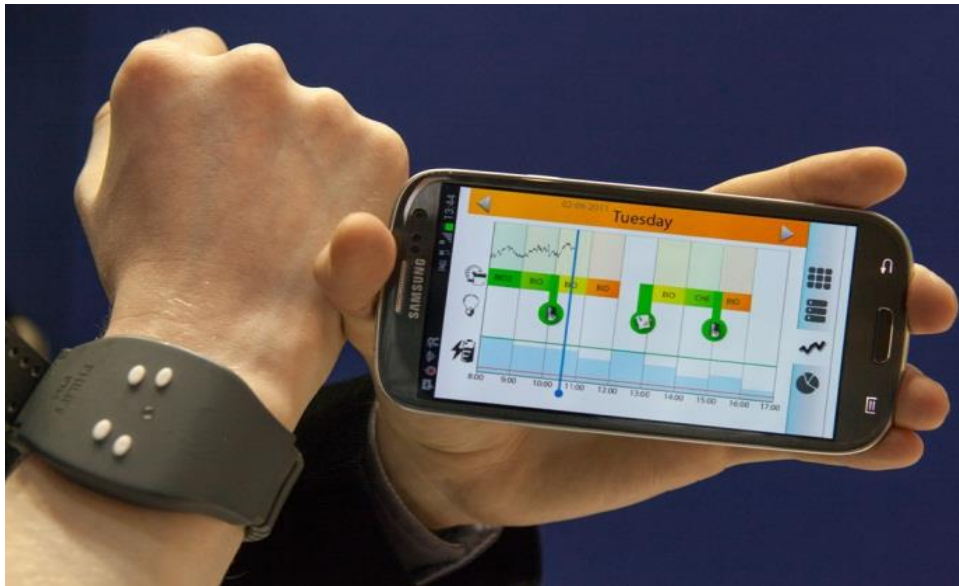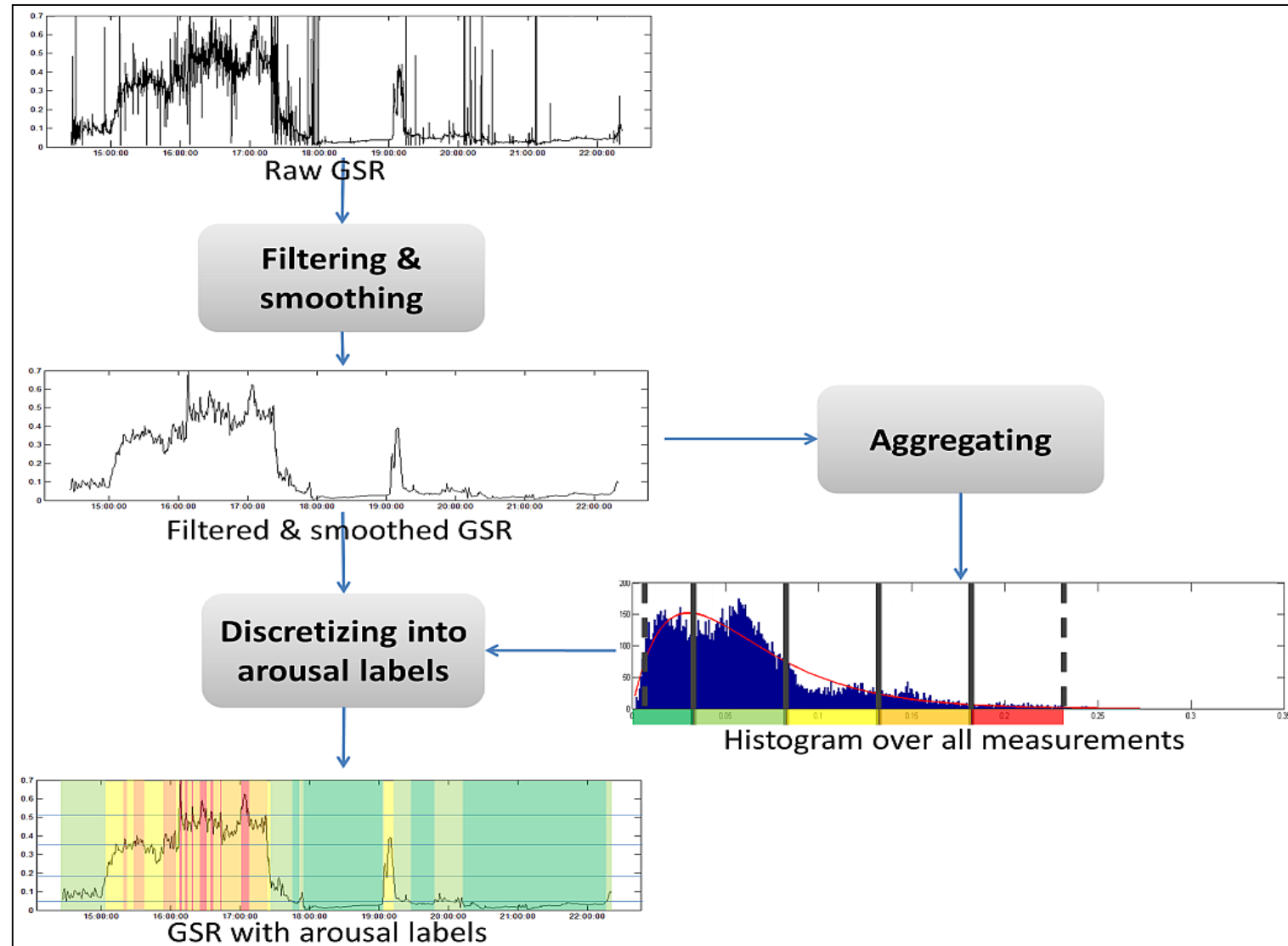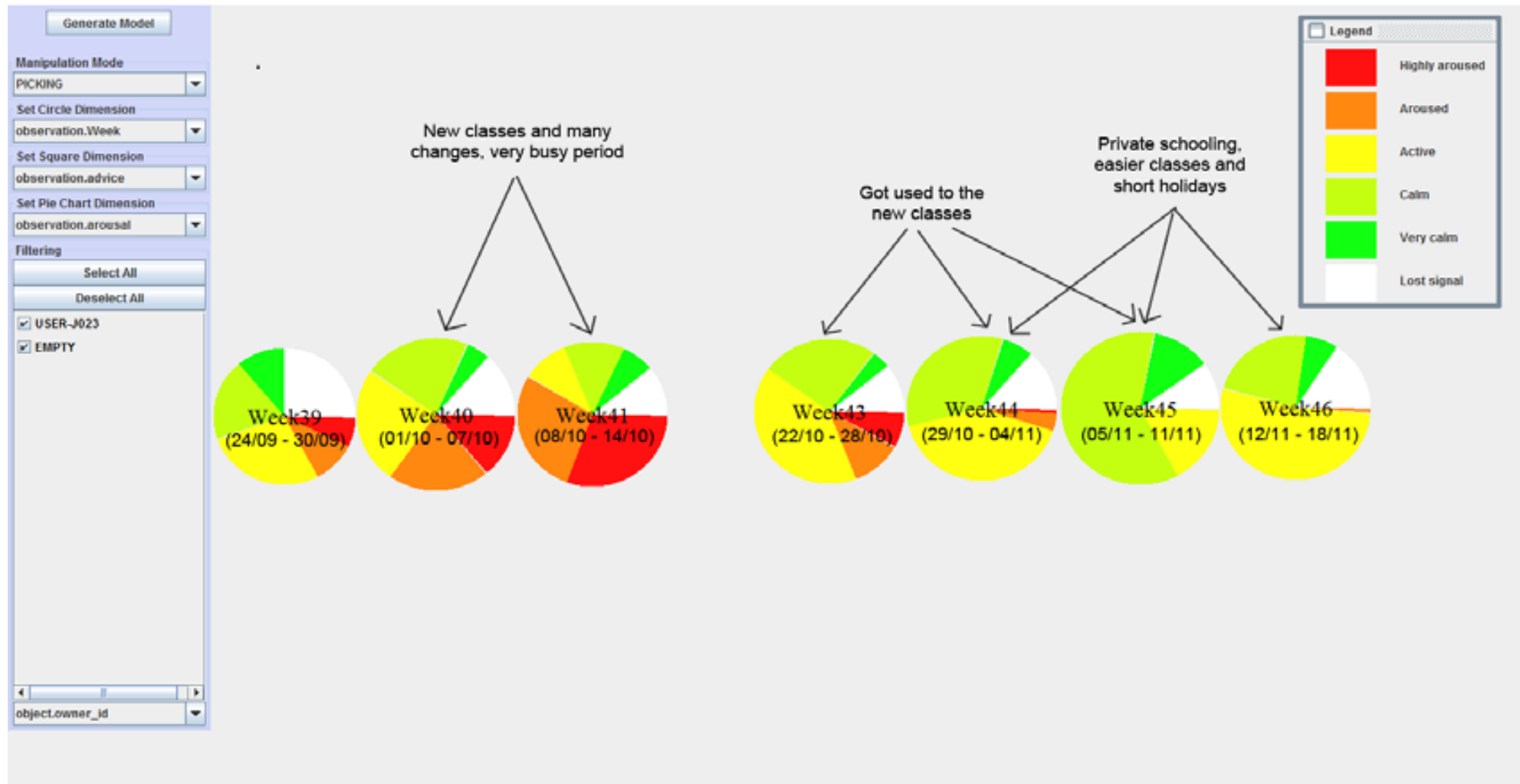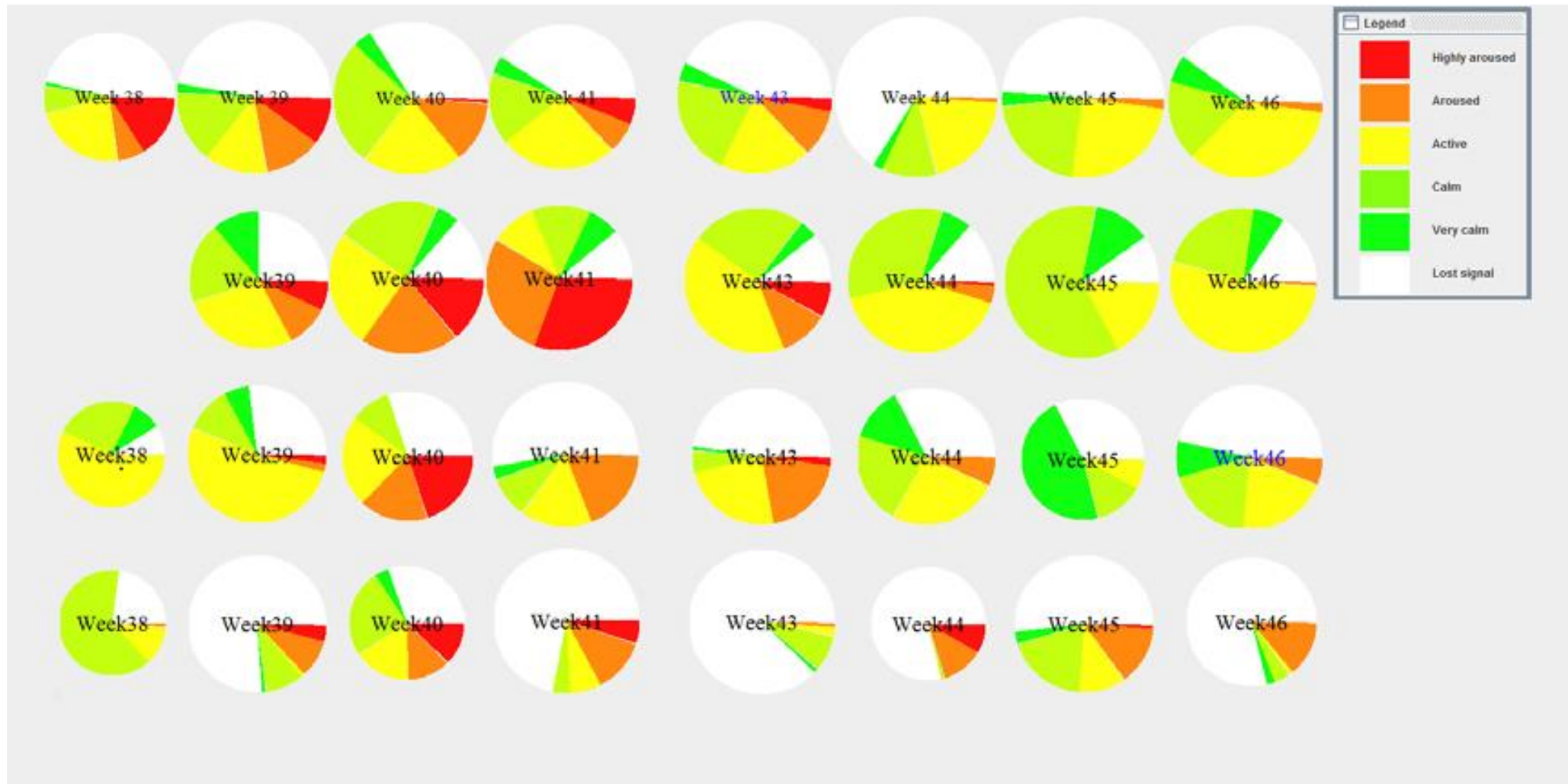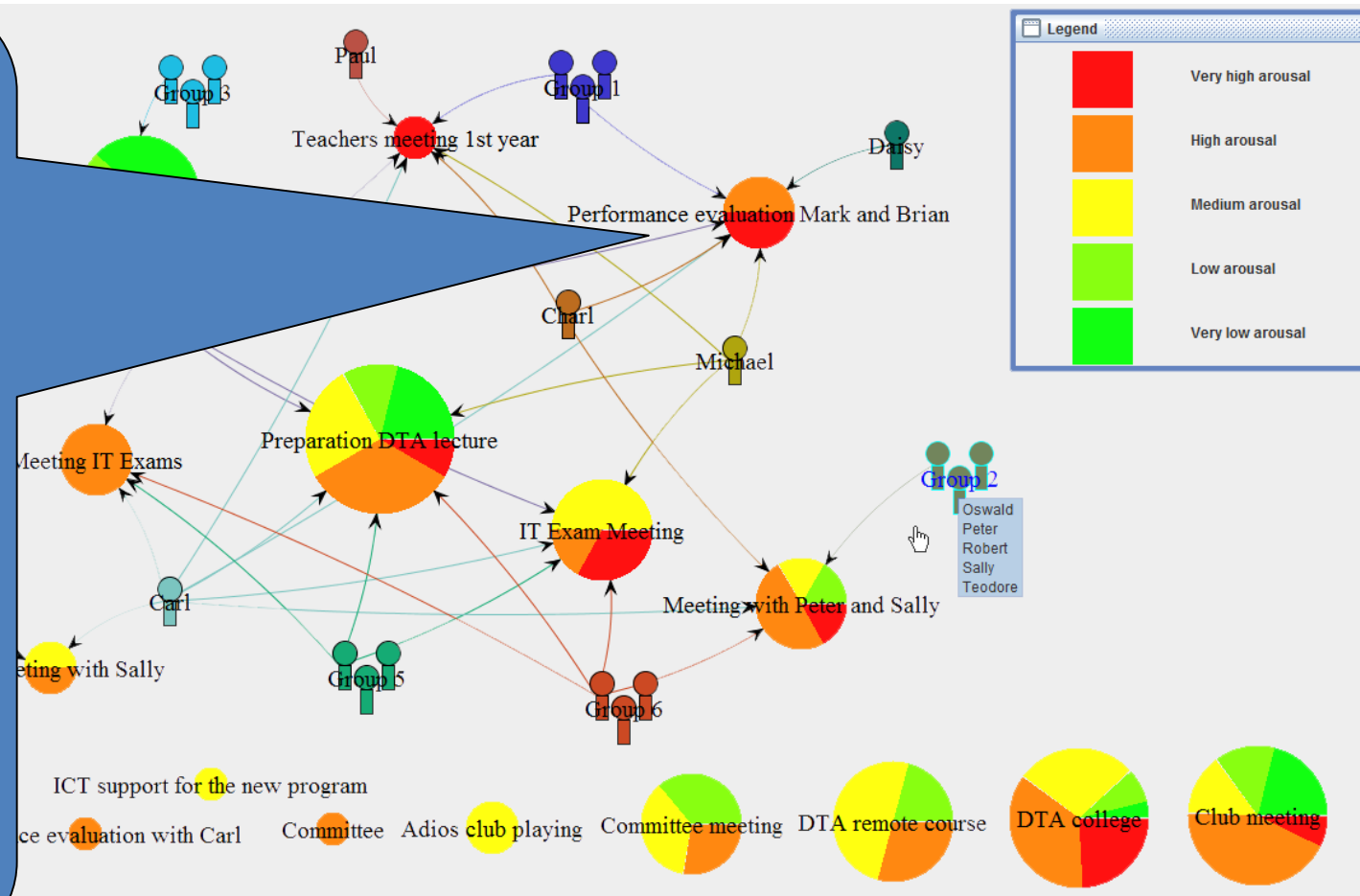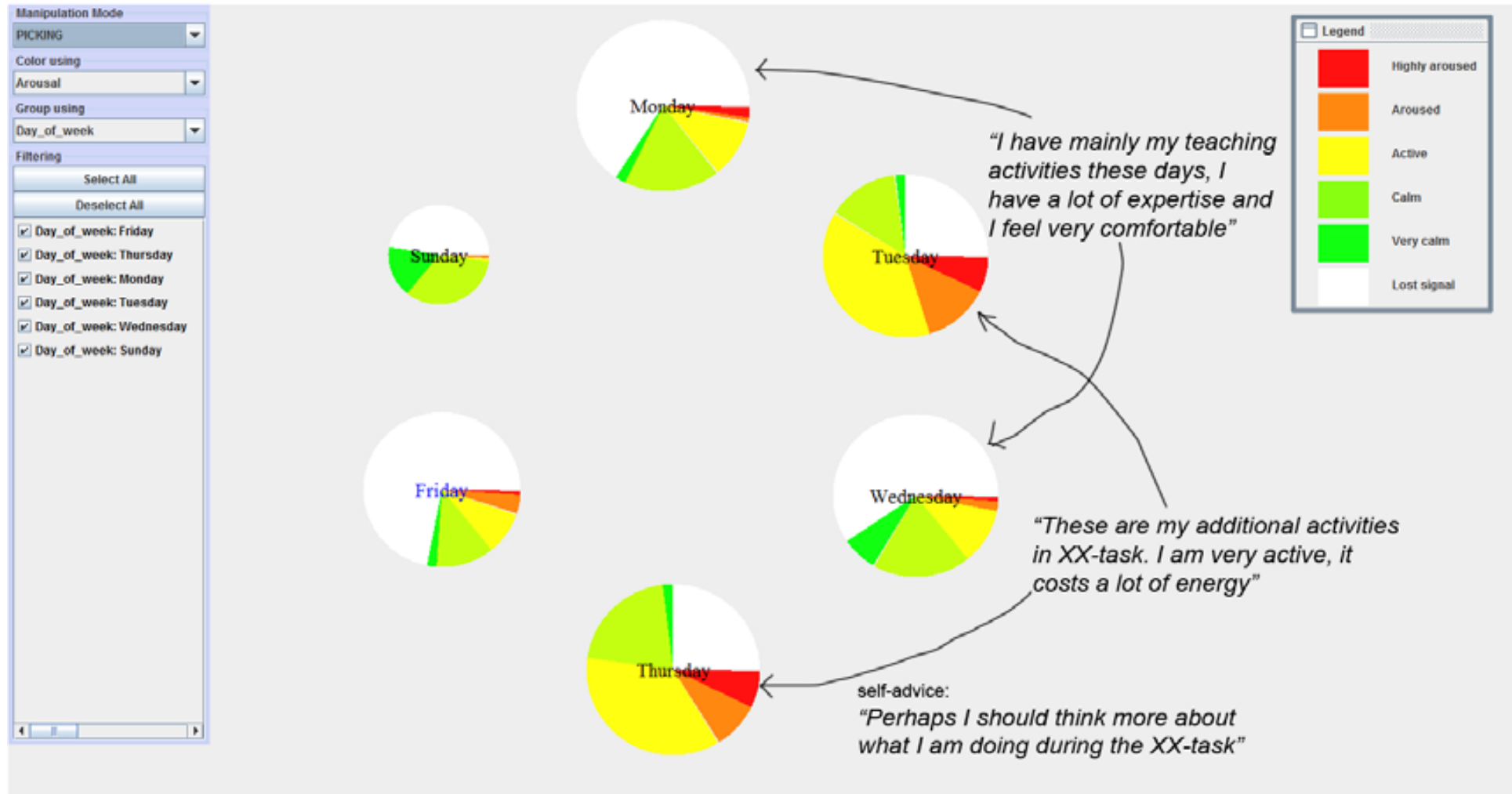"The data that I see about the performance evaluations. The stress level in these job performance evaluations says much more about what the performance evaluation really was like. Much more than what is written on the paper. (...) It does not lie! (Laugh!) The report may lie, but the stress level does not lie."

