

# Advanced course in questionnaire technique and clinimetrics

## Introduction

- Who am I?
- Who are you?
  - Name
  - Profession
  - Use of questionnaires
- Today's program
  - Developing a new questionnaire
  - Validity (including exercises)
  - Factor analysis (including exercises)
- Coffeekbreaks
  - When ever we want ☺

## Introduction

**Day:** Monday 5-11-2018  
**Location:** Det Blå Auditorium, Victor Albeck bygningen (+ 2 extra rooms)

Time	Contents	Pages	Teacher
9.00 – 10.00	Development of a new questionnaire (advanced) <ul style="list-style-type: none"> <li>• The six steps</li> </ul>	30-64	JSJ
10.00 – 11.00	Validity (advanced) <ul style="list-style-type: none"> <li>• Face and content validity</li> <li>• Construct and criterion validity</li> </ul>	154-181	JSJ
11.00 – 12.30	Exercise: Validity		JSJ
12.30 – 13.30	Lunch		
13.30 – 15.00	Factor analysis	72-80 Articles	EØ
15.00 – 16.00	Exercise: Factor analysis		EØ

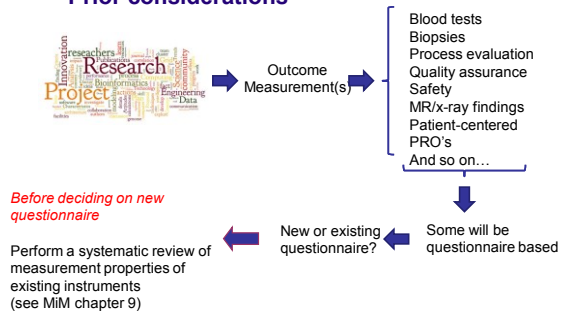
## Developing a new questionnaire

*Jens Søndergaard Jensen  
M.Sc. in Statistics*

## Outline

- Prior considerations
- The six steps
  1. Definition of the construct to be measured
  2. Choice of measurement method
  3. Selecting and formulating items
  4. Scoring issues
  5. Pilot-testing
  6. Field-testing

## Prior considerations



## Prior considerations

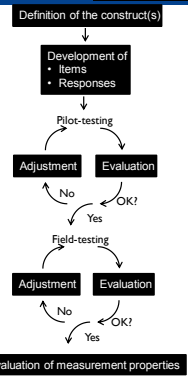
- Systematic literature review
  - Serves several purposes (among others):
    1. Prevents development of new instruments (if many already exist)
    2. Get ideas of what a novel instrument should (or should not) look like
    3. Saves time

“ONLY if no instrument is available, should a new measurement instrument be developed”.

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## Prior considerations

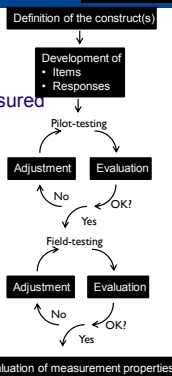
- Developing a new questionnaire
  - Not done on a Sunday afternoon
  - The process is iterative
    - The six steps are intertwined



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## The six steps

1. Definition of the construct to be measured
2. Choice of measurement method
3. Selecting and formulating items
4. Scoring issues
5. Pilot-testing
6. Field-testing (day 2)



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## 1) Definition of the construct to be measured

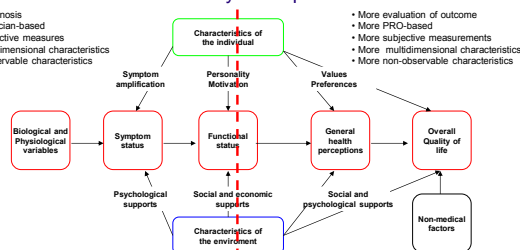
- Conceptualization
  1. What do we want to measure?
    - Which level in the conceptual model are we interested in
    - Uni- or multidimensional
  2. What is the target population?
    - Patient characteristics: Eg. age range, illness status, gender etc
    - Illness characteristics: range of diseases and treatments
  3. For which purpose?
    - Diagnostic → Discriminative instrument
    - Evaluation → Changes over time
    - Prediction → Classify according to prognosis



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## 1) Definition of the construct to be measured

- The Wilson and Cleary conceptual model



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## 2) Choice of measurement method

- Constructs can be measured in different ways
  - Eg. physical functioning in patients with brain damage
    - What they can do (capacity)
    - What they think they can do (perceived ability)
    - What they actually do (physical ability)
- Multi-item vs. single-item instrument
  - Multi-item: More reliable and comprehensive
  - Single-item: Less respondent burden
- The chosen instrument should correspond to the construct to be measured

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### 3) Selecting and formulating items

- Aim: Generate an exhaustive list of items
- Input for the items of a questionnaire
  - Go through the literature
  - Examine similar instruments (use your review)
  - Talk to experts (clinicians and patients)
- Deletion of items (part of pilot and field testing)?
  - Close overlap with other items?
  - Irrelevant to the target group (lack of importance)?

