

How to measure the construct - operationalisation

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Agenda

Time	Contents	Pages	Teacher
9.00– 10.00	Introduction to questionnaires - conceptualisation	7-13, 33-35	AØH
10.00 – 11.00	Exercise: Conceptualisation		AØH
11.00 – 12.30	Concepts in questionnaire technique <ul style="list-style-type: none">• Observed vs. latent variables• Conceptual frameworks• Reflective and formative models• Scales vs. indexes COSMIN taxonomy and requirements to questionnaire validation	13-17, 35-37 Vodcast Articles on www*	AØH
12.30 – 13.00	<i>Lunch</i>		
13.00 – 13.45	How to measure the construct – operationalisation <ul style="list-style-type: none">• Preparing items and answer categories	35-37 41-50	AØH
13.45 – 14.30	Exercise: Preparing items and answer categories		AØH
14.30 – 15.00	Structure and design of a questionnaire study Q & A about own study		AØH

* www = see www.clinimetrics.sdu.dk

From construct to questionnaire

From concept to construct

Concept: *“Global definition and demarcation of the subject of measurement”*

Construct: *“A well-defined and precisely demarcated subject of measurement e.g. intelligence, depression, HRQOL”*

From “what to measure” to “how to measure it”

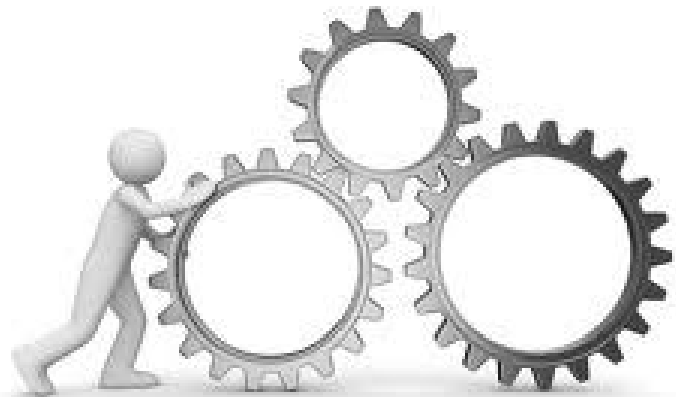
Operationalization



Operationalization

Definition:

The development of specific research procedures that will result in empirical observations representing those concepts in the real world



Things to consider

What do you want to measure – and how precise?

- Which constructs are found within your concepts? Is it a combination of several constructs?
- Which variables/items do you actually need? One or multiple?

What is the target population?

- Items should be tailored to the target population: age range, illness status, gender etc.
- Illness characteristics: range of diseases and treatments
- Difficulty of the items

For which purpose?

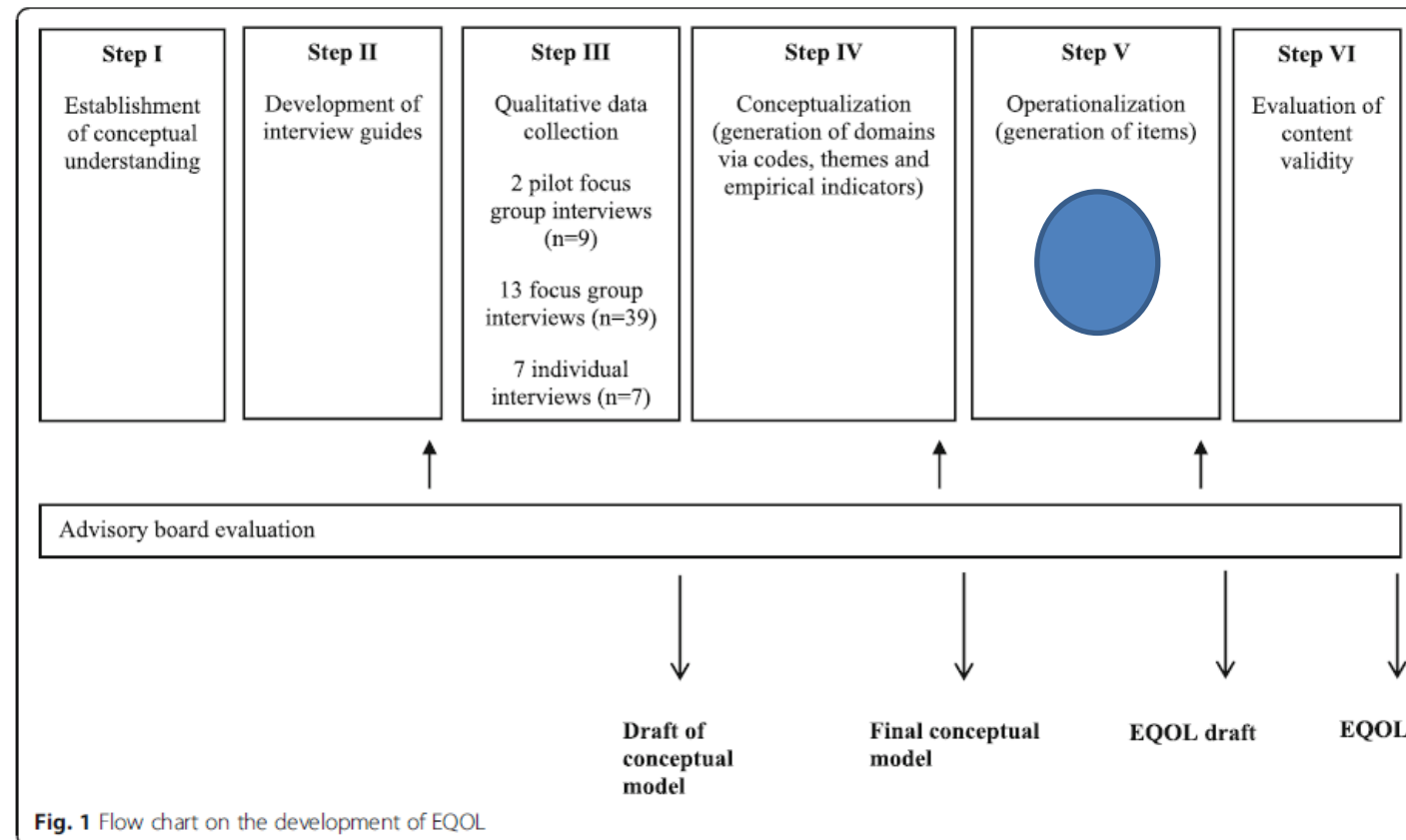
- Discrimination between groups (better vs. worse QoL)
- Evaluation (changes over time)
- Prediction



