

**LASI 2016**

**Analysis of log data from within the body**  
**: Learning analytics meets psycho-physiology**



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# Introduction

# Introduction

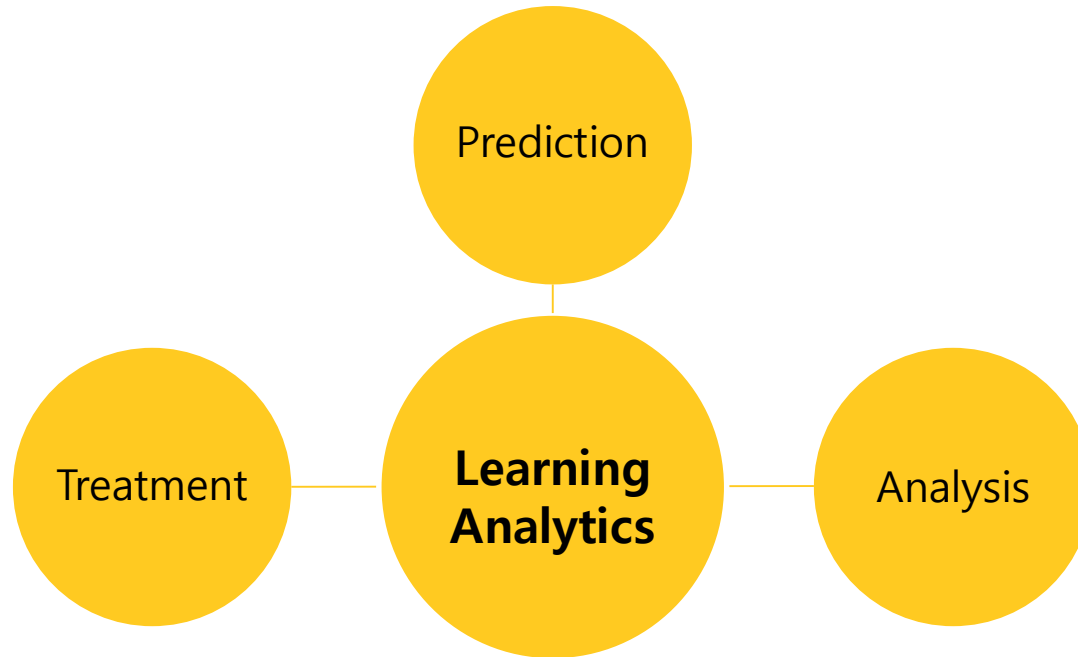


Understand “Learners” by their data



**Learning Analytics**

Who is the Learner?



the measurement, collection, analysis and reporting of **data about learners and their contexts**, for purposes of understanding and optimizing learning and the environments in which it occurs (Siemens, 2011)

It is all about LEARNERS

How can we know learners' mind in online learning environment?

- learners' online log behavior data
- Clustering learners by their online log behavior data
- ...

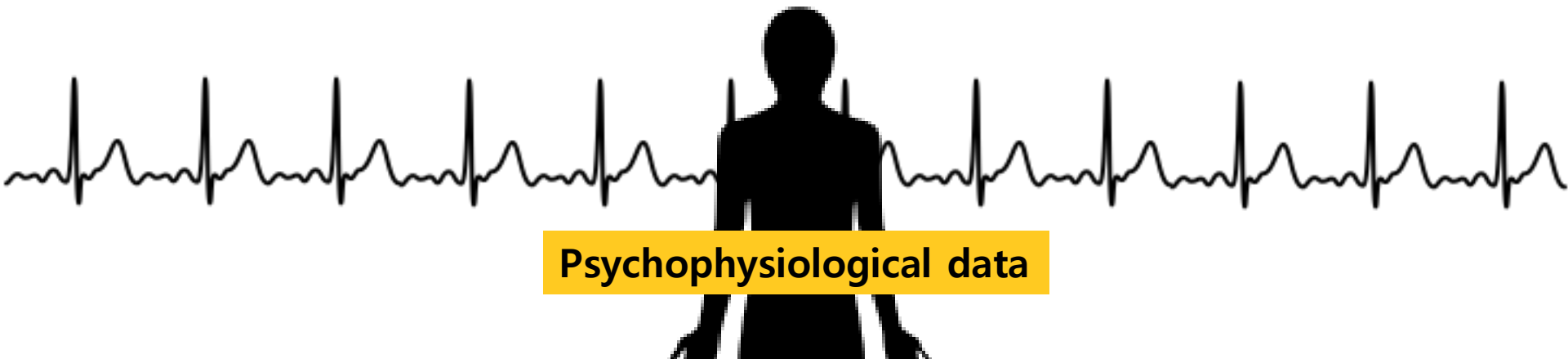
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# Introduction



- By survey ?
- After 15 weeks of class ?

▶ Need fast, real-time data to understand learners in online learning environment



**Psychophysiological data**

# Psychophysiological data



# Psychophysiological data



**Cognitive, emotional and behavioral responses emerged by physiological principles and phenomenon (Cacioppo & Tassinary, 1990)**

# Psychophysiological data

## 1) Advantages



- **Objectivity of data (Ravaja, 2004)**

- Responses from autonomic nervous system
- Able to get learners' unconscious psychological data

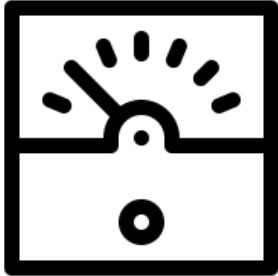


- **Time series data (Lee, 2008)**

- Able to observe changes of learners' responses over time
- Do not need learners' remembrance

