# Developing a new questionnaire

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SDU

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## Prior considerations


Outcome Measurement(s)

- Blood tests
- Biopsies
- Process evaluation
- Quality assurance
- Safety
- MR/x-ray findings
- Patient-centered
- Aso…

Some will be questionnaire based

New or existing questionnaire?

*Before deciding on new questionnaire*

- Does an instrument already exist?
- See ‘Selecting the best questionnaire’ vodcast



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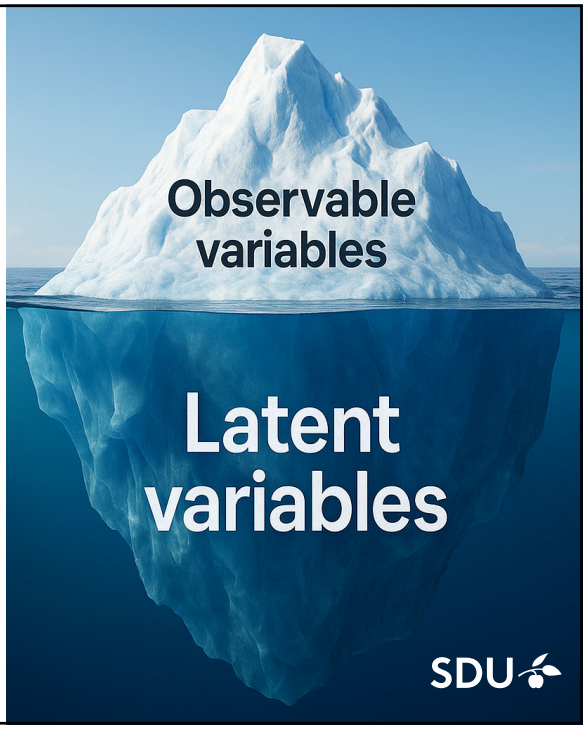
# Types of variables

**Observable variables – 'directly' measurable variables**

- What is your weight (kg)?
- Have you been admitted to a hospital in the last year (Y/N)?
- Grip strength (Nm)

**Latent variables – 'indirectly' measurable variables**

- What is your weight? (high/average/low)?
- Do you trust your doctor?
- Are you satisfied with your treatment?
- Are you happy?

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# Latent variables and factors

Almost all latent variables are multifactorial

- I.e. more factors are necessary to describe a certain variable

Each factor can be described with

- A global item or an instrument consisting of more items (a multi-item-scale)
- Also called a dimension

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# A construct

A construct is a *theoretical*, *unobservable* attribute inferred from patterns in *observable* indicators

Explains covariation among indicators

Example

- **Construct:** Working memory capacity
- **Definition:** A person's limited capacity to hold and manipulate information over short periods to guide ongoing thinking and behavior
- **Example indicators:**
  - Digit span backward (repeat numbers in reverse order)
  - Letter–number sequencing (reorder mixed letters/numbers into correct sequence)
  - Reading span: read sentences (judge sensibility) while remembering last words
  - Keep-track task: track the most recent items from several categories



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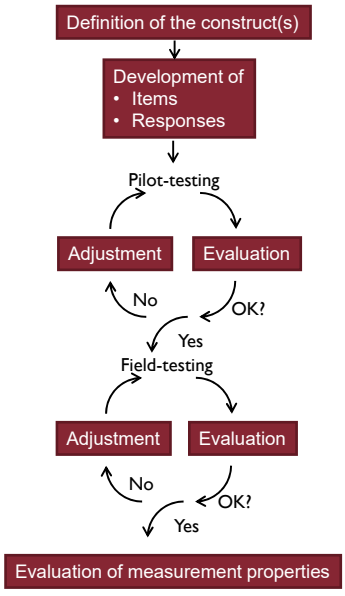
# The process

6 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



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Definition of the construct(s)

**3 questions:**

What do we want to measure?