Continued example

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



Step V: Operationalization of empirical indicators into items

Items

Initial item formulations were made by one of the authors (LNJ) based on the condensed descriptions of the domains and based on the conceptual model. For each empirical indicator, the composed item(s) was constructed to reflect that specific aspect of the domain. As an example, the empirical indicator “*Fear of being left by partner*” was operationalized as follows: *Does your disability cause fear of being left by your partner/ potential partner?* Whenever possible, precise words or phrases used by participants in the interviews were applied. The item formulation and the original purpose of each empirical indicator were then compared and discussed in detail by the external advisory board and the author group. Subsequently, items were discussed and adjusted several times until consensus was reached within the author group, so that the item seemed to reproduce the content of the empirical indicator and that the items appeared relevant and understandable to the target group. The

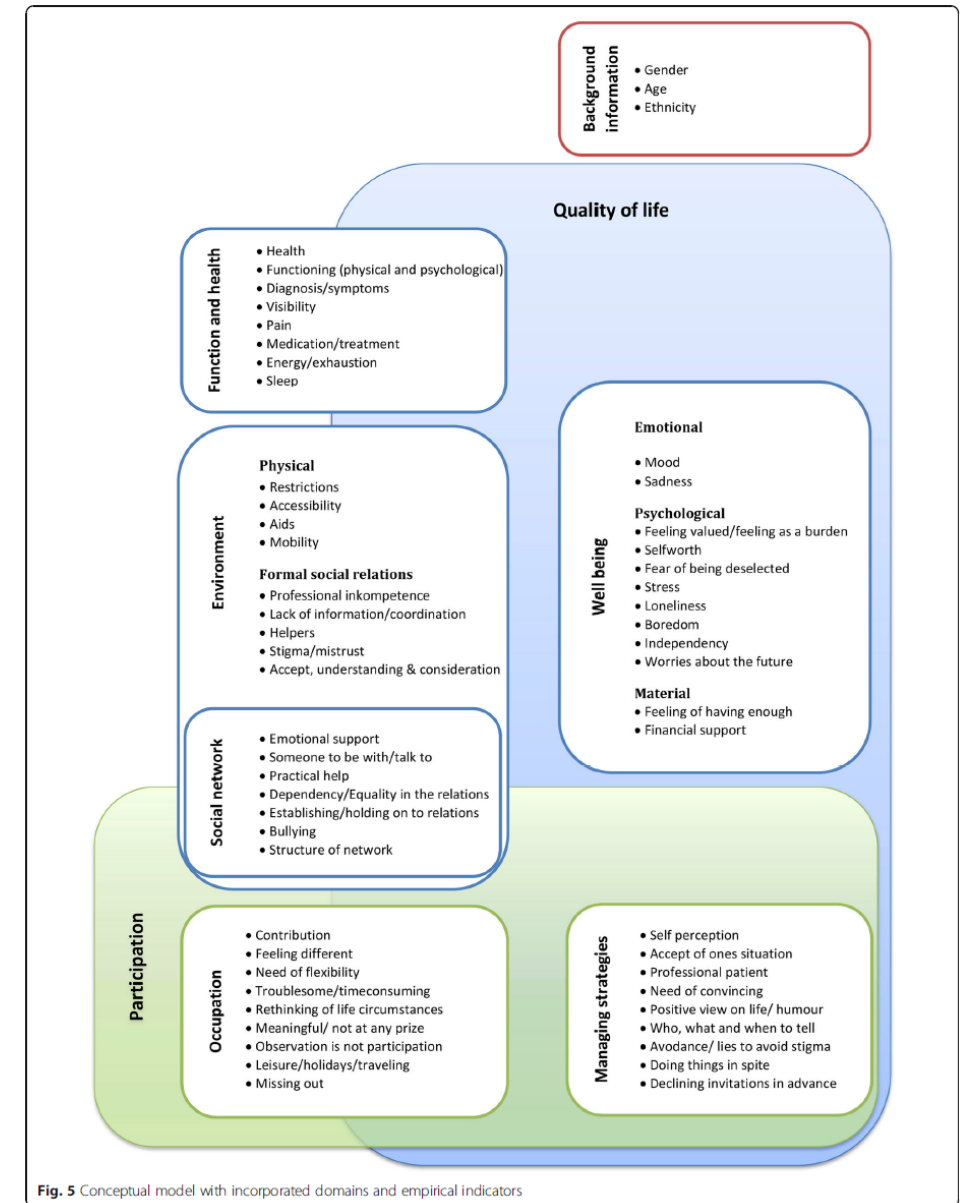


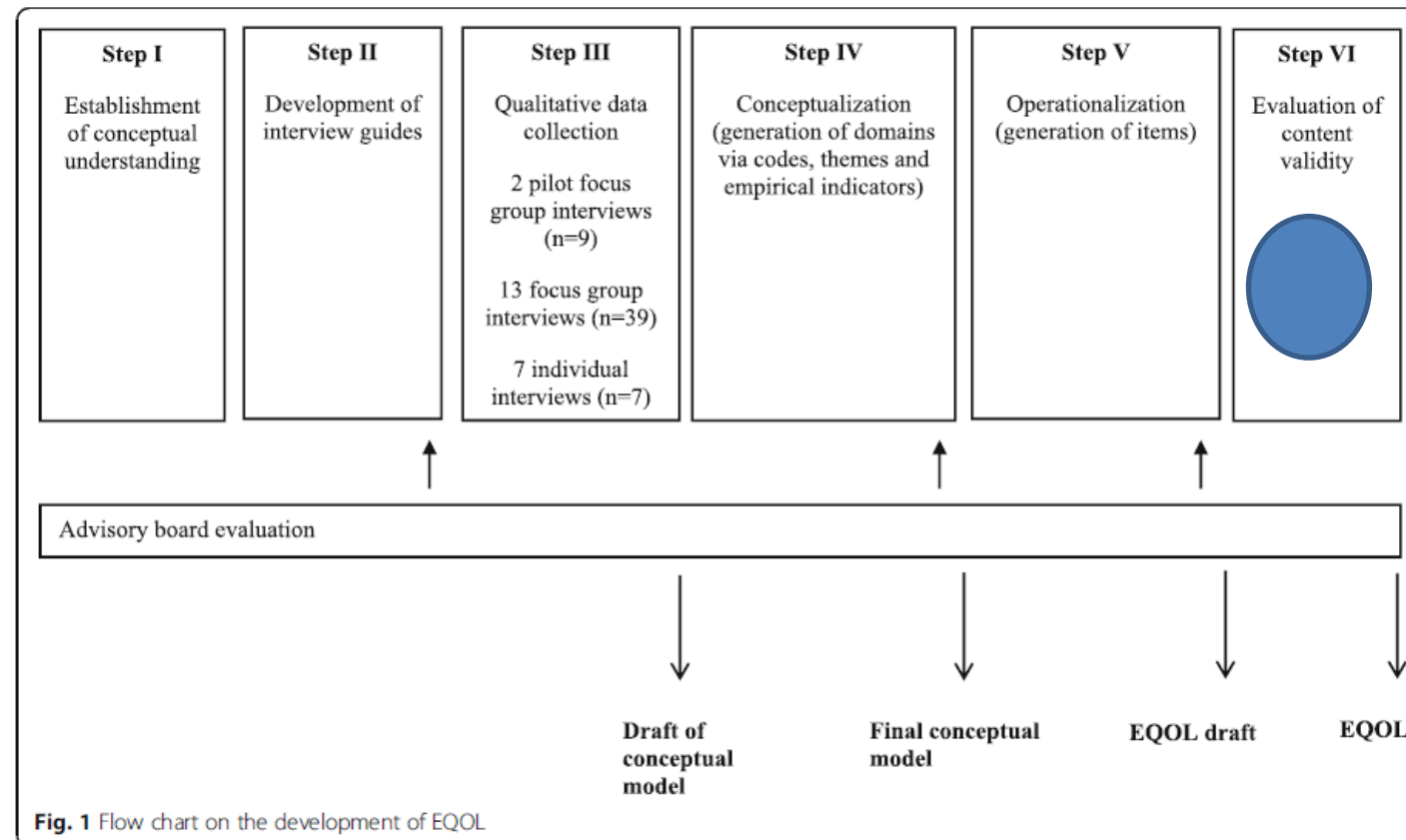
Fig. 5 Conceptual model with incorporated domains and empirical indicators