# Psychophysiological data

## 2) Disadvantages



- **Measurement issues**

- Need enough time to measure baseline data
- Relatively expensive equipment
- Uncomfortable measure experience



- **Difficulty of definition**

- Hard to match each physiological status to a psychological factor
- Unstable psychological construct (Fusco et al, 2014)

- ▶ Need to study about relationships between psychological factor and physiological data by using variety of psychophysiological data

# Psychophysiological data

## 3) Examples



Eye Movement



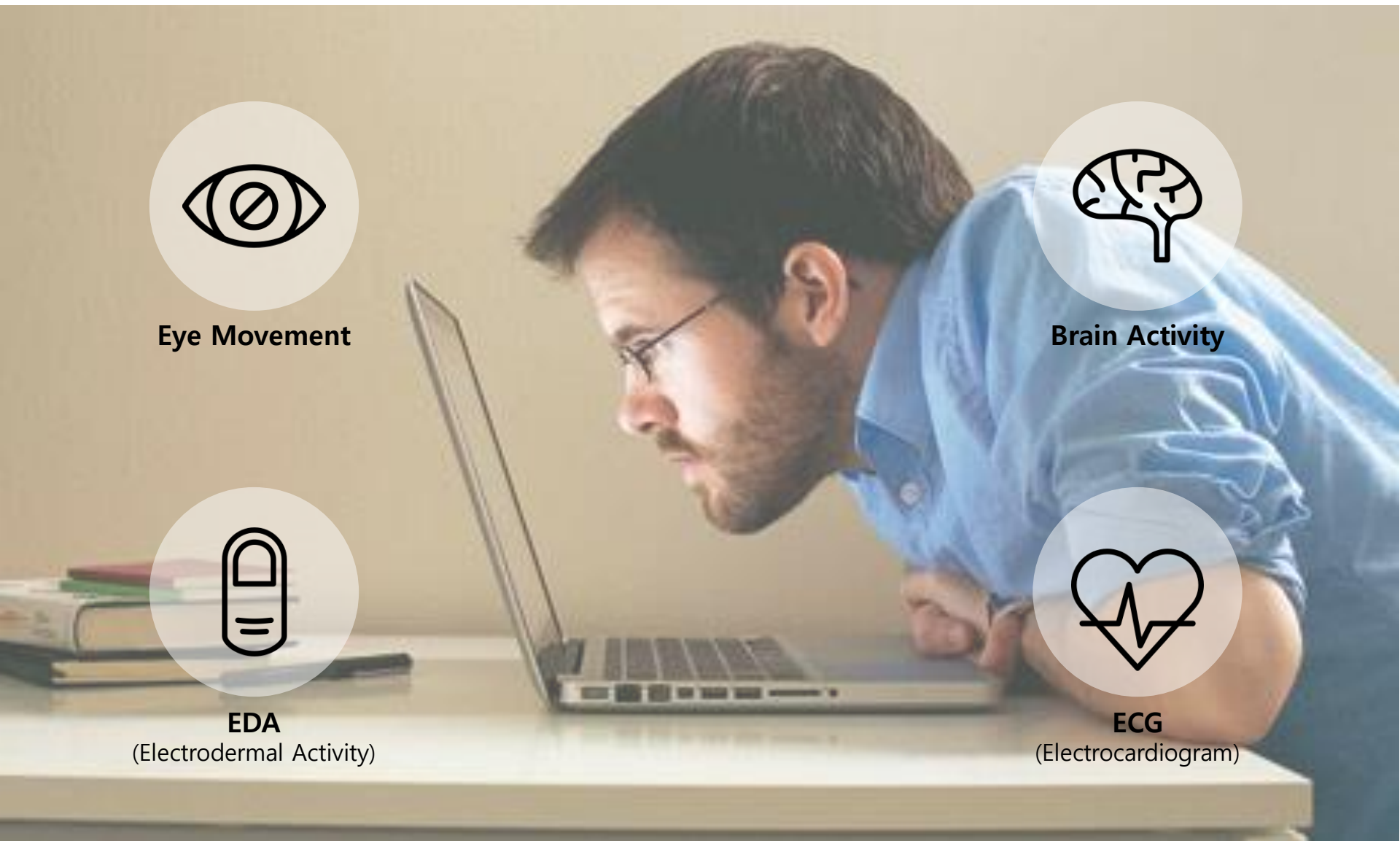
Brain Activity



EDA  
(Electrodermal Activity)