Individual data

Is stress awareness a good thing?

Stage-based Personal Informatics Model
- gathering information
- personal introspection → awareness
- action


In general, monitoring does help to make changes
- but no proof yet that this is because of awareness
- and stress awareness might also bring more stress

effortless

mood improvement

Automatic detection & improvement of ones mood with music

- music is one of the best self regulation methods to improve mood in the lab (Westermann, 1996), and in real world settings (Thayer, 1989)

- music preference is different for everyone, which makes it a challenge to individualize music selection
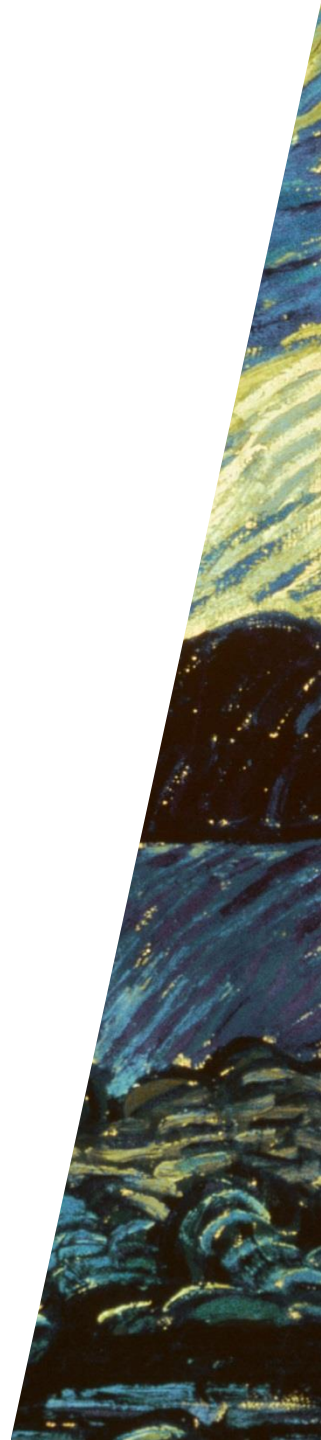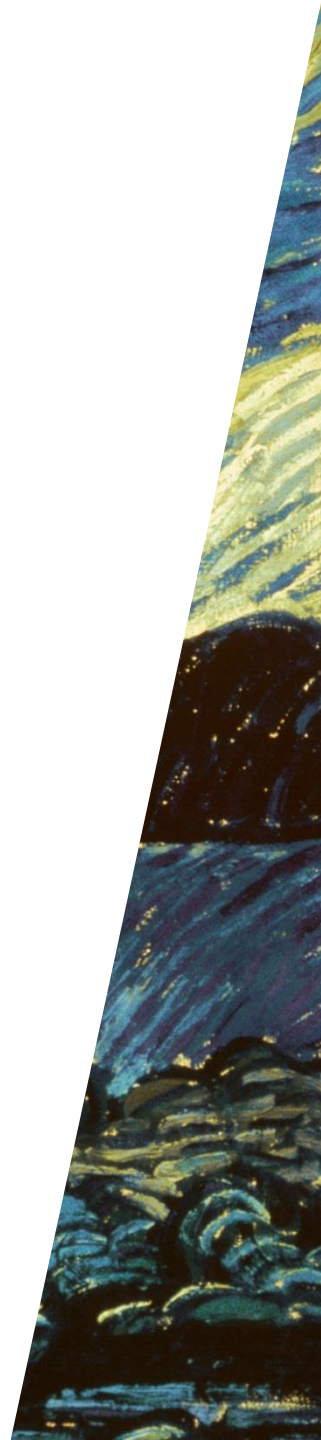
Influence:
select music to
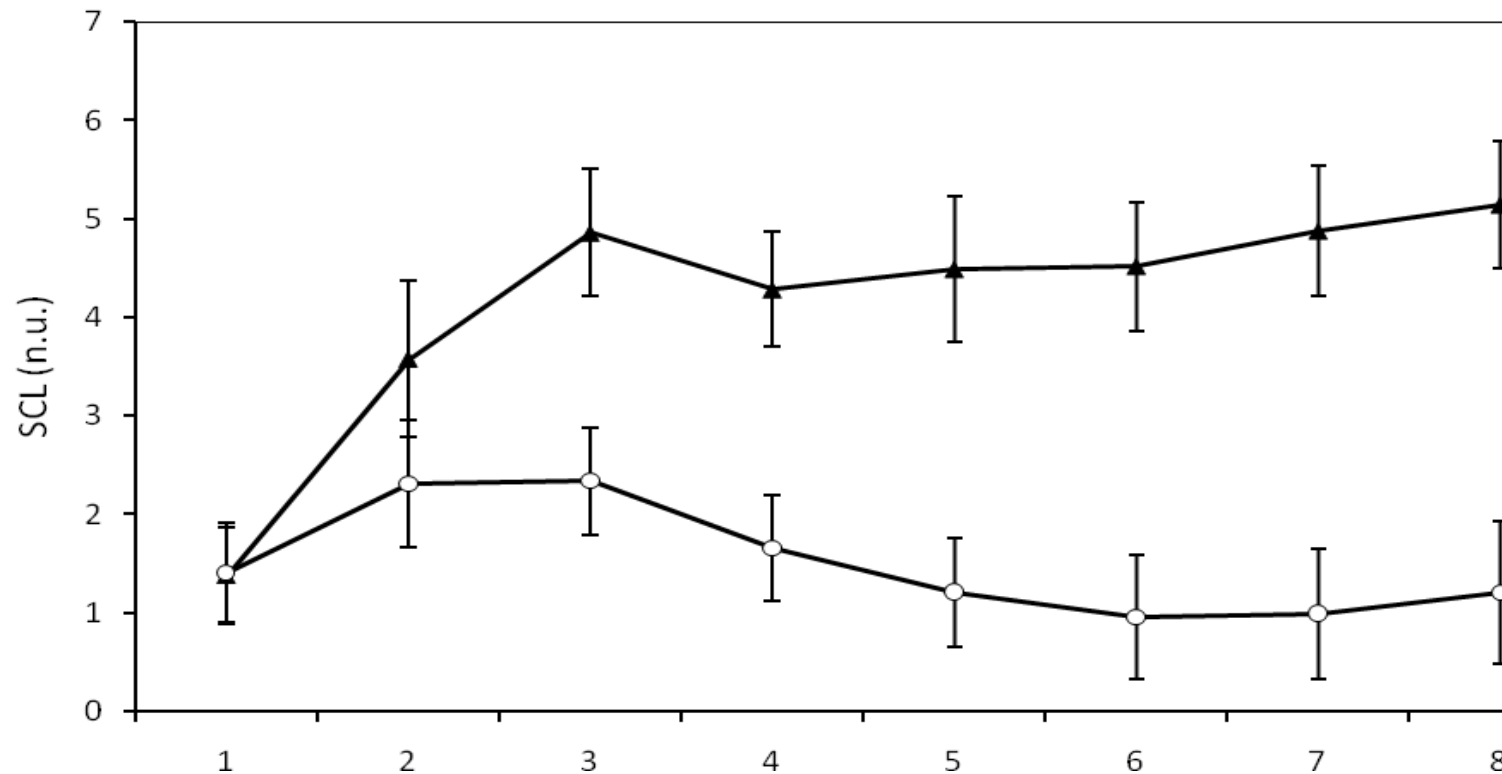reach goal state