Continued example

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

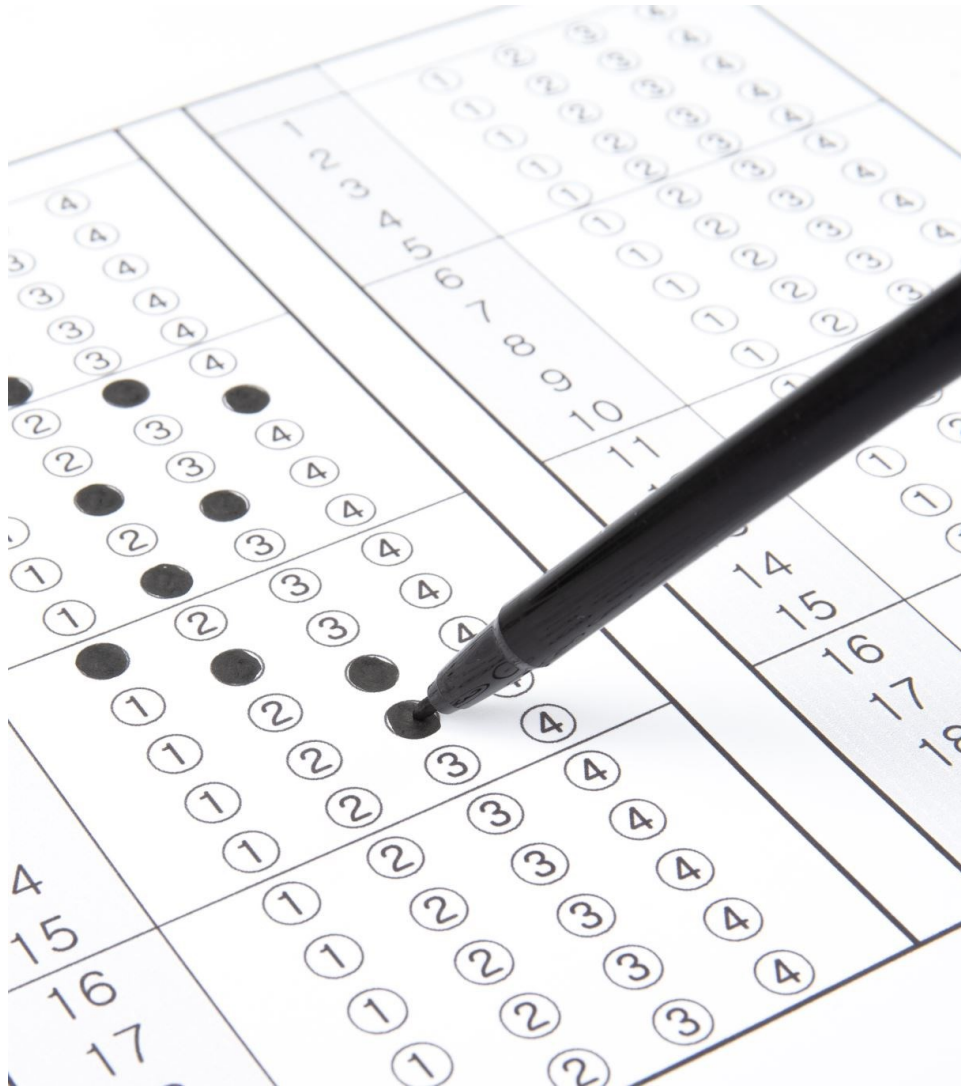
Louise Norman Jespersen*, Susan Ishøy Michelsen, Bjørn Evald Holstein, Tine Tjørnhøj-Thomsen and Pernille Due



Conceptualization/operationalization

- Conceptualization/operationalization are intertwined
 - Should be done thoroughly
- Proper conceptualization/operationalization
 - Makes validation easier
 - Gives a good idea of how to interpret our research results
 - Even if someone disagrees with our conceptualization
 - Saves time and saves you from a lot of fire extinguishing later
- A continuous process, but vital to address it at the beginning of any study design

” As a researcher, always be open to reexamining your concepts and definitions



Preparing items and
answer categories

Preparing items

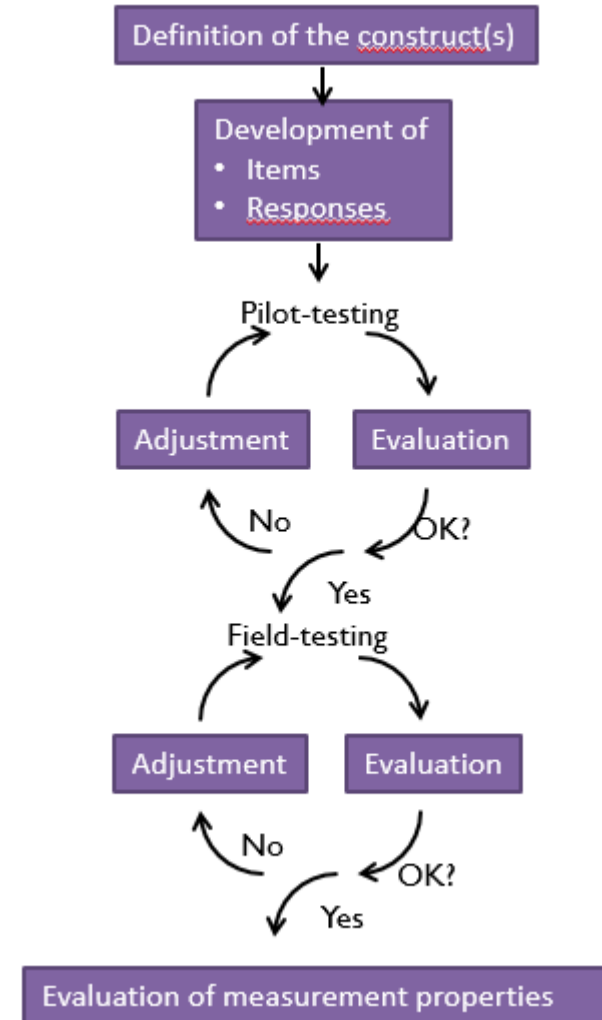
Generate an exhaustive list of items

Input for the items of a questionnaire

- Go through the literature
- Talk to experts

Deletion of items (part of pilot and field testing)

- Overlaps closely with other items?
- Irrelevant to the target group (Lack of importance)?



Preparing 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
6. Do not leave the question positive

First draft should contain as many items as possible

Things to keep in mind when formulating questions.