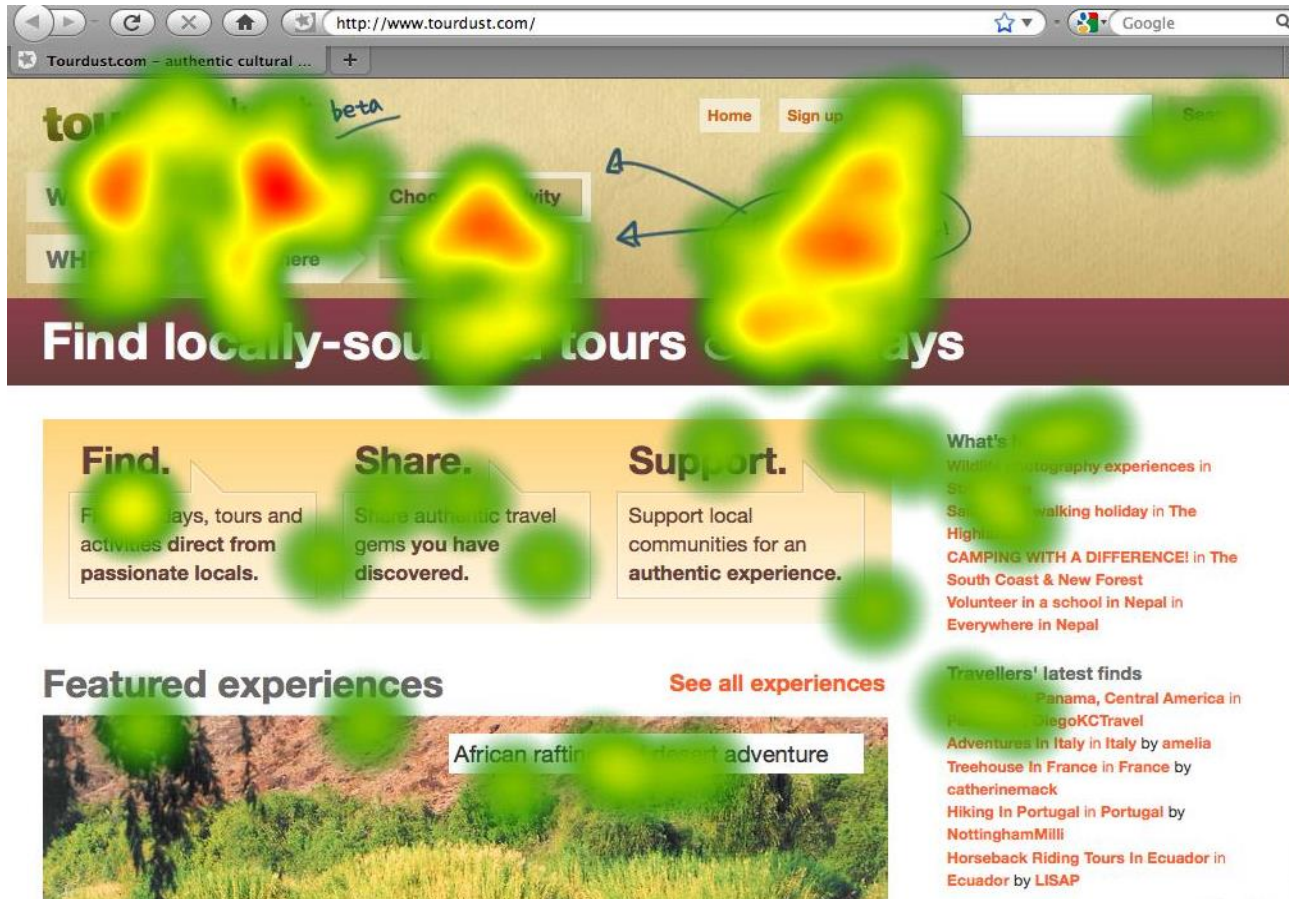


ECG  
(Electrocardiogram)



# Psychophysiological data

## 3) Examples



# Psychophysiological data

## 3) Examples



The computer calculates that there is a **96%** chance that **this** is a smile.

### Smile

The system is correctly registering her facial expression as a smile.

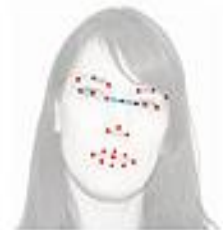


### Tracking Points

The system identifies 25 points on the face and tracks their movements.



The software uses the angle between the two inner eye corners to estimate a head roll.



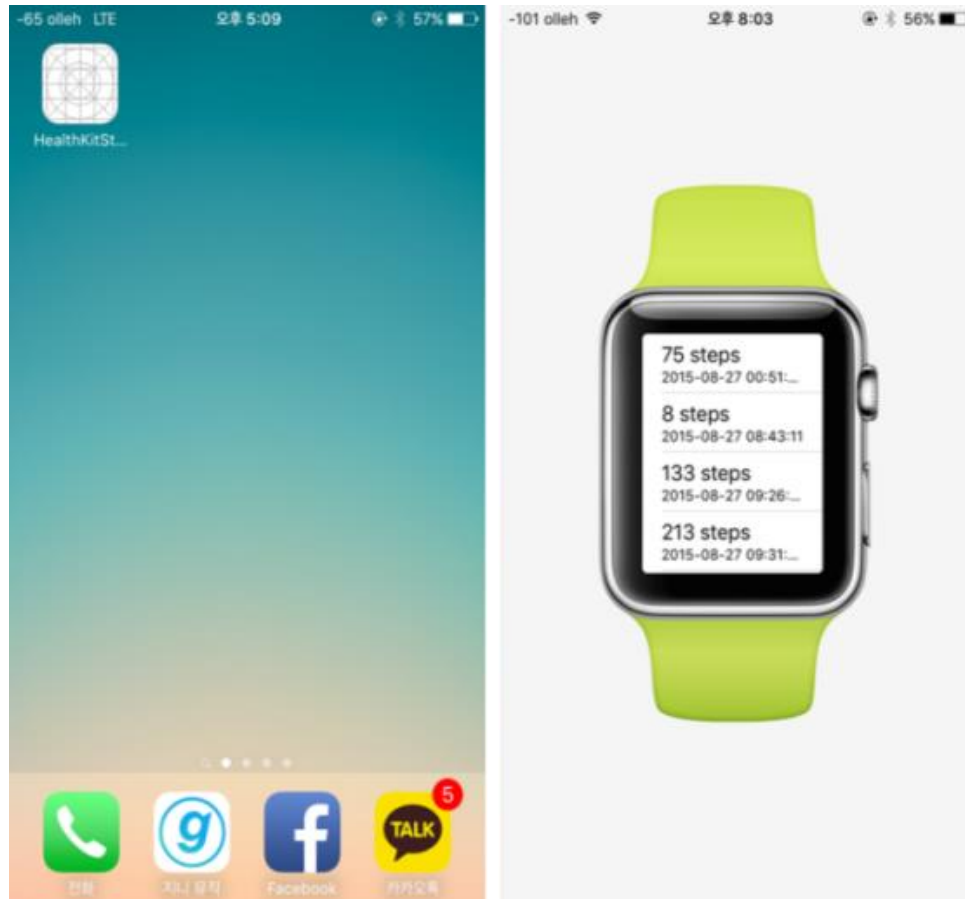
A smile is calculated by the motion and the change in the angle of the points around the mouth.