Sense:
physiology,
skin conductance

Interpret:
relaxed, active,
or neutral mood

Measuring mood from Physiology
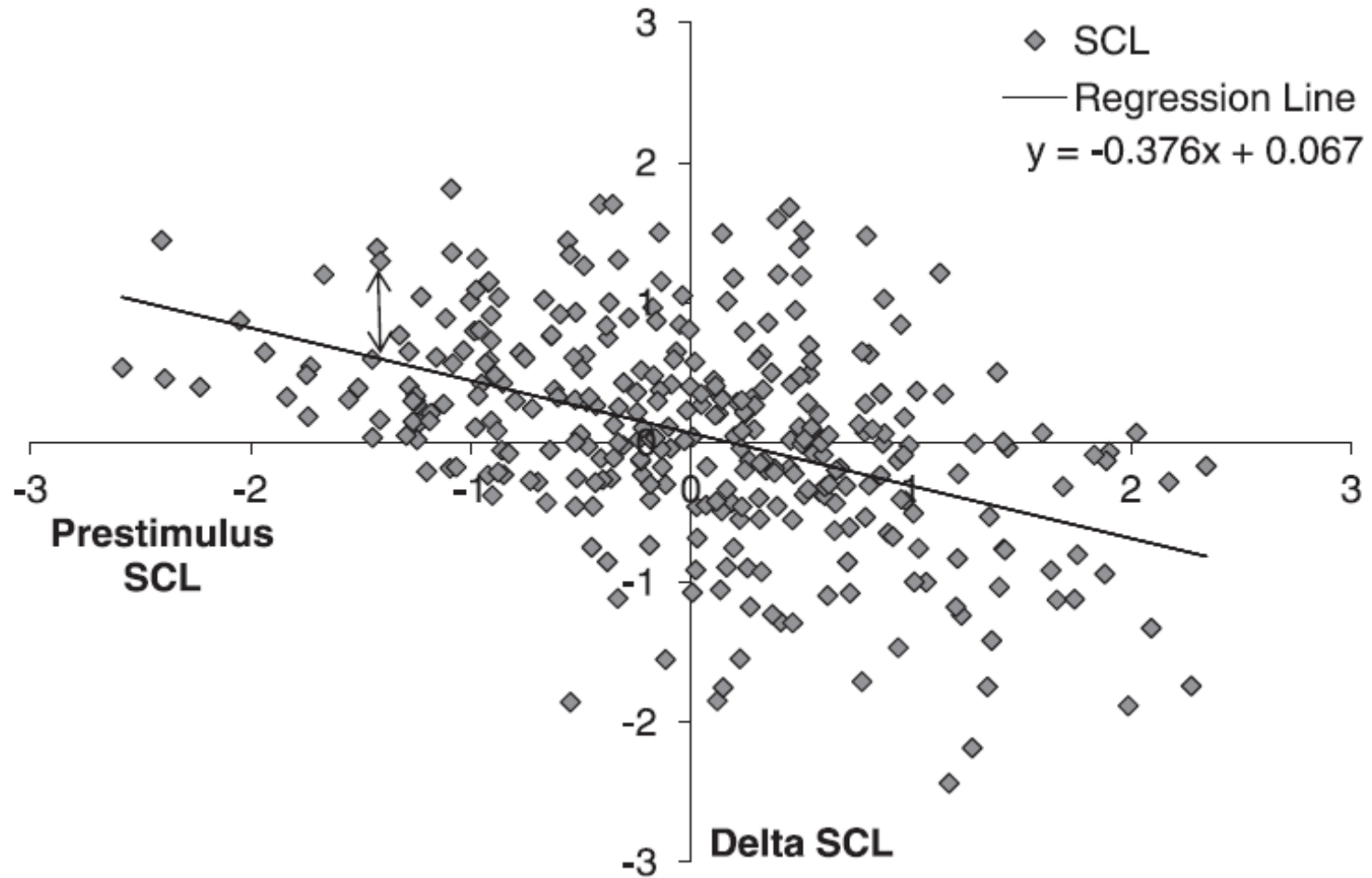
Skin Conductance Level (SCL)
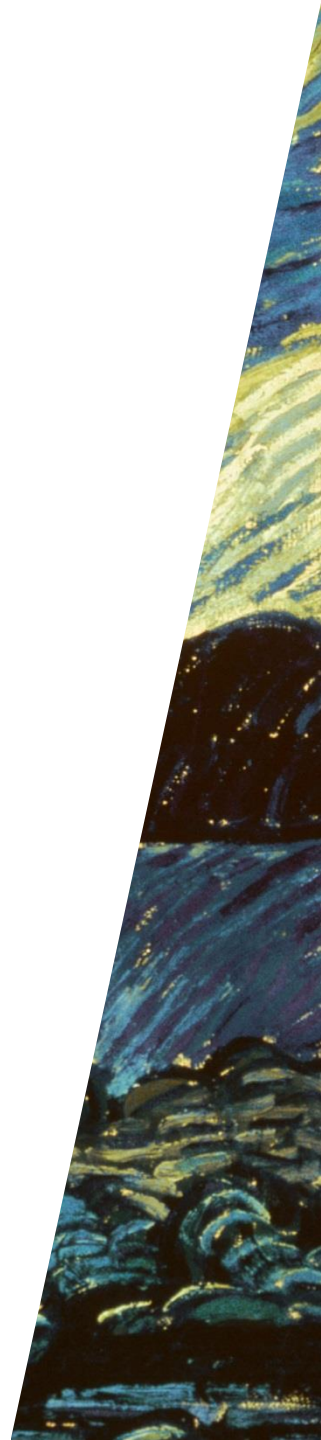- 8 songs self-reported to be positive, exciting (▲)
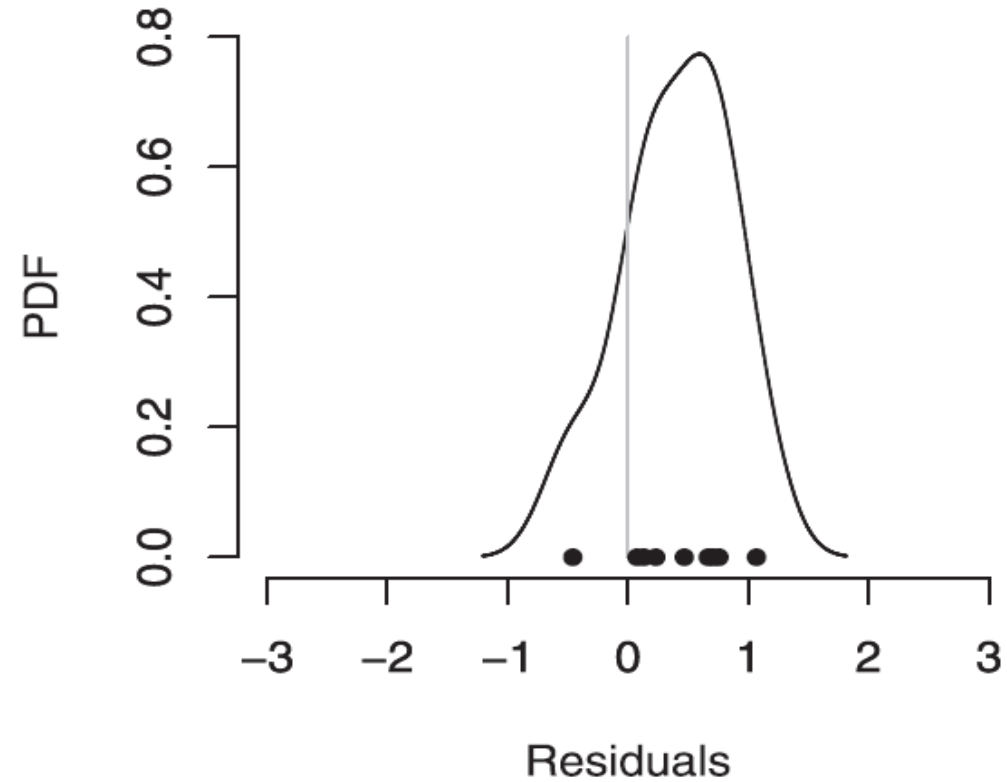- 8 songs self-reported to be negative, relaxing (○)
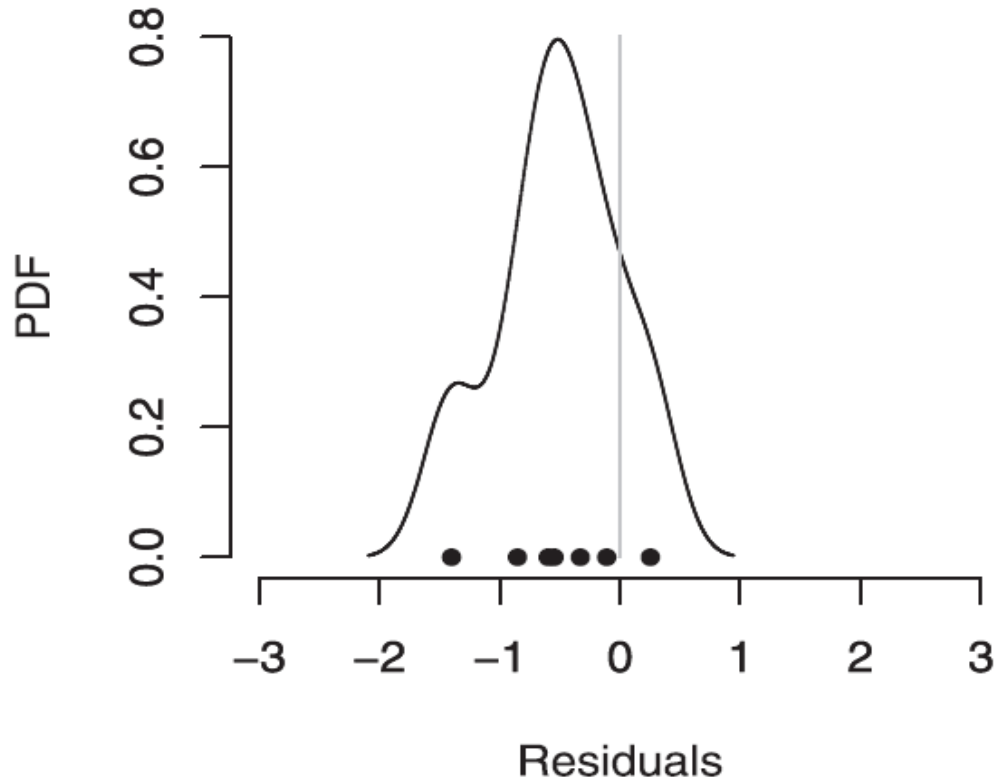
Out of the lab – into real life