- Construct
- Purpose eg. Discriminate or evaluate
- Target population
- Reflective or formative model
- Difficulty of items in relation to the target population
- Application in research or clinical practice
- Correspondence with response options

Examples of response categories

Response categories

- Exhaustive and exclusive
- Meaningful
- Make it capable of measuring change
- Provide (enough) detailed information
- Ensure reproducible and valid answers

Examples of response categories

Patient Global Impression of Change (PGIC)

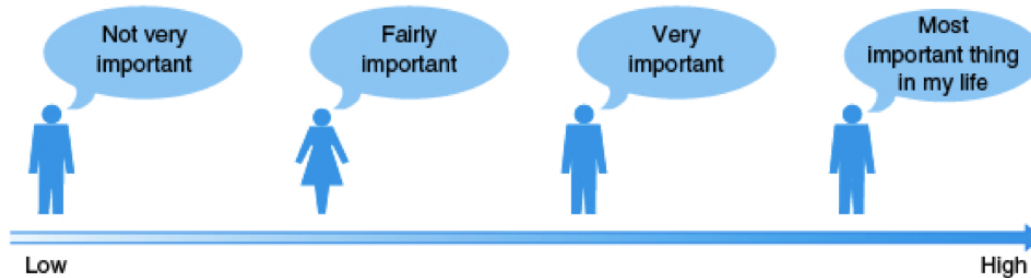
No change (or condition has got worse)	<input type="checkbox"/>	1
Almost the same, hardly any change at all	<input type="checkbox"/>	2
A little better, but no noticeable change	<input type="checkbox"/>	3
Somewhat better, but the change has not made any real difference	<input type="checkbox"/>	4
Moderately better, and a slight but noticeable change	<input type="checkbox"/>	5
Better, and a definite improvement that has made a real and worthwhile difference	<input type="checkbox"/>	6
A great deal better, and a considerable improvement that has made all the difference	<input type="checkbox"/>	7

Levels of measurement

Nominal Measure Example: Gender



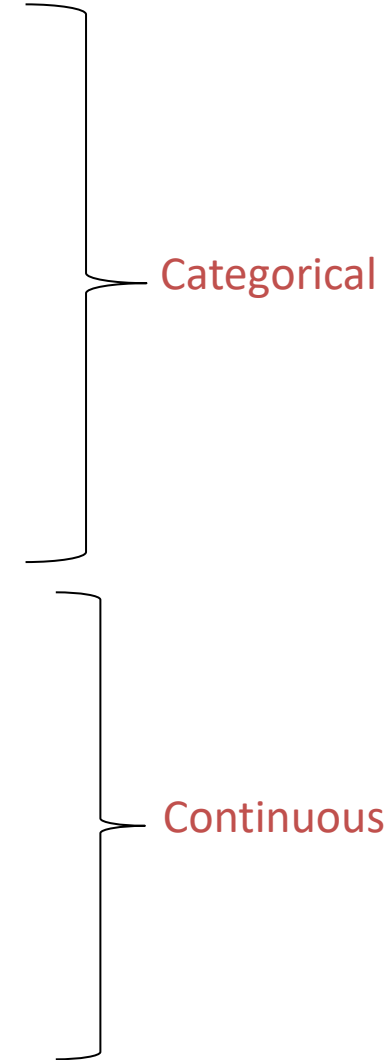
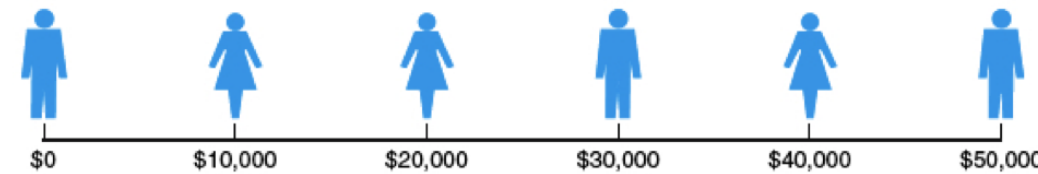
Ordinal Measure Example: Religiosity "How important is religion to you?"



Interval Measure Example: IQ



Ratio Measure Example: Income



Levels of measurement

Categorical data

- Measured on nominal and ordinal scale
- NO equidistance between different categories
 - We can not add and subtract
 - Mean, standard deviation and differences makes no sense
- Calculate frequencies
- We can analyze data using ordinary, ordered or multinomial logistic regression, regression models for relative risks or risk differences

Levels of measurement

Continuous data

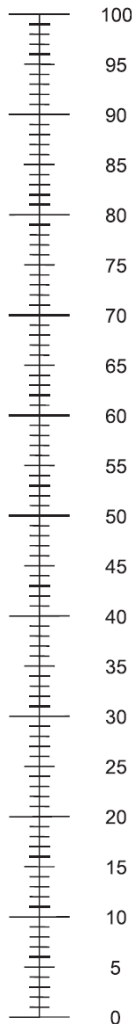
- Measured on ratio and interval scale
- Conversion of data to lower level possible
- Equidistance between different categories (scores)
 - We can add and subtract
- We can analyze data using t-test, linear regression, ANOVA, linear mixed models etc.
- Lacks descriptors and cut-points
 - E.g. No pain/mild pain/moderate pain/severe pain

Examples of response categories

Labelled categorical scale

- ‘How is your health?’: Excellent, very good, good, not so good, bad.
- ‘Smoking is bad for your health? ’: 3, 5 or 7 classes ranging from ‘strongly disagree’ to ‘strongly agree’

Examples of response categories



Visual Analogue Scale (VAS)