By SERGIO PEÇANHA and XAQUÍN G.V./THE NEW YORK TIMES

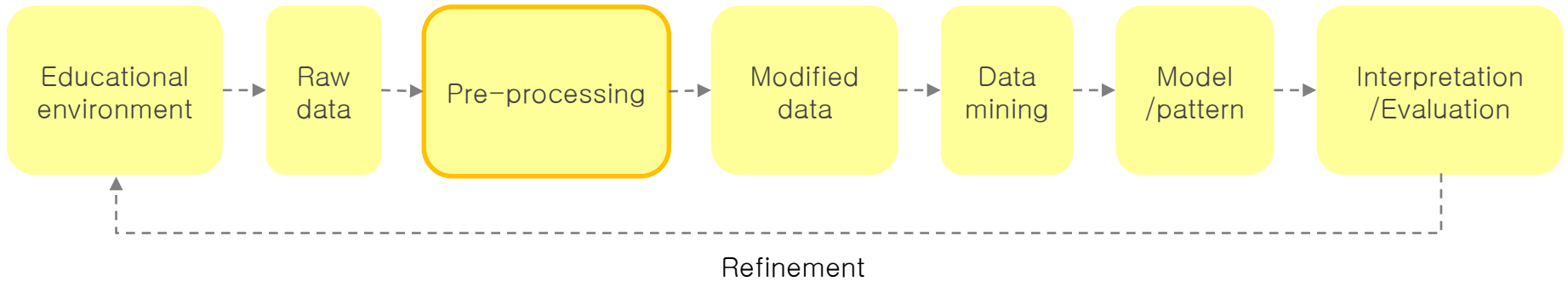
# Psychophysiological data

## 3) Examples



# Psychophysiological data

## 4) Concerns



### ● Different data unit



Eye-tracker

60 frames/sec



Face reading SW

14 frames/sec



EEG Sensor

14 frames/sec



ECG sensor  
in Applewatch

A frame per 5 sec



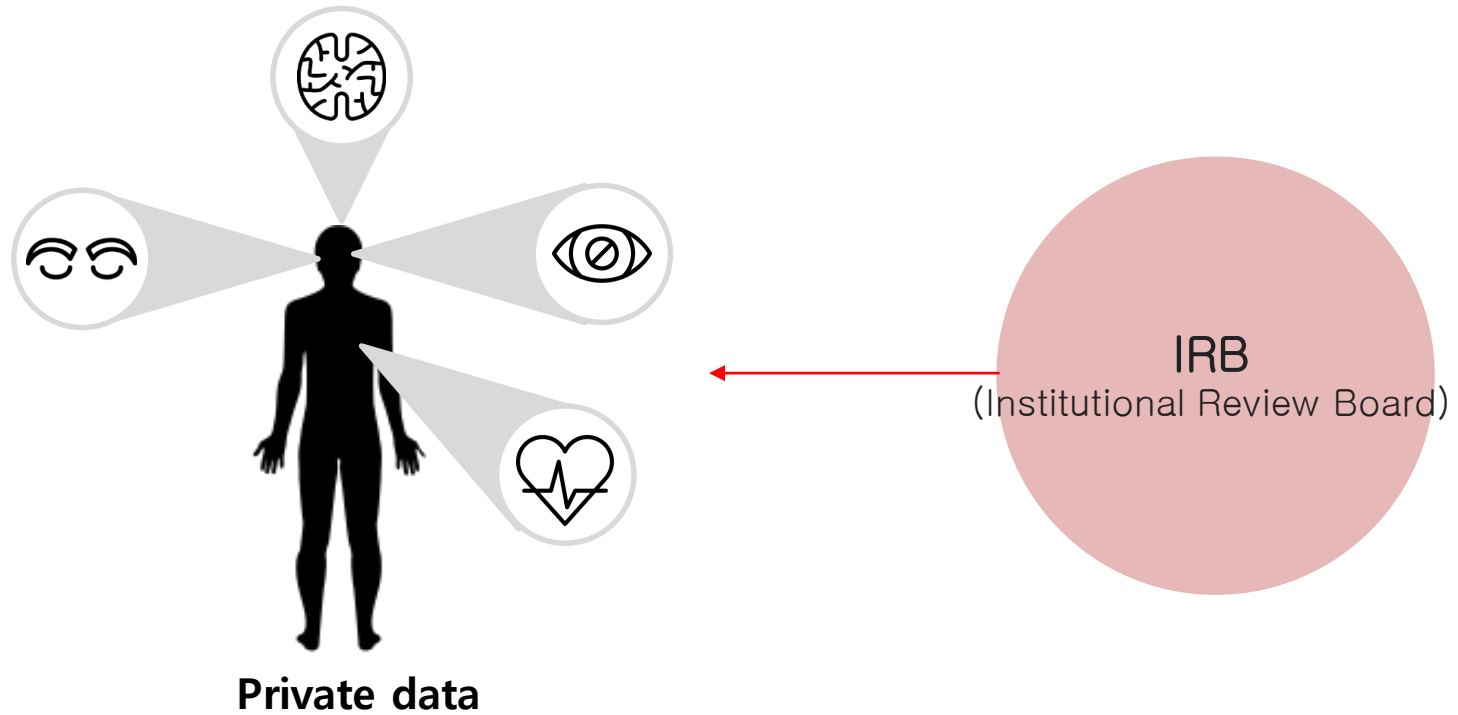
Need criteria to integrate data