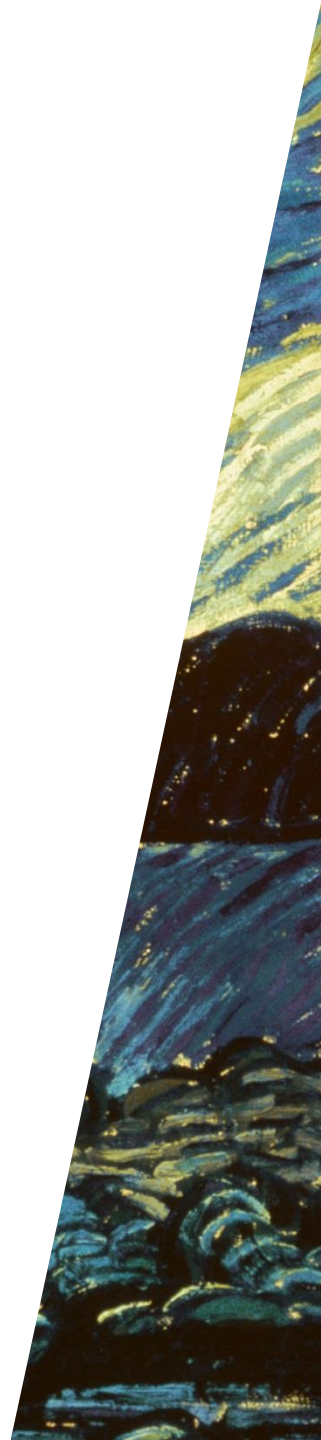# Law of Initial Values

Songs that on average affect SCL

Neutral songs
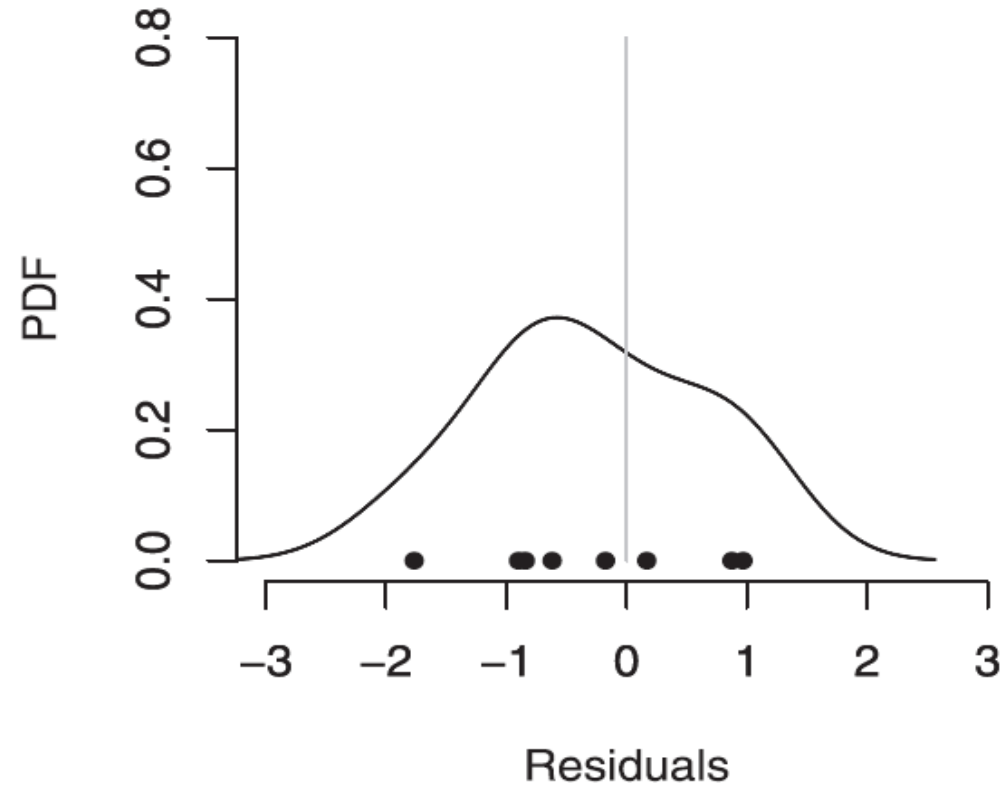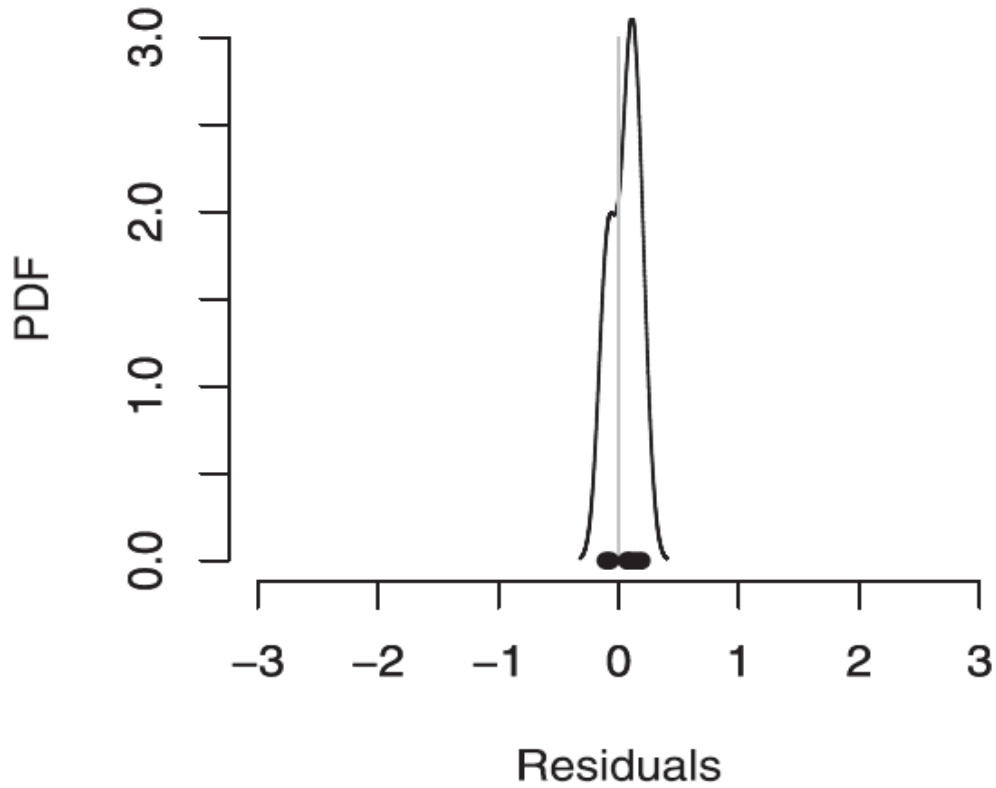
Choosing & presenting music

