Hello, Psychometrics!

Advanced Master in Agricultural Economics and Policy

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Attitudinal Scales for the Study
of Consumer Preferences
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Roadmap

20/04	Hello, Psychometrics!	◯
23/04	The Questionnaire	◯
24/04	Reliability and Validity of a Measure	◯
27/04	Latent Variables: Reflective or Formative?	◯
30/04	A Bit of SEM	◯
07/05	Stata Stata Stata Stata Stata Stata Stata	◯

Recommended readings:

- Chapters 4 and 7 from Jhangiani et al.2019)
- Chapters 7, 10 and 14 from Olivero and Russo2022)
- Chapter 12 from Mehmetoglu and Jakobsen2022)

Jhangiani, R. S., Chiang, I. A., Cuttler, C., and Leighton, D. C. (2019). *Research Methods in Psychology*. Kwantlen Polytechnic University, 4th edition.

Mehmetoglu, M. and Jakobsen, T. G. (2022). *Applied Statistics Using Stata: A Guide for the Social Sciences*. SAGE Publications Ltd, 2nd edition.

Olivero, N. and Russo, V. (2022). *Psicologia dei Consumi*. McGraw-Hill Education, 3rd edition.

Why psychometrics? The case of Dr. Mirko Marmellata

Why psychometrics? The case of Dr. Mirko Marmellata

Dr. Marmellata

every day chooses to buy lunch at the *Local Restaurant Near the Department*, despite spending much more than bringing lunch from home, and never being fully satisfied with the quality and quantity offered.

By the standards of homo oeconomicus

his choice would be **irrational**. To be fair, the choice still appears to us as **suboptimal**.

Why psychometrics? The case of Dr. Mirko Marmellata

Random Utility Model (RUM)

$$U_{ia} = V_{ia} + \varepsilon_{ia}$$

- U_{ia}: total utility that individual i associates with alternative a;
- V_{ia}: observable component (price, quantity...);
- ε_{ia}: unobserved component (habits, emotions...).

For Mirko Marmellata:

$$U_{\text{MM,Restaurant}} > U_{\text{MM,Home}}$$

What drives his preference is probably hidden in ε.

Why psychometrics? The case of Dr. Mirko Marmellata

The role of psychometrics

It allows us to "open" the ε and model the latent constructs that influence decisions.

Objective

To bring psychological factors out of ε and into the model, improving **prediction** and **understanding**.

Moving on to...

Brief Introduction to Measurement Theory

Constructs: Conceptual and Operational Definitions

Levels of Measurement

Vietnam flashback...

DATA GENERATING PROCESS

- How do we measure something we cannot observe?

Vietnam flashback...

DATA GENERATING PROCESS

- How do we measure something we cannot observe?

According to **measurement theory**, even if we cannot directly observe a theoretical concept (such as intelligence), we can observe its *reflections* in reality: behaviours, responses, outcomes...

Example:
We do not weigh a person's intelligence on a scale, but we can infer it from a series of signals: they graduated with honours, they are good at Stata, they use complex words, they have read all the nineteenth-century Russian novels...
Note that a lot depends on our definition of intelligence!

What we mean by measurement

Proposed definition:

The *systematic* assignment of a score to entities (individuals, objects, events...), such that the score represents a characteristic of those entities.

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The *systematic* assignment of a score to entities (individuals, objects, events...), such that the score represents a characteristic of those entities.

- When the characteristic under investigation is psychological in nature, the science of measurement is called **psychometrics**.

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Brief Introduction to Measurement Theory

Constructs: Conceptual and Operational Definitions

Levels of Measurement

Constructs

Some characteristics of interest are simple to measure: the consumer's age, height, weight.
Others, such as intelligence, self-esteem or attitudes, cannot be directly observed.

- These variables are called **constructs**.

Constructs

Constructs include (but are not limited to):

- Personality traits (e.g. extraversion)
- Emotional states (e.g. fear)
- Attitudes (e.g. towards certifications)
- Abilities (e.g. in scientific subjects)

Constructs

- The construct describes a *general tendency* to act in a certain way, not a specific behaviour at a given moment.
- Constructs are **abstract summaries** of complex processes.
- No single behaviour or process can fully "define" the construct.

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- It may also include: genetic origins, stability over time, correlations with physical pain and somatic symptoms.
- Scientific definitions differ from dictionary definitions (more precise, empirically testable, and open to revision).
- Often multiple conceptual definitions of the same construct exist in the literature.

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Conceptual definition

⇓ *Operationalisation* ⇓

Operational definition

Operational definition of a construct

Operational measures fall into three broad categories:

1. **Self-report**: the individual reports their own thoughts, emotions or behaviours.
2. **Behavioural**: a behaviour is observed and recorded.
3. **Physiological**: biological processes are recorded.