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### 3) Selecting and formulating items

- Formulating items
  - A challenging task
  - Basic rules
    1. Items should be comprehensible to target population
    2. Ambiguous terms should be avoided
    3. Items should be specific
    4. Items should contain only one question
    5. Negative wording should be avoided
  - First draft should contain as many items as possible

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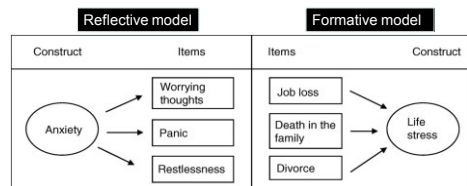
### 3) Selecting and formulating items

- Other things to keep in mind
  - Conceptual framework: Reflective vs. formative model
  - Difficulty of items
  - Application in research or clinical practice
  - Correspondence with response options

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### 3) Selecting and formulating items

- Reflective vs. formative model
  - Do we expect the items to change when the construct changes?
  - The distinction is not always clear cut



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### 3) Selecting and formulating items

- Reflective models
  - Items are manifestations of the construct
  - Hence items correlate and may replace each other
  - Come up with as many items as possible (reduce later using for example FA)
- Formative models
  - Each item contributes to a part of the construct
  - Together the items form the whole construct
  - Find ALL items that contribute (substantially) to the construct
  - FA does not make any sense!

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### 3) Selecting and formulating items

- Difficulty of items
  - Keep the difficulty of items, in relation to target population, in mind
- Application in research or clinical practice
  - Clinical practice:
    - Instruments are usually shorter
    - Fewer distinctions may be made (e.g. grade of severity)
- Correspondence with response options
  - Questions must correspond exactly with response options

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#### 4) Scoring issues for single items

**Nominal level**

- Number of groups that lack an order
- E.g. Gender, yes/no, color

**Ordinal level**

- Number of groups with observable order
- E.g. Likert-scale, dose

**Interval level**

- Expressed in numbers
- A difference is meaningful
- E.g. Temperature (°C), IQ

**Ratio level**

- Similar to interval level, but has an absolute zero point
- A ratio is meaningful
- E.g. Temperature (°K), height, weight

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#### 4) Scoring issues for single items

Compute	Nominal	Ordinal	Interval	Ratio
Frequencies	Yes	Yes	Yes	Yes
Percentiles	No	No/yes	Yes	Yes
Add/subtract	No	No	Yes	Yes
Mean, std. dev.,	No	No	Yes	Yes
Ratio	No	No	No	Yes

#### 4) Scoring issues for single items

- Interval/ratio level
  - Conversion of data to lower level possible
  - High amount of information
    - However, is higher discrimination valid (e.g. VAS)?
  - Equidistance between different categories (scores)
    - We can add and subtract (and divide on ratio level)
  - Lacks descriptors and cut-points
    - E.g. No pain/mild pain/moderate pain/severe pain

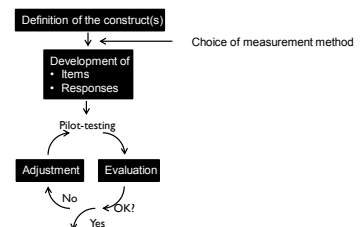
#### 4) Scoring issues for several items

- Summary scores in reflective models
  - Scale scores
    - Items are summed up (what about missing data?)
    - Average score
- Summary scores in formative models
  - Index scores
    - Multiple aspects or dimensions summarized in one score
    - APGAR-score
- Profile scores
  - Multiple dimensions summarized in one scale score per dimension
  - SF-36 8 dimensions

#### 4) Scoring issues for several items

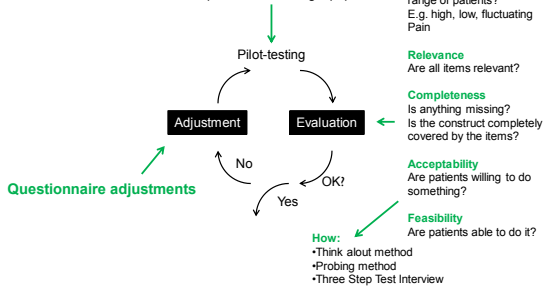
Multi-item instruments	Uni or multi-dimensional	Scores
Scale	<i>Unidimensional</i> : set of items measuring one dimension	Sum-score based on a reflective model
Index	<i>Multidimensional</i> : set of items measuring different dimensions	Sum-score based on a formative model or observable constructs
Profile	<i>Multidimensional</i>	A score per dimension

#### 5) Pilot-testing



## 5) Pilot-testing **Qualitative analysis**

Semi-structured interviews  
N=15-30 patients of the target population



## 6) Field-testing

**Quantitative analysis**  
Item reduction and data structure  
N=150-300 patients of the target population