Measure personal reactions
to individual songs
several times

→ individual probabilistic predictions

Choose song with impact
in right direction
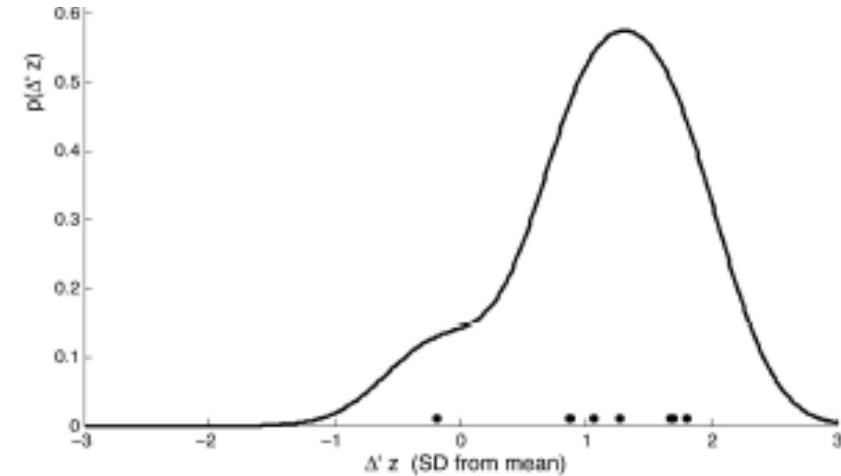
Validation results

Songs selected by the system, based on SCL
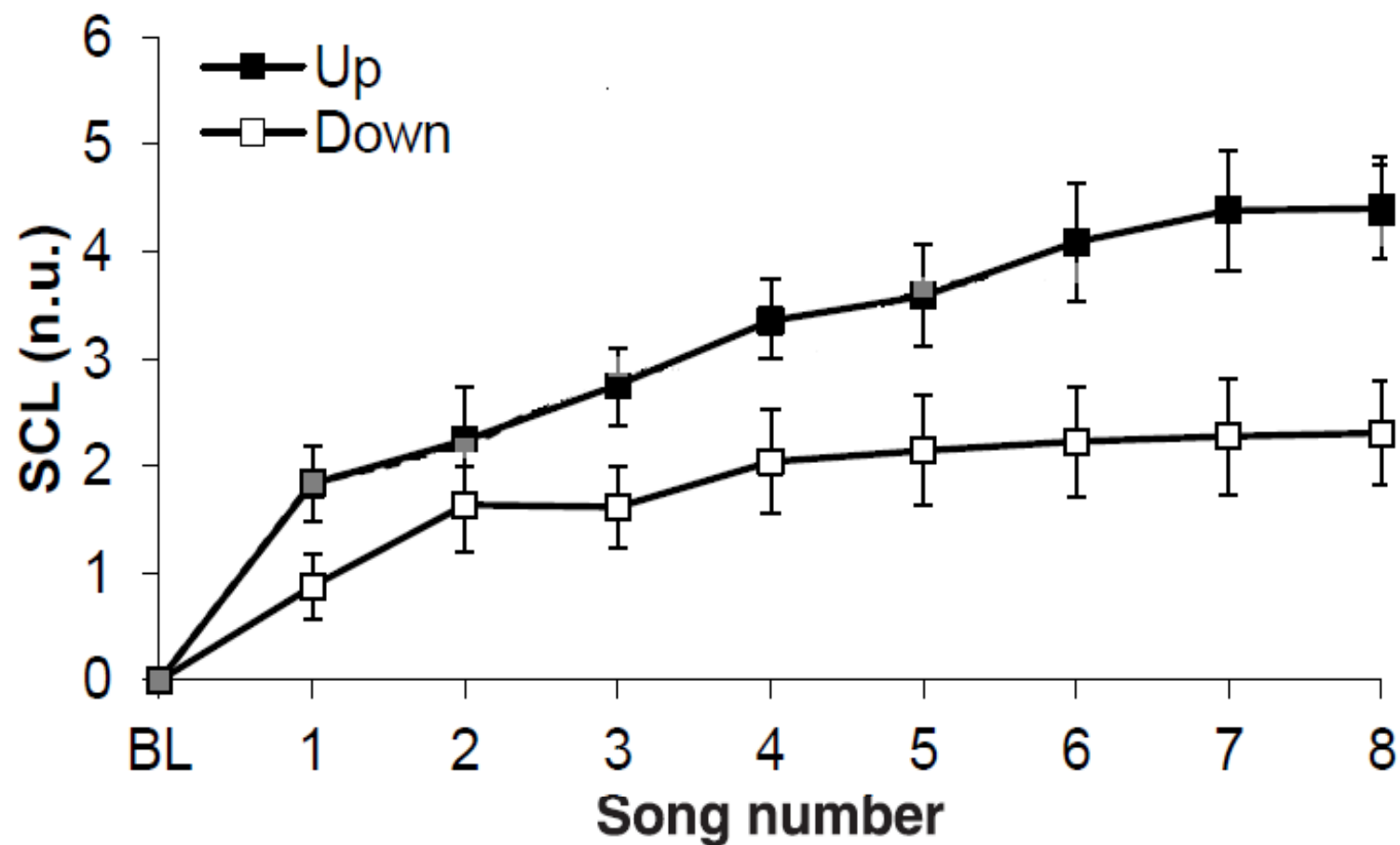
User interface
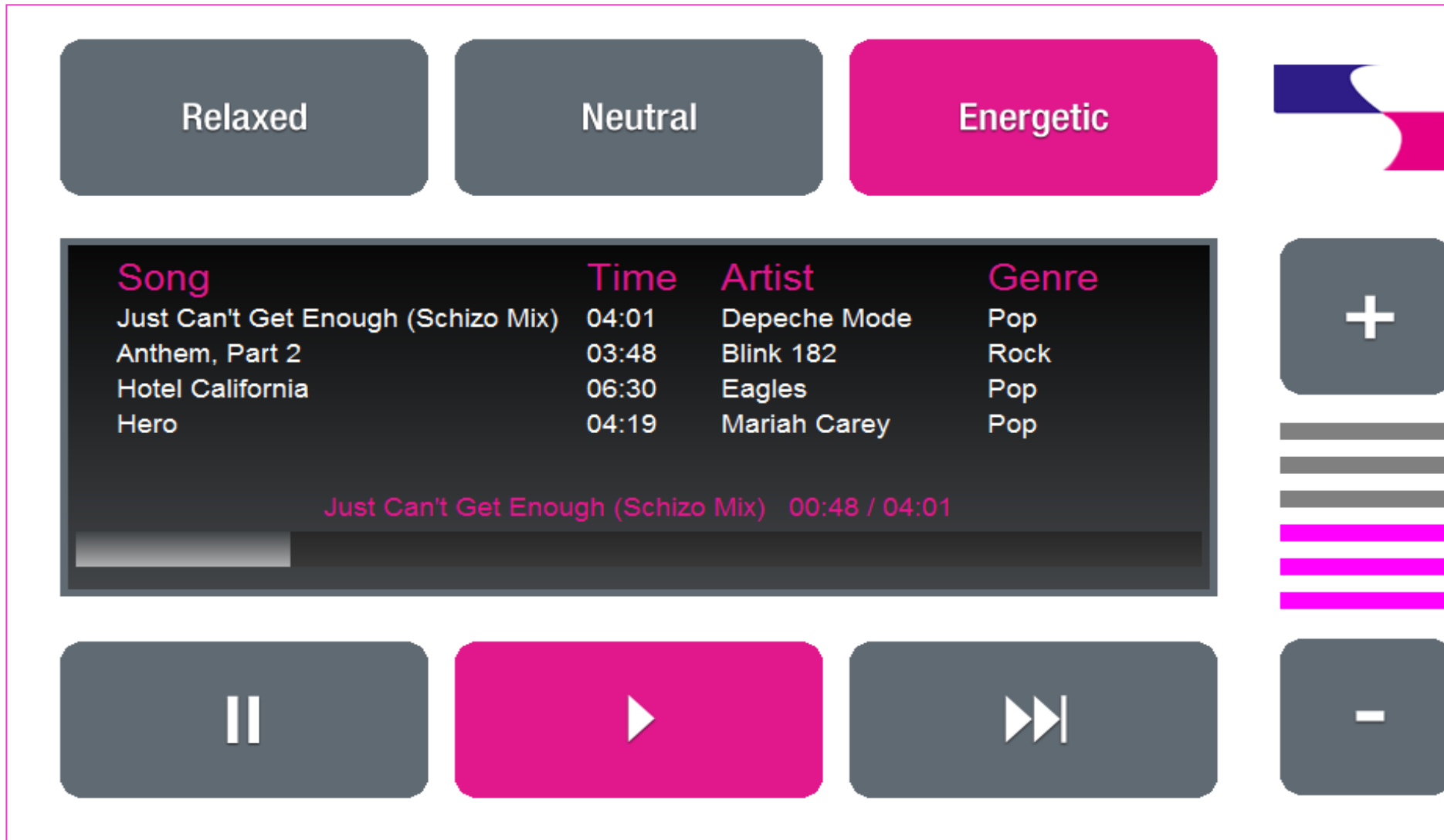
Implementation in Ferrari