Example - diabetes

- Pathophysiological processes
- Symptoms
- Functioning
- Quality-of-Life
- Uni- or multidimensional
- …

Conceptual model

(Day 1 and advanced course)



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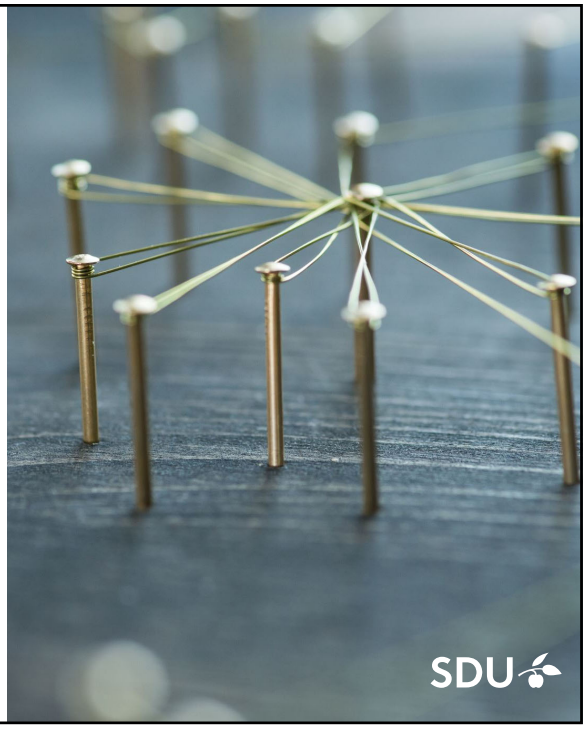
## Use a conceptual model

”A theoretical model of how different constructs within a concept are related”

Two methods

- Use an existing theoretical framework and align your instrument items to it
- Develop your own conceptual model via qualitative concept elicitation, expert input and/or cognitive interviewing

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Definition of the construct(s)

**3 questions:**

What do we want to measure?

In which population?

## Example - diabetes

- Pathophysiological processes
- Symptoms
- Functioning
- Quality of life
- Uni- or multidimensional

Tailored to the target population

- E.g. age, sex, severity, comorbidity etc…



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Definition of the construct(s)

**3 questions:**

What do we want to measure?

In which population?

What is the purpose?

## Example - diabetes

- Pathophysiological processes
- Symptoms
- Functioning
- Quality of life
- Uni- or multidimensional

Tailored to the target population

- E,g, age, sex, severity, comorbidity Aso…

*Diagnostic* → discriminative instrument
*Evaluation* → change over time
*Prediction* → classify pts. according to future outcome



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Definition of the construct(s)

↓

Development of
- Items
- Responses

## Operationalisation

**Definition**

i.e. from our conceptualisation

The process of transforming an abstract concept into a precise definition that is measurable and testable; creating **operational definitions**.



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Definition of the construct(s) → Conceptualisation

↓

Development of
- Items
- Responses

→ Operationalisation

} Development & Content validity

**Input for items:**

- *Existing items*
  - Litterature searches
  - Other PROs
  - Experts
- *New items*
  - Qualitative research (focus groups *or* individual interviews)
    - Patients
    - Researchers
    - Clinicians
    - Other relevant individuals



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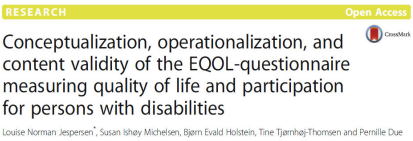
# Operationalisation


RESEARCH Open Access

Conceptualization, operationalization, and content validity of the EQOL-questionnaire measuring quality of life and participation for persons with disabilities

Louise Norman Jespersen*, Susan Ishøy Michelsen, Bjørn Evald Holstein, Tine Tjørnhøj-Thomsen and Pernille Due

Qualitative research

- Use themes and indicators (codes) to formulate items

**Aim:** To transform complex themes & codes from qualitative research into items which can be answered by respondents

Example

Theme: *"Fear of being left by partner"*

Operationalisation

*"Does your disability cause fear of being left by your partner/potential partner?*



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# Development of items

Beware of caveats in item formulation – day 1

*Assigning a grammatical structure to a sentence as you read, figuring out how words group into phrases and who does what to whom. It identifies parts of speech and relations (subject, verb, object, modifiers), enabling you to compute meaning.*