# Psychophysiological data

## 4) Concerns

- Risk of privacy invasion

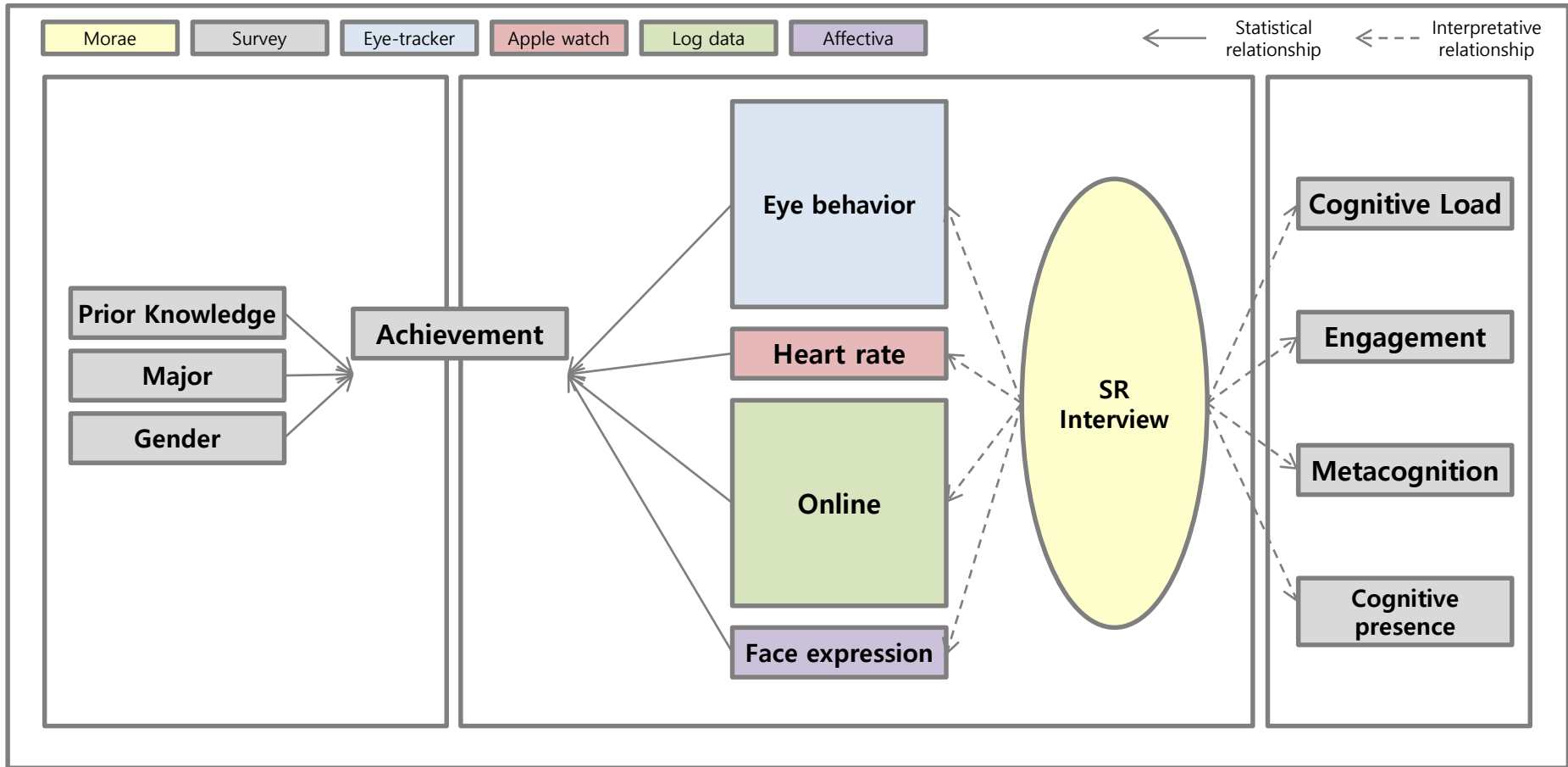


▶ Need more efforts to protect learners' right



# Psychophysiological data

- Model to use psychophysiological data



# Research

1st Stage



[ What learners do ]

- Observation
- Log data

2nd Stage



[ Why learners do that ]

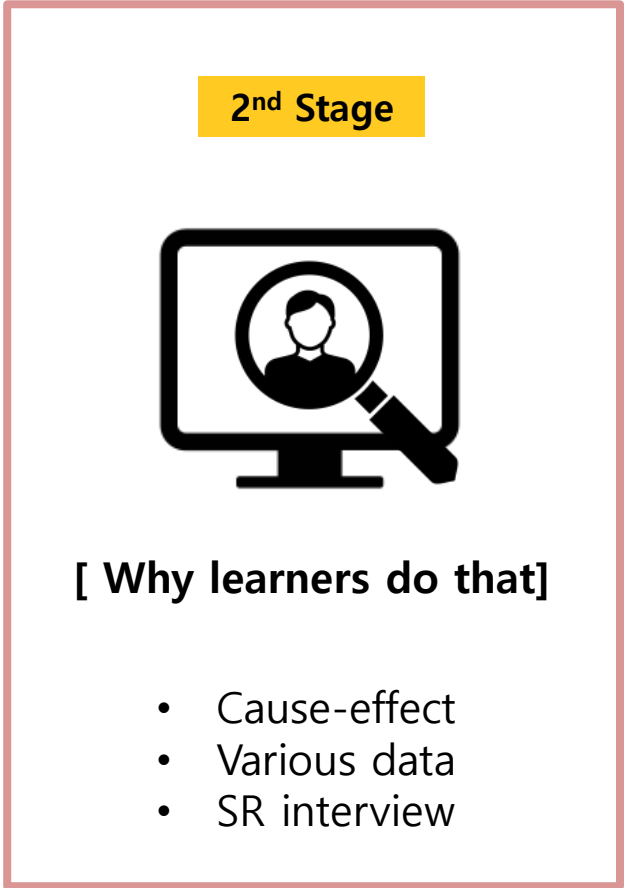
- Cause-effect
- Various data
- SR interview