- ‘On a scale from (0-10 or 0-100) how much pain do you feel right now’
- ‘How satisfied are you with your treatment’
 - Not satisfied _____ Satisfied

Numerische rating skala (NRS)

Advantage:

Easy to understand
Validated for some conditions
(e.g. pain)

Disadvantage:

Unrealistic impression of accuracy
Low reliability
More difficult to answer than a Likert item

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
- Be sure the categories are relevant, exhaustive and exclusive

Interpretations of words used to indicate frequencies

Word	Interpretation (range of mean percentages)	Definition in the <i>Oxford English Dictionary</i>
Invariably/always	91-100	At every time, on every occasion, at all times, on all occasions. Opposed to sometimes, occasionally
Almost always	85-94	—
Normally	71-81	Under normal or ordinary conditions; as a rule, ordinarily
Usually	70-84	In a usual or wonted manner; according to customary, established, or frequent usage; commonly, customarily, ordinarily; as a rule
More often than not	64	—
Common(ly)	56-69	As a usual circumstance; as a general thing; in ordinary cases; usually, ordinarily, generally
Often	42-71	Many times; at many times; on numerous occasions; frequently; for a significant amount or proportion of the time
Frequent(ly)	36-72	At frequent or short intervals, often, repeatedly
Not infrequently	24-35	Rather frequently
Occasionally	17-21	Now and then, at times, sometimes; irregularly and infrequently
On occasion	12	As need or opportunity arises; now and then, occasionally
Infrequently	12-14	Not frequently; somewhat rarely, seldom
Sometimes	11-33	On some occasions; at times; now and then
Seldom	7-8	On few occasions, in few cases or instances, not often; rarely, infrequently
Almost never	2	Scarcely ever
Very rare(ly)	0.8-3	—
Rare(ly)	0.5-9	Seldom, infrequently, in few instances
Exceptionally	0.4-1	Uncommonly, unusually
Never	0-2	At no time or moment; on no occasion; not ever

Exercise PRWHE

Name: _____

Date: _____

PATIENT RATED WRIST/HAND EVALUATION

The questions below will help us understand how much difficulty you have had with your wrist/hand in the past week. You will be describing your **average** wrist symptoms **over the past week** on a scale of 0-10. Please provide an answer for **ALL** questions. If you did not perform an activity, please **ESTIMATE** the pain or difficulty you would expect. If you have **never** performed the activity, you may leave it blank.

1. PAIN

Rate the average amount of pain in your wrist/hand over the past week by circling the number that best describes your pain on a scale from 0-10. A zero (0) means that you did not have any pain and a ten (10) means that the pain is the worst possible (i.e. worst you have ever experienced or that you could not do the activity because of pain).

RATE YOUR PAIN:	None	Worst
At rest	0 1 2 3 4 5 6 7 8 9 10	
When doing a task with a repeated wrist/hand movement	0 1 2 3 4 5 6 7 8 9 10	
When lifting a heavy object	0 1 2 3 4 5 6 7 8 9 10	
When it is at its worst	0 1 2 3 4 5 6 7 8 9 10	
How often do you have pain?	0 1 2 3 4 5 6 7 8 9 10	
	Never	Always

Please turn the page.....

2. FUNCTION											
A. SPECIFIC ACTIVITIES											
<p>Rate the amount of difficulty you experienced performing each of the items listed below - over the past week, by circling the number that describes your difficulty on a scale of 0-10. A zero (0) means you did not experience any difficulty and a ten (10) means it was so difficult you were unable to do it at all.</p>											
	No Difficulty									Unable To Do	
Turn a door knob using my affected hand	0	1	2	3	4	5	6	7	8	9	10
Cut meat using a knife in my affected hand	0	1	2	3	4	5	6	7	8	9	10
Fasten buttons on my shirt	0	1	2	3	4	5	6	7	8	9	10
Use my affected hand to push up from a chair	0	1	2	3	4	5	6	7	8	9	10
Carry a 10lb object in my affected hand	0	1	2	3	4	5	6	7	8	9	10
Use bathroom tissue with my affected hand	0	1	2	3	4	5	6	7	8	9	10
B. USUAL ACTIVITIES											
<p>Rate the amount of difficulty you experienced performing your usual activities in each of the areas listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. By "usual activities", we mean the activities you performed before you started having a problem with your wrist/hand. A zero (0) means that you did not experience any difficulty and a ten (10) means it was so difficult you were unable to do any of your usual activities.</p>											
Personal care activities (dressing, washing)	0	1	2	3	4	5	6	7	8	9	10
Household work (cleaning, maintenance)	0	1	2	3	4	5	6	7	8	9	10
Work (your job or usual everyday work)	0	1	2	3	4	5	6	7	8	9	10
Recreational activities	0	1	2	3	4	5	6	7	8	9	10
APPEARANCE- OPTIONAL											
How important is the appearance of your hand? <input type="checkbox"/> Very Much <input type="checkbox"/> Somewhat <input type="checkbox"/> Not at all											
Rate how dissatisfied you were with the appearance of your wrist/hand during the past week.											
	0 1 2 3 4 5 6 7 8 9 10										
	No					Complete					
	Dissatisfaction					Dissatisfaction					
Any other comments?											