Reading a text requires two things:

- **(1) Automatic processes (system 1)**
  - Fast, effortless, often unconscious, pattern-based
  - Supports: word/letter recognition, lexical access, much syntactic parsing becomes **automatised** in skilled reading

**Example**

***"I saw the man with the telescope."***

(a) I used a telescope; or
(b) the man had a telescope

Elfenbein, A. The Gist of Reading, Stanford University Press
Jytte fra marketing er desværre gået for i dag, Morten Münster



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# Development of items

Reading a text requires two things:

- **(2) Controlled processes (system 2)**
  - Slow, reflective, effortful, consciously directed
  - Supports: comprehension monitoring, resolving ambiguity, reanalysis ("garden-path" sentences), making inferences, integrating across text and prior knowledge, critical evaluation

Is a sentence which lures you into an initial, plausible - but wrong - parse, so you must stop, backtrack, and reanalyse

**Example**

**"While Anna dressed the baby played in the crib."**

At first it seems that *Anna dressed the baby*
The main clause is *the baby played…*

Elfenbein, A. The Gist of Reading, Stanford University Press
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# Development of items

Question 1:
The **automatic reading** will focus on the location
The **controlled reading** will recognize that you don't bury survivors

Question 2:
The **automatic reading** is to answer 2 animals
The **controlled reading** will analyse and reflect that it was not 'Noah'

TAKE HOME MESSAGE

Effective reading is an **interactive process**: fast, largely **automatic routines** (word recognition, much syntactic parsing, prediction) work in parallel with **controlled**, effortful processes that engage when needed to monitor comprehension, resolve ambiguity, make inferences, and think critically about the text. Skilled readers flexibly shift load between the two.

Most often this does not happen when patients answer questionnaires…

Resolved (partly) by pilot testing



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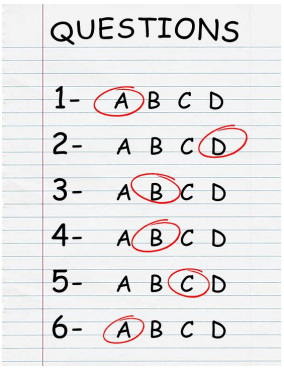
## Other things to keep in mind (item development)

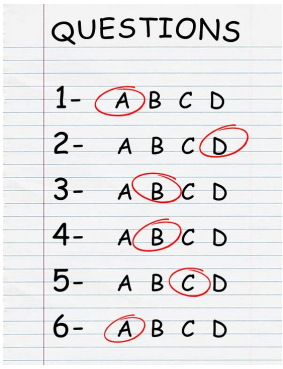
- The construct
- The target population
- The purpose of the measurement
- Reflective vs. formative model






## Other things to keep in mind (item development)

- The construct
- The target population
- The purpose of the measurement
- Reflective vs. formative model
- Difficulty of the items
- Application in research or clinical practice
- Correspondence with response options



# Response options

Scoring
- *Nominal*
  - E.g. present/absent; Denmark, Turkey, Ireland etc.
- *Ordinal*
  - E.g. Likert → agree - - - - disagree
- *Interval*
  - E.g. body temperature
- *Ratio*
  - E.g. age, tumour size (absolute 0)

↑ sophisticated quantitative procedures



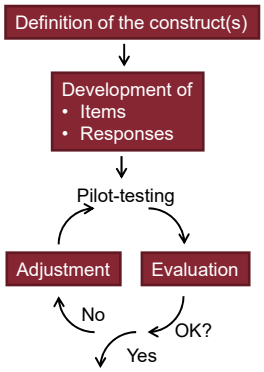
# Construction of response categories

Categorical vs. continuous scale
- If possible use continuous (e.g. exact age or height)

Number of response categories
- No more than 7. Between 4-7 is optimal

Even or uneven number of response categories
- Even: Force respondents to 'have' an opinion
- Uneven: It is possible for respondents to be neutral

Make sure the categories are relevant, exhaustive and exclusive



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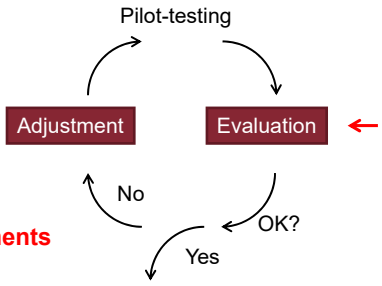
**Qualitative anaysis**

Semi-structured interviews

N=15-30 patients of the target population




**Questionnaire adjustments**

**Comprehensive**

Do the questions cover the range of patients?