Can we use biosignals to increase the feeling of intimacy between two people?
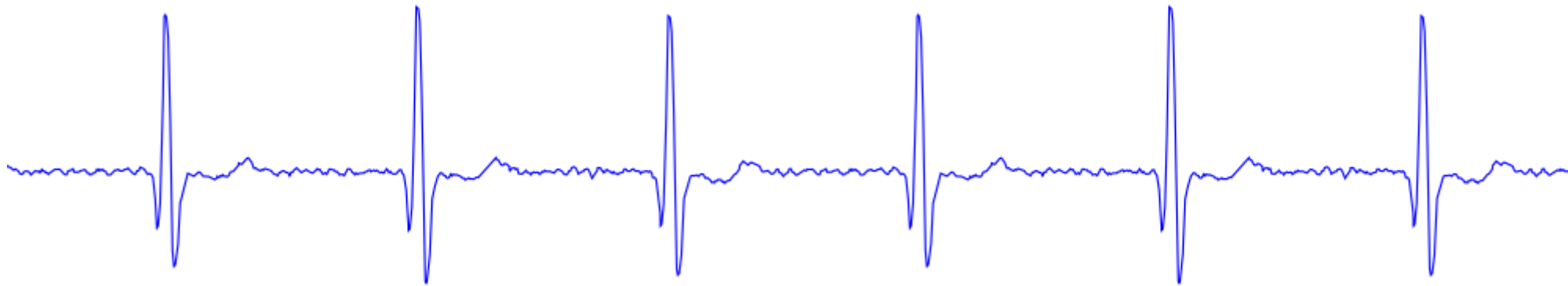
The intimacy of heart beats

While sitting
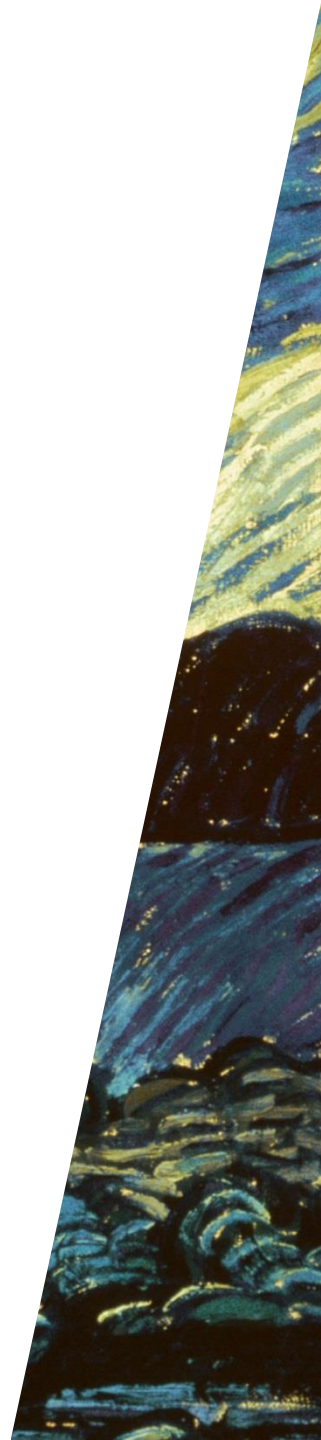- participants sit opposite of confederate
- manipulate distance, gaze, and heart beat sound
- measure experienced intimacy on 2 pictorial items
- in an Immersive Virtual Environment to:
  – control confederate behavior
  – precisely measure location
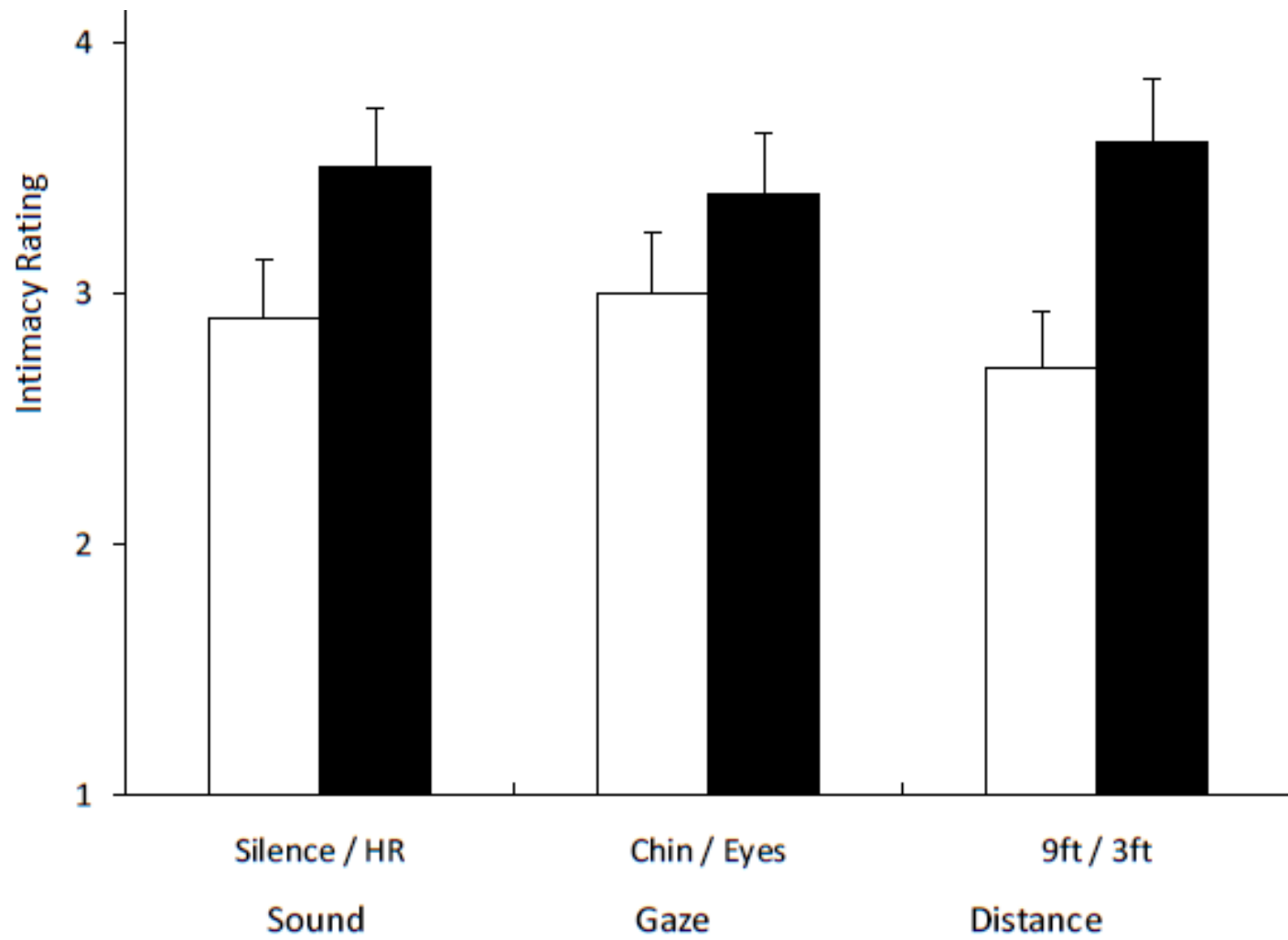
The intimacy of heart beats