Exercise PRWHE

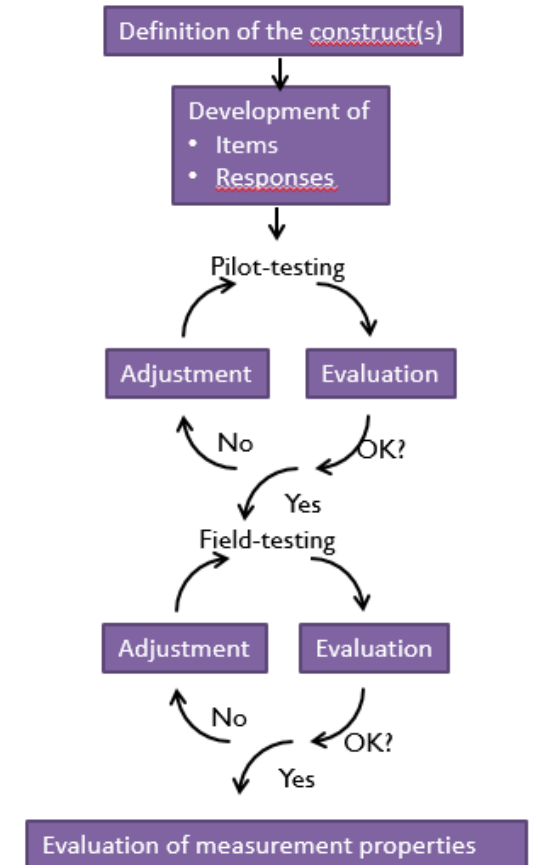
- You want to use this questionnaire in a Danish context with patients with hand-related disorders.
 - Is there anything to be aware of?
 - Any difficult items?

Implication of bad items

- More missing values
- Sampling bias (missing response within different groups)
- Item bias (different understanding in different groups)

In general developing a questionnaire

- The layout should be user-friendly, simple and unambiguous
- Make a clear instruction on how to fill in the questionnaire
- Get others to go through the questionnaire
 - Experts (within the area) and "civilians".
 - Patients
- Pilot test and field test in the target population



Exercise 2A

A questionnaire survey is intended to assess the concept of "health and disability" in Denmark. For this purpose formulate questions/items concerning

1. The patient (age, gender, socio-demographics, health etc.)
2. Some of the constructs from the conceptual model in the previous session.

- Create (at least) 3 items for each of the two points
- Consider the scale you use for your responses?
 - Nominal, ordinal, interaval or ratio?

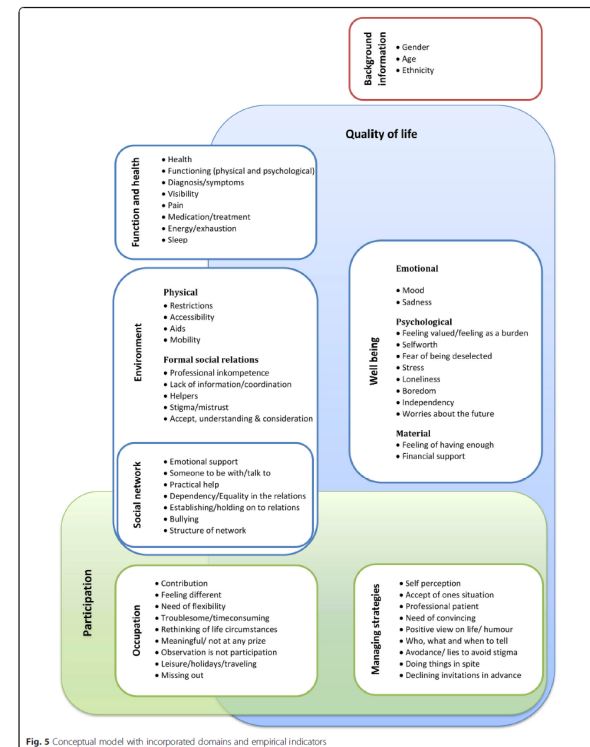


Fig. 5 Conceptual model with incorporated domains and empirical indicators

Exercise 2B

Errors in development of items – What is the problem?

1. error

- Has your child had diarrhoea for more than 2 weeks?
- How many days have you had headack within the last year?
- Which examinations have you been through within the last year?

Are the references to time appropriate?



Syge skal svare på spørgsmål, der er 'tågede' og 'hjemmestrikkede'

Detektiver overvåger, om syge lyver, men der kan være tale om misforståelser. Ekspert kritiserer dårlige spørgeskemaer.



Førtidspensionisten Kim Bertil Strange skulle svare på et spørgeskema fra sit pensionselskab og blev efterfølgende overvåget af en eller flere detektiver. PFA mener, at han begik svig og har givet urigtige oplysninger om sin sygdom. Kim siger, at han misforstod et svært spørgeskema. (Foto: PFA overvågningsvideo)

10 problematic items

Spørgeskema fra Pensionsselskaberne Danica, Velliv, og Codan til syge og førtidspensionister, når pensionselskaber skal undersøge, om de stadig er syge.

Kilde: www.dr.dk d. 25. aug. 2020

SPØRGSMÅL 01

Kan du gå?

- Ja, ingen problemer
- Til dels, hvor længe ad gangen
(en linje til at beskrive)
- Nej overhovedet ikke

Kilde: PFA Pension, Danica Pension og Velliv

BEDØMMELSE

Finn Breinholt Larsen

Det er meget unuanceret og vævende spørgsmål. Syge, der for eksempel har en gigtlidelse, vil have perioder, hvor de fungerer godt og andre perioder, hvor de ikke kan gå så godt. Spørgsmålet giver ikke et billede af, om sygdommen kommer og går.