3rd Stage



[ How to treat learner ]

- Treatment
- E.T approach



## Learner Analysis

# Research

## 1) 1<sup>st</sup> Stage



Login Time & Frequency



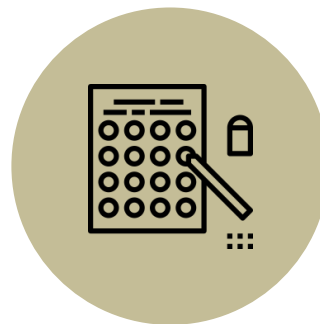
Time on Movie



Time on Discussion



Dropout rate

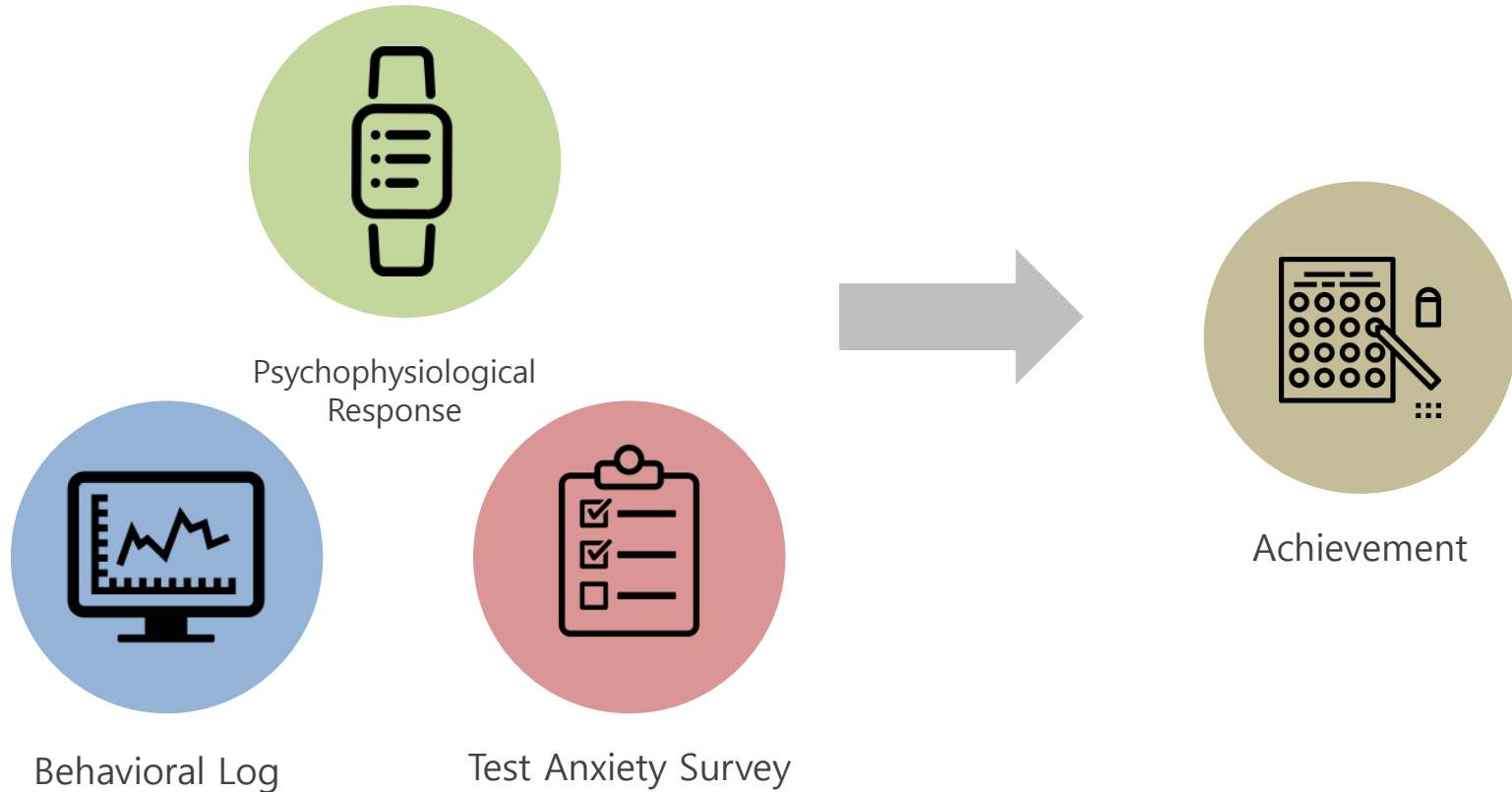