While walking
- participants start opposite of confederate
- walk towards them
  - and stop at a position
  - they would feel comfortable
  - for 30 seconds
- measure distance
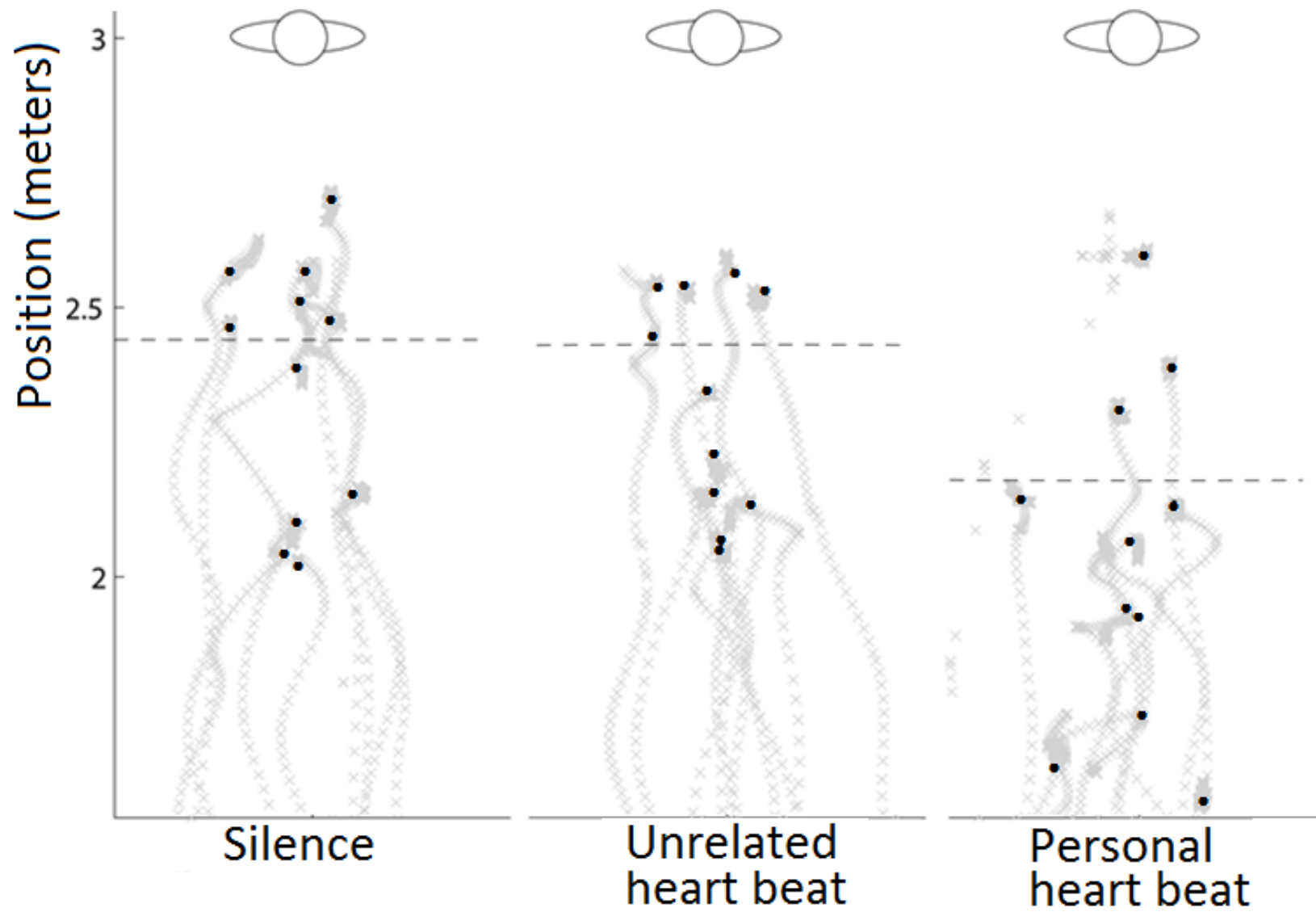
Heart beat exchange in real life

Heart beat exchange in real life

User experiences with heart rate sharing

Heart rate as information → impression management
- not easy to interpret: depends on context
- not always useful: depends on presence of emotions
- preference to hide if useful: especially @work
- fun in games with friends

Heart rate as connection:
→ representation as part of your body
- between partners
- when not otherwise connected

conclusion

Take home messages

Mental & social wellbeing are important to our health
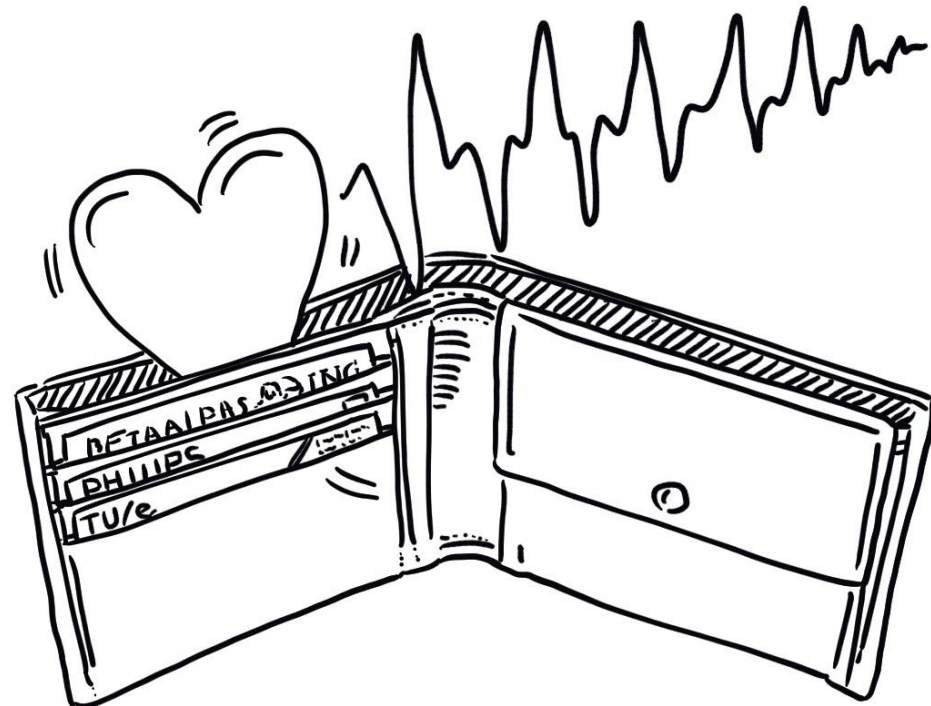
Physiology can help in promoting them
- wearable measurements allow use in every-day life
- accumulation of (big) data allows personalized monitoring & interventions

Areas of interest
- stress awareness through monitoring
- effortless mood improvement
- psychophysiology in communication

RESEARCH Jeremy Bailenson, Gert-Jan de Vries, Geraldine Fitzpatrick, Esther Hilbers, Wijnand Ijsselsteijn, Joris Janssen, Rafal Kocielnik, Fabrizio Maggi, Martin Ouwerkerk, Alessandro Ragnoni, Andreas Schroeder, Natalia Sidorova, Petr Slovak, Marjolein van der Zwaag, Joyce Westerink

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ARTWORK Paul Bril, Caspar David Friedrich, Yves Klein, Jeff Koons, Roy Lichtenstein, Edvard Munch, Peter Paul Rubens, Vincent van Gogh

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