Se svaret fra pensionsselskaberne nederst i artiklen

SPØRGSMÅL 02

Er du støj eller lysfølsom?

- Nej
- Lidt
- Moderat
- Meget

Mulighed for at beskrive
med fritekst.

Kilde: PFA Pension og Velliv har næsten
samme spørgsmål

BEDØMMELSE

Finn Breinholt Larsen

Alle mennesker er støj og lysfølsomme i et eller andet omfang. Hvis man bare spørger, er du støj eller lysfølsom, er alle mennesker nødt til at sige ja. Det ville være mere relevant at finde ud af, om folk var mere støj og lysfølsomme end normalt. Påvirker det de daglige gøremål?

Se svaret fra pensionselskaberne nederst i artiklen

SPØRGSMÅL 03

Har du ændret livsstil i forbindelse med skaden/lidelsen?

- Nej
- Ja, på hvilken måde
(fem korte linjer til at uddybe)

Kilde: Codan

BEDØMMELSE

Finn Breinholt Larsen

Hvad menes der med livsstil? Livsstil forbinder vi med rygning og alkohol, men det kan også være, hvad man laver i fritiden eller ens tøjstil. Livsstil er et meget bredt begreb, så det er svært at svare på spørgsmålet.

Se svaret fra pensionselskaberne nederst i artiklen

SPØRGSMÅL 04

Er du fuldstændig uarbejdsdygtig?

- Ja, jeg kan ikke arbejde længere
- Nej, jeg kan godt arbejde lidt/
hvor mange timer om ugen?
- Nej, jeg er fuldt raskmeldt

Kilde: Danica Pension

BEDØMMELSE

Finn Breinholt Larsen

Spørgsmålet er meget unuanceret. Det går på, hvordan sygdommen påvirker muligheden for at arbejde. Men det afhænger meget af, hvilket arbejde, der er tale om og hvilke opgaver, som er på jobbet. Det er vanskeligt at vide, hvordan folk forstår fuldstændigt uarbejdsdygtig. Opfatter de spørgsmålet som manuelt arbejde eller skrivebordsarbejde?

Se svaret fra pensionsselskaberne nederst i artiklen

SPØRGSMÅL 05

Hvornår regner du med at genvinde arbejdsevnen?

Dato _____

- Delvist
- Helt
- Aldrig

Kilde: Danica Pension

BEDØMMELSE

Finn Breinholt Larsen

Det er de færreste langtidssygemeldte, der på dato ved, hvornår de kan komme tilbage i arbejde igen. Det ville være bedre med svarkategorier inden for den næste måned, to-tre måneder osv.

Se svaret fra pensionselskaberne nederst i artiklen

SPØRGSMÅL 06

Er der siden sidste lægeerklæring sket ændringer i begrænsningen af dine daglige aktiviteter

- Nej
- Ja, hvilke ændringer er der sket?
(lille boks at skrive i)

Kilde: Velliv

BEDØMMELSE

Finn Breinholt Larsen

Spørgsmålet er svært at forstå. Man kunne have spurgt. Er du blevet mere eller mindre begrænset i dagligdagen end tidligere. Det ville gøre det lettere at svare på.

Se svaret fra pensionselskaberne nederst i artiklen

SPØRGSMÅL 07

Hvornår forventer du at arbejde helt eller delvist?

- Mulighed for at svare i en lille boks med fritekst.
-
-
-
-
-

Kilde: Velliv

BEDØMMELSE

Finn Breinholt Larsen

Her spørger man om to ting på en gang. Folk kan have en forventning om at starte så småt om tre måneder, men tror ikke de kommer på fuld tid. Hvad svarer de på?

Se svaret fra pensionsselskaberne nederst i artiklen

SPØRGSMÅL 08

Lider du af svimmelhed?

- Nej
- Ja, hvis ja i hvilket omfang
(mulighed for at uddybe)

Kilde: Velliv og PFA Pension har et lignende spørgsmål

BEDØMMELSE

Finn Breinholt Larsen

Alle mennesker oplever svimmelhed i deres liv ind imellem, men der er stor forskel på, om man lider af svimmelhed hver dag eller har oplevet det tre gange i sit liv. Muligheden for at svare på spørgsmålet er meget upræcist.

Se svaret fra pensionsselskaberne nederst i artiklen

SPØRGSMÅL 09

Beskriv din dagligdag og daglige rutiner

- Mulighed for at skrive flere linjes fritekst.

Kilde: Codan og Danica Pension

BEDØMMELSE

Finn Breinholt Larsen

Det er et meget bredt spørgsmål for de fleste mennesker, hvor det er svært at komme med et godt og præcist svar.

Se svaret fra pensionsselskaberne nederst i artiklen

SPØRGSMÅL 10

Er din søvn påvirket?

- Nej
- Lidt
- Moderat
- Meget

Kilde: PFA Pension og Velliv har et lignende spørgsmål

BEDØMMELSE

Fin Breinholt Larsen

Det kan være relevant at spørge til søvn, men spørgsmålet er upræcist. Hvordan er søvnen påvirket? Er det længden af søvnen? At søvnen er afbrudt? At man vågner tidligt og ikke kan falde i søvn igen? Eller vågner og ikke føler sig udhvilet. Det siger ikke så meget, at søvnen er påvirket. Det som betyder noget er måden søvnen er påvirket på.

Se svaret fra pensionselskaberne nederst i artiklen