Achievement

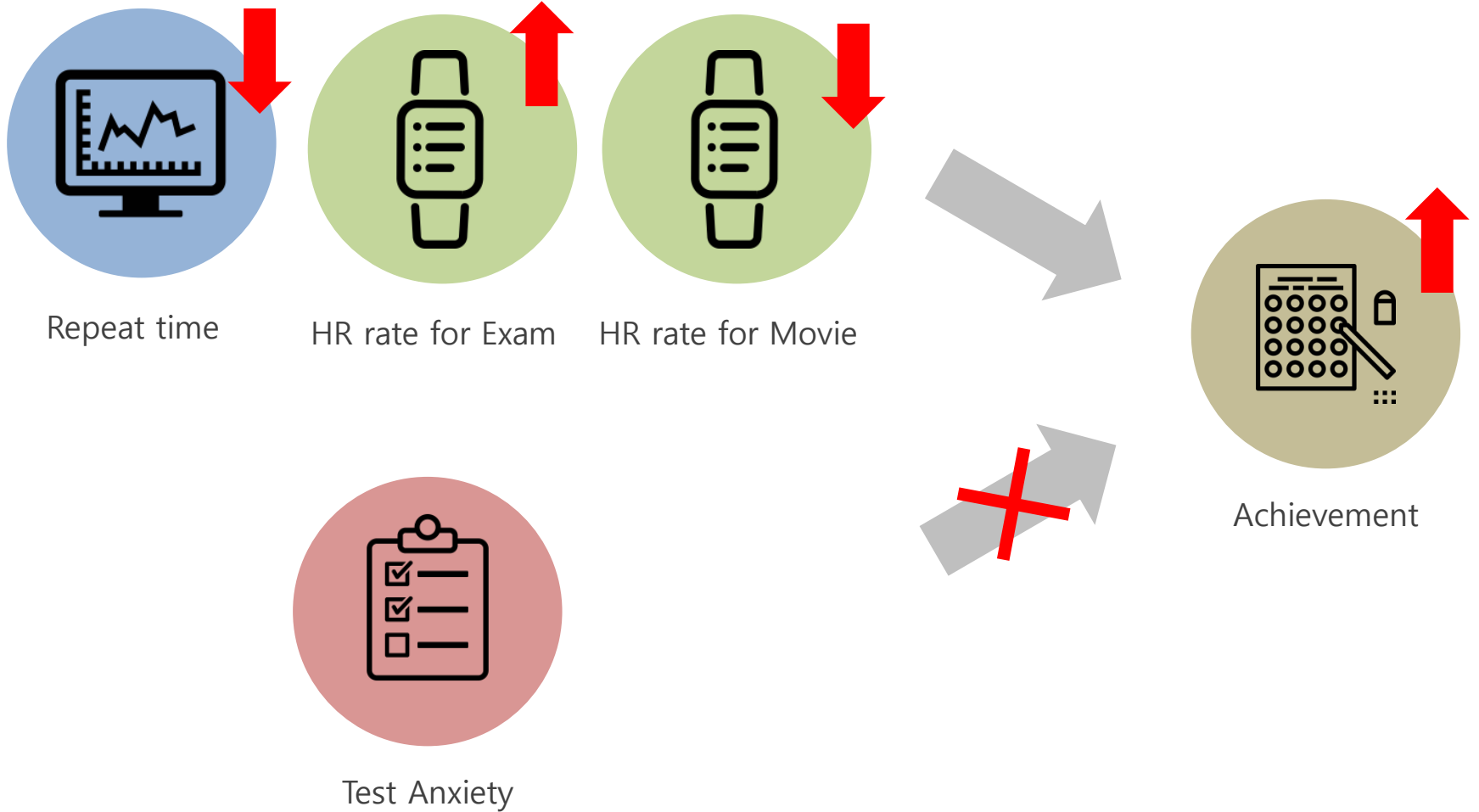
# Research

## 2) 2<sup>nd</sup> Stage

- The initial attempt



**Psychophysiological approach with Learning Analytics**





- **Second attempt**

Brainwave data



Facial Expression data

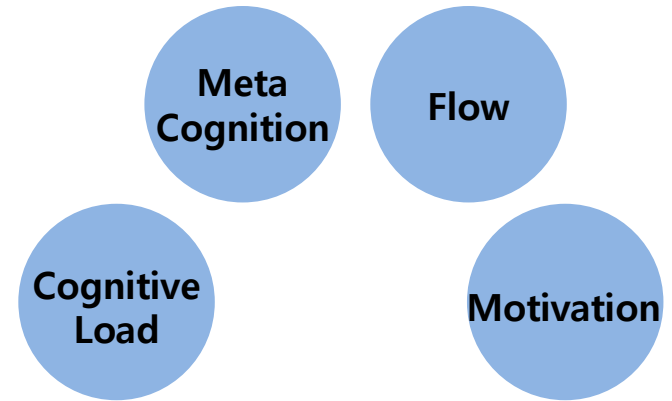