E.g. high, low, fluctuating pain

Is anything missing?

**Comprehensible**

Are all items understandable and easy to read?

**Relevance**

Are all items relevant?



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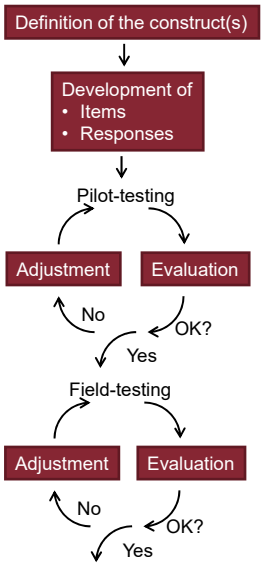




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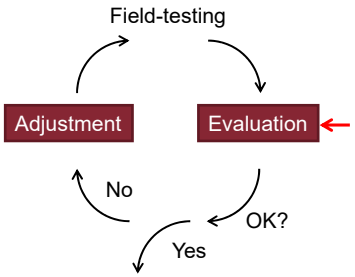
## Quantitative analysis

Item reduction and data structure

N≈150-300 patients (or more) of the target population




**Complex statistical analyses**

Advanced course



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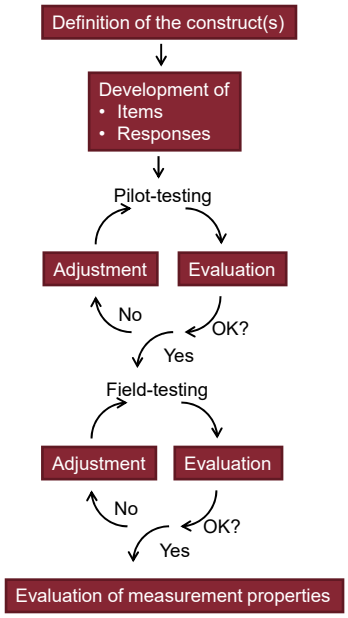




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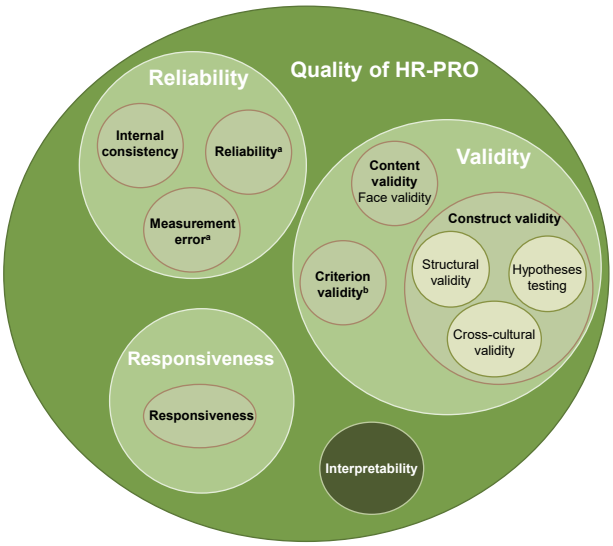
## This is your validation study



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# Main points when developing a new questionnaire

- **A process of 6 steps**
  - Definition of the construct to be measured
  - Choice of measurement method
  - Selecting and formulating items
  - Scoring issues
  - Pilot testing
  - Field testing
- **Establishing content validity is most important**
  - Conceptualisation
  - Operationalisation
  - Item development
- **Is a difficult proces where you have to be critical and observant**
  - Item understanding
- **Is an iterative process with many steps**
  - Pilot test
  - Field test
- **Is a time consuming proces which should be avoided if a questionnaire already exists**



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