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Operational definitions

- **Self-report**: the participant rates how disgusting they find the idea of tasting the product on a scale from 1 to 7.
- **Behavioural**: it is observed whether the participant refuses to taste the product.
- **Physiological**: the galvanic skin response (GSR) or facial muscle activity (EMG) related to disgust is measured when the participant is asked to taste the product.

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Brief Introduction to Measurement Theory

Constructs: Conceptual and Operational Definitions

Levels of Measurement

Levels of measurement

The level of measurement can be:

1. Nominal
2. Ordinal
3. Interval
4. Ratio

Each level conveys a different degree of quantitative information, and determines the appropriate statistical analyses.

Nominal and Ordinal

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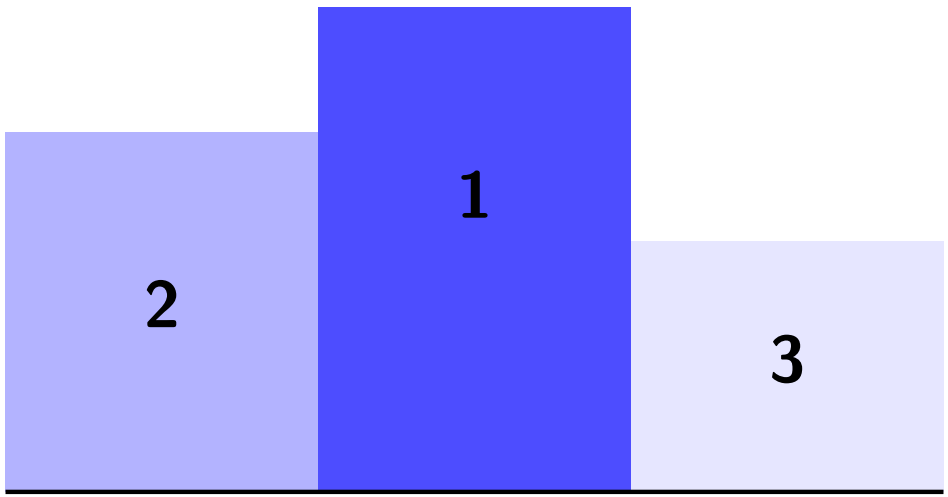

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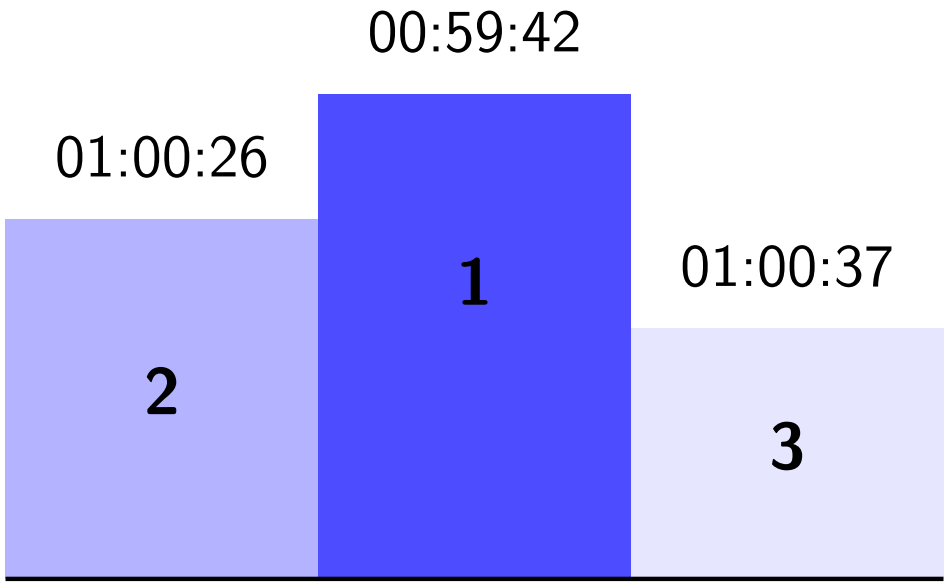

Interval and Ratio

Interval

Numerical differences with consistent meaning: e.g. degrees Celsius.

The distance between 12°C and 22°C is the same as that between 22°C and 32°C. However...

- **No true zero:** 0°C does not mean "absence of temperature".
- Therefore **it makes no sense to speak of "double" or "half":** at 30°C it is not twice as hot as at 15°C.

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Ratio

Like interval, but with zero indicating the **absolute origin**.

- Allows proportional comparisons: 100 kg is twice 50 kg.
- E.g.: height, weight, income, temperature in Kelvin.

Summary

Possible operations with the different measurement scales:

Level	$= \neq$	$> <$	$+ -$	$\times \div$
Nominal	✓			
Ordinal	✓	✓		
Interval	✓	✓	✓	
Ratio	✓	✓	✓	✓