Eye behavior data

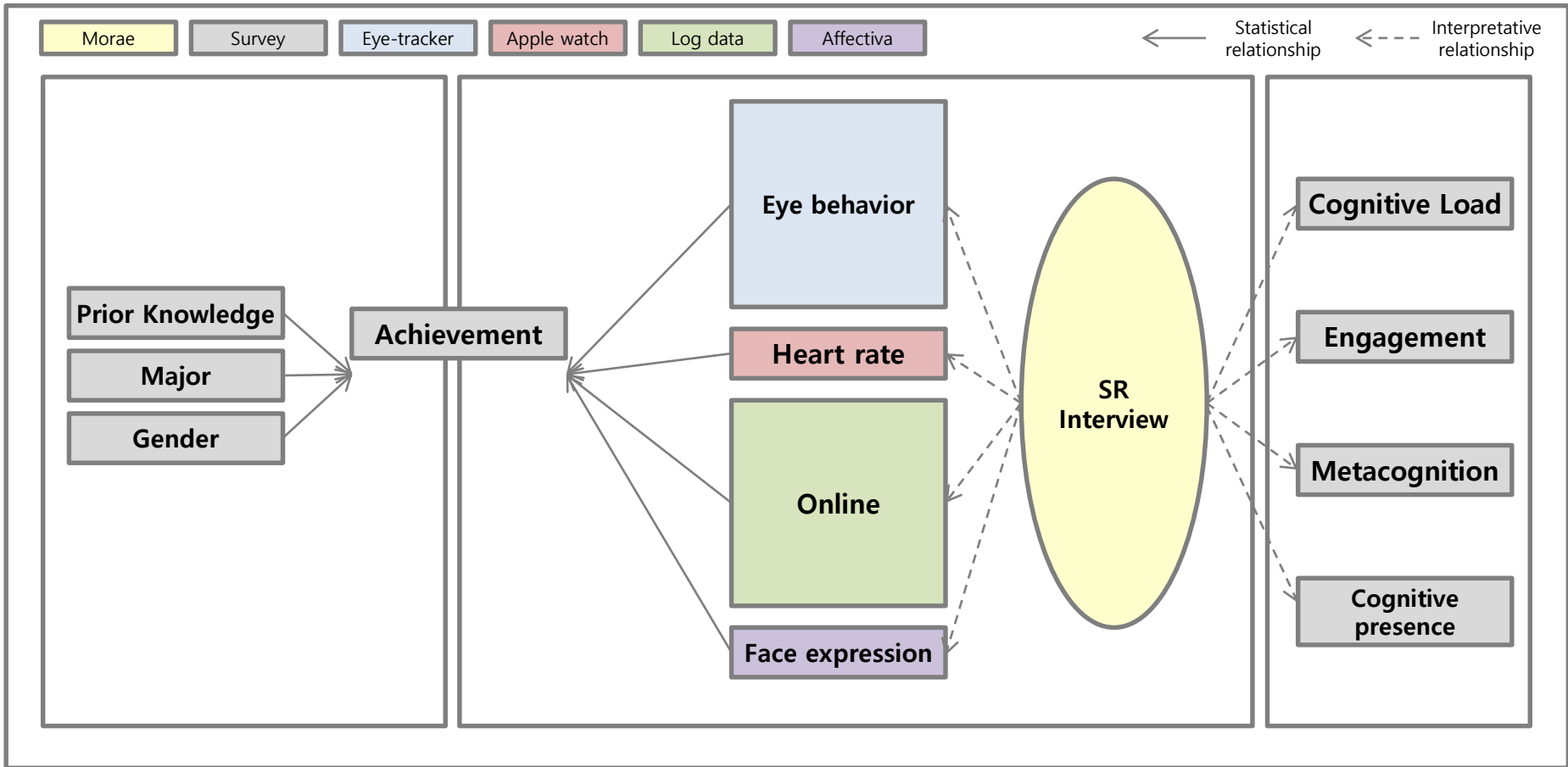


Heart Rate data

Psychophysiological data

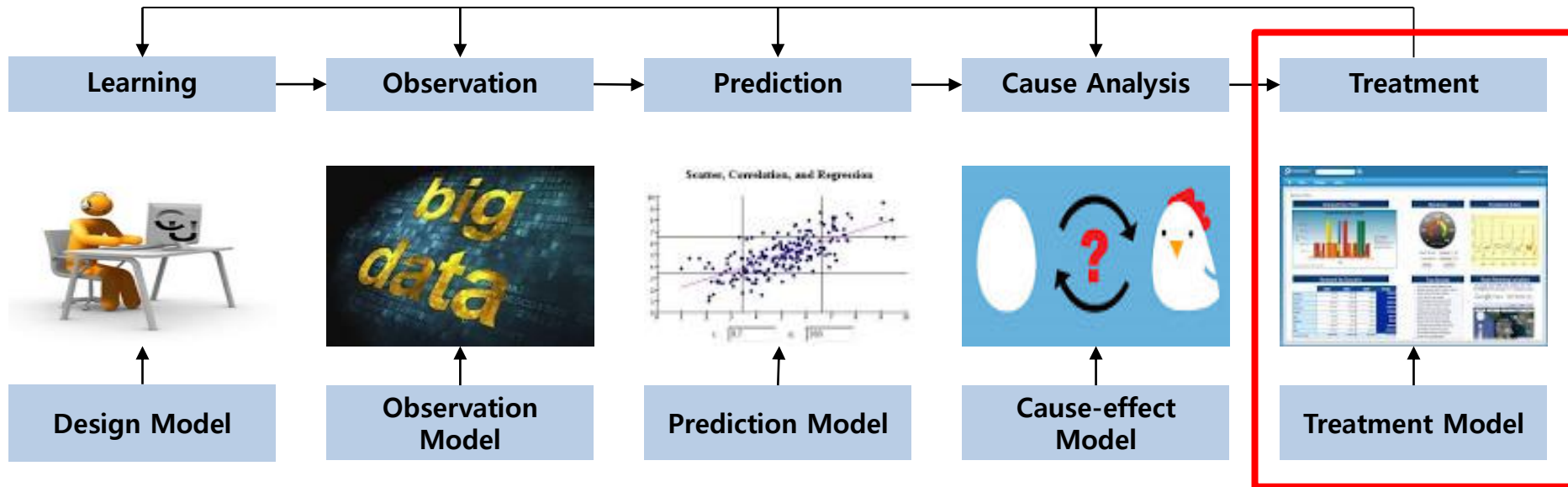


Cognitive psychological factors





[ How to treat learner ]



# Q & A

# Thank you !

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